ECOLOGICAL RISK ASSESSMENT AND ASSESSMENT OF EFFECTS ON NON-HUMAN BIOTA

TECHNICAL SUPPORT DOCUMENT
NEW NUCLEAR – DARLINGTON

NK054-REP-07730-00022 Rev 000

Submitted To:

Ontario Power Generation Inc.

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EXECUTIVE SUMMARY

Ontario Power Generation (OPG) was directed by the Ontario Minister of Energy in June 2006 to begin the federal approvals process, including an environmental assessment (EA), for new nuclear units at an existing site. This Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD was written in support of the EA for the New Nuclear – Darlington (NND) Project.

This TSD describes the potential effects on non-human biota as a result of exposures to radiological and conventional constituents from NND. The assessment of effects of the Project was completed in two stages:

1) Assess the baseline (existing) environmental exposures to non-human biota; and
2) Determine the potential incremental exposures as a result of the NND Project.

A baseline data collection program was designed and implemented to assess the existing concentrations of constituents and radionuclides in the Site, Local and Regional Study Areas. The baseline program was developed using the preliminary description of the NND Project and a review of previous Ecological Risk Assessments (ERAs) completed for the DN site. The baseline program collected information on concentrations of radiological and conventional constituents in various environmental media. A screening process was undertaken related to constituents measured in water (i.e. Lake Ontario and on-site ponds), sediments (Lake Ontario and on-site ponds) and soils (site-wide) to identify constituents of potential concern (COPCs) in the existing environment. The screening process identified hydrazine as a conventional COPC in Lake Ontario water and cadmium, copper, lead and selenium in Lake Ontario sediments; boron, cobalt, iron, hydrazine, manganese, strontium in the water and copper in the sediments of Coots Pond; and strontium and zirconium in the soils on the site. Seven radionuclides were selected to be used in the risk assessment due to their prevalence in the environment, historical concerns regarding environmental concentrations and relevance to nuclear power generation. These radionuclides were C-14, H-3, Sr-90, Co-60, Cs-134, Cs-137 and I-131.

The methodology used in assessing the effects on non-human biota (i.e. ecological risks) for the existing conditions followed guidelines outlined by various regulatory agencies including Environment Canada and the Canadian Council of Ministers of the Environment (CCME 1996). Four different steps were considered as provided in the various regulatory frameworks. They are:

- the problem formulation stage, in which the various chemicals of concern, receptors, exposure pathways, and scenarios are identified;
- the exposure assessment, where predicted exposures are calculated for the various receptors and COPC;
- the hazard assessment, in which exposure limits for the COPC are determined; and,
- the risk characterization stage, where the exposure and hazard assessment steps are integrated.

The exposures to the identified COPCs were determined for a selected group of ecological receptors. These ecological receptors were selected to cover a wide range of exposures and represent the characteristics of other ecological species within the environment.

These exposures were then compared to published toxicity reference values for conventional constituents and reference dose rates for radionuclides. A screening index (SI) value approach was used to assess the effects of conventional COPC and radionuclides on ecological receptors in the existing environment.

The evaluation determined that for the existing conditions, radionuclide doses were well below any reference dose rates. Also, conventional COPC exposure would not result in any adverse effects to non-human biota in the existing environment. Although the assessment for amphibians under existing conditions resulted in Screening Index values above one for strontium in Coots Pond and Tree Frog Pond, site-specific field evidence collected on amphibians at the site indicate that these ponds provide breeding grounds for six species of amphibians and healthy populations exist thus there are no adverse effects on amphibian populations in any of the on-site ponds in the existing environment.

Following the determination of the risks associated with COPCs from the existing conditions to the ecological receptors, the detailed project description was reviewed to determine if there were any potential new or additive COPCs resulting from the Project works and activities. For this assessment, the conclusions identified by the Surface Water, Atmospheric and Geology and Hydrogeology technical specialties were reviewed for applicable information on potential changes in surface water, atmospheric, soil and groundwater quality. No measurable changes in the quality of these environmental components or project-related COPCs were identified for a bounding release scenario. A qualitative assessment was conducted for conventional COPC and a preliminary quantitative assessment was carried out for the radionuclide COPC for the proposed NND based on the information presented from the other work groups. The assessment indicated that no potential adverse effects on non-human biota were expected as a result of radionuclide and conventional constituent emissions from the NND Project.

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SPECIAL TERMS

UNITS

Bq	becquerel
Bq/kg	becquereal per kilogram
Bq/L	becquerel per litre
Bq/m^2	becquerel per square meter
Bq/m^3	becquerel per cubic meter
Bq/month	becquerel per month
Bq/week	becquerel per week
Bq/y	becquerel per year
dw	dry weight
fw	fresh weight
g/s	grams per second
Gy	gray
GW	gigawatt
km	kilometre
L/s	litres per second
L/y	litres per year
mg/L	milligrams per litre
mg/kg	milligrams per kilogram
m/s	meters per second
mGy	milligray
mSv	millisievert
mSv/y	millisievert per year
MW	Megawatt
P-Sv	person-sievert
ppm	part per million
Sv	sievert
μg/m^3	micrograms per cubic meter
μGy	microgray
μSv/y	microsievert per year

ABBREVIATIONS AND ACRONYMS

Acronym	Full Terminology
BLCR	Black Crappie
BW	Body weight (of ecological receptor)
CCME	Canadian Council of Ministers of the Environment
CEAA	Canadian Environmental Assessment Act
CN	Canadian National
CNSC	Canadian Nuclear Safety Commission
COPC	Constituents of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario

Acronym	Full Terminology
CSM	Conceptual site model
DCCs	Dose Conversion Coefficients
DFO	Department of Fisheries and Oceans
DN site	Darlington Nuclear site
DNGS	Darlington Nuclear Generating Station
DW	Dry Weight
DQO	Data Quality Objectives
EA	Environmental Assessment
EC	Effects Concentration
EC_{20}	Concentration that caused effects in 20% of the species
EC_{25}	Concentration that caused effects in 25% of the species
EC_{50}	Concentration that caused effects in 50% of the species
Eco-SSLs	Ecological soil screening levels
EER	Ecological Effects Review
EIS	Environmental Impact Statement
ELC	Ecological Land Classification
ENEVs	Estimated No Effect Values
ERA	Ecological Risk Assessment
FASSET	Framework for Assessment of Environmental Impact
FW	Fresh Weight
GTA	Greater Toronto Area
HC	Health Canada
HPA	Health Protection Agency
ICRP	International Committee on Radiation Protection
ISQG	Interim Sediment Quality Guidelines
JRP	Joint Review Panel
LC	Lethal concentration
LC_{50}	Concentration that caused lethality in 50% of the species
LEL	Lowest Effect Level
LSA	Local Study Area
LOAEL	Low Observed Adverse Effect Level
LOEC	Lowest Observed Effect Concentration
L&ILW	Low and Intermediate Level Waste
MACT	Maximum Acceptable Toxicant Concentration
MDL	Method Detection Limit
MW	Megawatt
MOE	Ontario Ministry of Environment
NCRP	National Council on Radiation Protection and Measurements
NOAEL	No Observed Adverse Effect Level
NOEL	No Observed Effect Level
NND	New Nuclear - Darlington
OPG	Ontario Power Generation
OTR	Ontario Typical Range
PEL	Probable Effects Level

Acronym	Full Terminology
PPE	Plant Parameter Envelope
PWQO	Provincial Water Quality Objectives
QA	Quality Assurance
RBE	Relative Biological Effectiveness
REMP	Radiological Environmental Monitoring Program
RSA	Regional Study Area
SEL	Severe Effect Level
SI	Screening Index
SLC	Screening Level Concentration
SSA	Site Study Area
SSD	Species Sensitivity Distribution
SWMP	Storm Water Management Pond
TFs	Transfer Factors
TRV	Toxicity Reference Value
TSD	Technical Support Document
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
U.S.EPA	United States Environmental Protection Agency
VEC	Valued Ecosystem Component
95^{th} UCLM	95^{th} Percentile Upper Confidence Level of Mean Concentrations

GLOSSARY OF TERMS

Term	Definition
Absorbed dose:	In exposure assessment, the amount of a substance that penetrates an exposed organism's absorption barriers (e.g. skin, lung tissue, gastrointestinal tract) through physical or biological processes. The term is synonymous with internal dose.
Activity:	A measurement of the number of becquerels of a radioactive species in a sample.
Ambient air:	Any unconfined portion of the atmosphere: open air, surrounding air.
Assessment endpoint:	A quantitative or quantifiable expression of the environmental value considered to be at risk in a risk assessment.
Atmospheric dispersion:	The dispersion into the atmosphere of matter and gases that can be carried by air currents.
Background radiation:	The radiation in the natural environment, including cosmic rays and radiation from naturally radioactive elements. It is also called natural radiation.
Becquerel or Bq:	A standard international unit of radioactivity, equal to one radioactive disintegration per second. The obsolete unit curie or Ci, based upon the amount of radioactivity in a gram of radium, equals 3.7×10^{10} Bq.
Benthos:	The whole assemblage of plants or animals living on the lake or river bottom; distinguished from *plankton*.
Bioaccumulation:	The net accumulation of a chemical by an organism as a result of uptake from all routes of exposure.

Term	Definition
Bioavailability:	Degree of ability to be absorbed and ready to interact in organism metabolism.
Biomagnification:	The tendency of some chemicals to accumulate to higher concentrations at higher levels in the food web through dietary accumulation
Biota:	The animal and plant life of a region.
Chronic effect:	An adverse effect on an animal in which symptoms recur frequently or develop slowly over a long period of time.
Chronic exposure:	Multiple exposures occurring over an extended period of time or over a significant fraction of an animal's or human's lifetime (Usually seven years to a lifetime.)
Chronic toxicity:	The capacity of a substance to cause long-term poisonous health effects in humans, animals, fish, and other organisms.
Conceptual Site Model:	A conceptual site model (CSM) is a diagrammatic representation that shows the interrelations between biotic and abiotic components of the environment in different geographical locations on the site and identifies any potential sources of constituents within the assessment boundaries. The conceptual site model is a simple description of the various environmental components and non-human biota that will be evaluated in the ERA.
Constituent of Potential Concern:	A constituent of potential concern (COPC) is a chemical constituent in the environment that may be of potential concern for ecological receptors. A chemical is identified as a COPC when it has a concentration in the environment higher than a given criterion, which typically includes background concentrations and regulatory criteria such as the CCME and MOE. The process for selecting these constituents is discussed further in Section 4.1.1. All radionuclides are considered COPC.
Conservative:	As used in the term conservative estimates, this is considered a pessimistic or an overestimate of the level, effect or hazard, as the case may be.
Contaminant migration:	The movement of contaminants from one location to another.
Contamination:	Elements both radioactive and non-radioactive that are present at levels above those normally found (i.e. above background).
Curie:	See **Becquerel**.
Decay:	The disintegration of the nucleus of an unstable radionuclide by the spontaneous emission of energy or particles, resulting in a decrease in the number of radioactive atoms in the sample.
Decay chain:	The series of nuclides that form sequentially as radioactive decay progresses.
Decommissioning:	The act of removing a regulated facility from operation and operational regulation. This usually entails a certain amount of cleanup (decontamination).
Dose:	See **Effective dose** (unless otherwise specified)
Ecological Risk	The application of a formal framework, analytical process, or model to

Term	Definition
Assessment:	estimate the effects of human action(s) on a natural resource and to interpret the significance of those effects in light of the uncertainties identified in each component of the assessment process. Such analysis includes initial hazard identification, exposure and dose-response assessments, and risk characterization. When specifically used for the purposes of an EA, the ERA first determines the risk to non-human biota in the baseline environment, and then assesses the potential incremental risks as a result of the proposed Project. Potential effects on non-human biota related to loss of habitat or fish impingement have been addressed by other parts of the EA.
Ecological Receptors:	Ecological receptors are selected to represent the characteristics of other ecological species within the environment. They are selected in the ERA to represent a range of possible exposures at a site. Any potential effects on the VEC are, by extension, considered to occur in other like species in the ecosystem.
Effective dose:	This term is intended to express radiation doses in a manner such that the long-term biological harm to humans will be approximately the same per unit of effective dose, regardless of the Linear Energy Transfer (LET) of the type of radiation involved or of the parts of the body exposed to radiation. To obtain effective dose in Sv, the absorbed radiation dose in Gy is multiplied by the appropriate radiation factor and, in case of partial body exposure, by the appropriate tissue weighting factors. Both of these factors are taken to be one in the case of whole body exposure to gamma rays. Further details can be found in ACRP-13 (1991) and ICRP Publication 60 (1991).
Environmental Assessment:	An environmental analysis to determine whether a site / facility would significantly affect the environment and thus require a more detailed environmental impact statement.
Environmental Impact:	A change in environmental conditions resulting from an action or development, which may be negative, positive, or neutral.
Exposure:	The amount of radiation or pollutant present in a given environment that represents a potential health threat to living organisms.
Exposure Assessment:	Identifying the pathways by which toxicants may reach individuals, estimating how much of a chemical an individual is likely to be exposed to, and estimating the number likely to be exposed.
Exposure Concentration:	The concentration of a chemical or other pollutant representing a health threat in a given environment.
Exposure Pathway:	The path from sources of pollutants via soil, water, or food to man and other species or settings.
Food Web:	A food web is a diagrammatic representation of the dependence of a series of Ecological receptors on one another and abiotic components of the environment for food. The food webs developed for this EA incorporate air, water, soil, sediment and the major dietary components for the Ecological receptors. In simple terms, a constituent in the environment is

Term	Definition
	taken up by the species at the bottom of the food chain (typically smaller organisms such as insects and benthos) and is then transferred to larger organisms in the food webs when they consume the smaller organisms. Constituents behave differently as they move through the food web; some constituents accumulate and others do not. The use of transfer factors specific to each constituent accounts for these differences.
Gamma radiation:	The greatest penetrating power, but least ionizing, of the three principal forms of radiation from radioactive materials. Gamma radiation can completely penetrate and damage all body organs. Gamma radiation can be shielded effectively by several inches of lead, steel, or concrete, depending upon the shielding material and the energy and intensity of the gamma radiation.
Gray or Gy:	Standard international unit for absorbed radiation dose, equal to the absorption of one joule of radiation energy per kilogram of material. Absorbed doses are frequently expressed in milligray (mGy), equal to one-thousandth of a gray, and must specify the medium in which the energy is absorbed.
Groundwater:	Water beneath the earth's surface, accumulating as a result of infiltration and seepage, and serving as a source of springs and wells.
Half-life:	The time in which half the atoms of a particular radioactive substance disintegrate to another nuclear form. Each radionuclide has a unique half-life. Measured half-lives vary from millionths of a second to billions of years.
Hazard:	Potential for radiation, a chemical or other pollutant to cause human illness or injury. Hazard identification of a given substances is an informed judgment based on verifiable toxicity data from animal models or human studies.
Hazard Assessment:	Evaluating the effects of a contaminant or determining a margin of safety for an organism by comparing the concentration which causes toxic effects with an estimate of exposure to the organism.
Incremental:	Small increase.
Internal Dose:	In exposure assessment, the amount of a substance penetrating the absorption barriers (e.g. skin, lung tissue, gastrointestinal tract) of an organism through either physical or biological processes. (See: absorbed dose)
Ionizing radiation:	Any radiation that disassociates electrons from atoms or molecules, thereby producing ions. Examples are alpha particles, beta particles, X-rays, and gamma rays.
Isotope:	Differing forms of a particular chemical element. The atoms of all forms will have the same number of protons in each nucleus and the same number of electrons surrounding the nucleus. Hence, the chemical behaviour of all forms will be essentially identical. However, each version's nuclei will have a number of neutrons that is different from any other version. Thus, the isotopes (forms) of a particular element will have

Term	Definition
	different physical properties, including the mass of its atoms and whether the nuclear structure of its atoms will retain its identity indefinitely (be "stable") or undergo spontaneous transformation at some future time (be "radioactive").
Lower limit of detection:	This is the lowest concentration of radioactive material in a sample that can be detected at the 95% confidence level with a given analytical system.
Macrophytes:	Rooted aquatic vascular plants.
Measurement endpoint:	A quantitative summary of the results of a toxicity test, a biological monitoring study, or other activity intended to reveal the effects of a substance.
Mitigation:	An action or design intended to reduce the severity or extent of an environmental impact.
Modelling:	Using mathematical principles, information is arranged in a computer program to model conditions in the environment and to predict the outcome of certain operations.
Natural radioactivity:	The property of radioactivity exhibited by more than 50 naturally occurring radionuclides.
Non-ionizing radiation:	Radiation that is not capable of dislodging electrons from atoms or molecules (see **ionizing radiation**). Examples of non-ionizing radiation are radio waves, microwaves, and light.
Nucleus:	The small, positively charged core of an atom. It is only about 1/10000th the diameter of the atom but contains nearly all the atom's mass. All nuclei contain both protons and neutrons, except the nucleus of ordinary hydrogen, which consists of a single proton.
Nuclide:	An atomic nucleus that contains a specific number of protons and neutrons. The nuclei of all isotopes of a given element have the same numbers of protons but different numbers of neutrons, and therefore are different nuclides.
Order of magnitude:	A range of values between a specified lower value and an upper value ten times as large.
Pathway:	The physical course a chemical or pollutant takes from its source to the exposed organism.
Pathways analysis:	A method of estimating the transfer of contaminants (e.g. radionuclides released in water) and subsequently accumulated up the food chain to fish, vegetation, mammals and humans and the resulting radiological dose to humans.
Radiation:	The emission and propagation of energy through space or matter in the form of electromagnetic waves (e.g. gamma rays) or fast-moving particles such as alpha and beta particles.
Radioactive:	The condition of a material exhibiting the spontaneous decay of an unstable atomic nucleus into a stable or unstable nucleus (e.g. uranium-238 decays into thorium-234 (unstable) and polonium-210 decays into lead-208 (stable)).

Term	Definition
Radionuclide:	An element or isotope which is radioactive as a result of the instability of the nucleus of its atom (e.g. radium or uranium).
Reference Values:	A reference value is a value that is used to quantify the degree of risk posed by a constituent to non-human biota. Exposures below this value indicate that the constituent is unlikely to pose a measurable risk or adverse effect. Examples are toxicity reference values (TRVs) for conventional COPC and dose rate limits for radionuclides.
Relative Biological Effectiveness:	A factor that reflects how different types of radiation differ quantitatively in producing biological effects. For example, if one radiation type requires 10 Gy to produce a biological effect and another type requires 5 Gy for the same effect, then the RBE of the second relative to the first is 10 Gy/5 Gy = 2.
Risk:	A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.
Risk Assessment:	Qualitative and quantitative evaluation of the risk posed to the environment by the actual or potential presence and/or use of specific pollutants.
Risk Characterization:	The last phase of the risk assessment process that estimates the potential for adverse health or ecological effects to occur from exposure to a stressor and evaluates the uncertainty involved.
Run-off:	The part of rainfall that is not absorbed directly by the soil but is drained off in rills or streams.
Screening:	A preliminary stage of the assessment process for quick evaluation of relatively simple and routine activities, or for determining the level of effort required for evaluating more complex projects.
Screening Index:	The ratio of estimated site-specific exposure to a single chemical over a specified period to the estimated exposure level, at which no adverse health effects are likely to occur.
Sievert or Sv:	A unit of equivalent or effective dose. In theory, the unit Sv should only be applied at low doses and low dose rates. Equivalent and effective doses are frequently expressed as millisievert (mSv), equal to one-thousandth of a sievert, or as microsievert (μSv), equal to one-millionth of a sievert.
Uncertainty:	A qualitative or quantitative expression of error.
Uptake:	The process/act by which a contaminant (e.g. a radionuclide) enters a biological organism (e.g. inhalation, ingestion by humans).

LIST OF TECHNICAL SUPPORT DOCUMENTS (TSDS)

Atmospheric Environment Existing Environmental Conditions TSD – SENES Consultants Limited

Atmospheric Environment Assessment of Environmental Effects TSD – SENES Consultants Limited

Surface Water Environment Existing Environmental Conditions TSD – Golder Associates Limited

Surface Water Environment Assessment of Environmental Effects TSD – Golder Associates Limited

Aquatic Environment Existing Environmental Conditions TSD – SENES Consultants Limited and Golder Associates Limited

Aquatic Environment Assessment of Environmental Effects TSD - SENES Consultants Limited and Golder Associates Limited

Terrestrial Environment Existing Environmental Conditions TSD – Beacon Environmental

Terrestrial Environment Assessment of Environmental Effects TSD – Beacon Environmental

Geological and Hydrogeological Environment Existing Environmental Conditions TSD – CH2M HILL Canada Limited and Kinectrics Incorporated

Geological and Hydrogeological Environment Assessment of Environmental Effects TSD – CH2M HILL Canada Limited

Land Use Existing Environmental Conditions TSD – MMM Group Limited

Land Use Assessment of Environmental Effects TSD – MMM Group Limited

Traffic and Transportation Existing Environmental Conditions TSD – MMM Group Limited

Traffic and Transportation Assessment of Environmental Effects TSD – MMM Group Limited

Radiation and Radioactivity Environment Existing Environmental Conditions TSD – AMEC NSS

Radiation and Radioactivity Environment Assessment of Environmental Effects TSD – SENES Consultants Limited and AMEC NSS

Socio-Economic Environment Existing Environmental Conditions TSD - AECOM

Socio-Economic Environment Assessment of Environmental Effects TSD - AECOM

Physical and Cultural Heritage Resources Existing Environmental Conditions TSD – Archaeological Services Incorporated

Physical and Cultural Heritage Resources Assessment of Environmental Effects TSD – Archaeological Services Incorporated

Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD – SENES Consultants Limited

Scope of Project for EA Purposes TSD – SENES Consultants Limited

Emergency Planning and Preparedness TSD – SENES Consultants Limited and KLD Associates Incorporated

Communications and Consultation TSD – Ontario Power Generation Incorporated

Aboriginal Interests TSD – Ontario Power Generation Incorporated

Human Health TSD – SENES Consultants Limited

Malfunctions, Accidents and Malevolent Acts TSD – SENES Consultants Limited

Nuclear Waste Management TSD – Ontario Power Generation Incorporated

1.0 INTRODUCTION

1.1 Background

Ontario Power Generation (OPG) was directed by the Ontario Minister of Energy in June 2006 to begin the federal approvals process, including an environmental assessment (EA), for new nuclear units at an existing site. OPG initiated this process and in September 2006 submitted an application for a Licence to Prepare Site to the Canadian Nuclear Safety Commission (CNSC) for a new nuclear power generating station at the Darlington Nuclear site (DN site), located in the Municipality of Clarington on the north shore of Lake Ontario in the Region of Durham. The DN site is currently home to Darlington Nuclear Generating Station (DNGS), a 4-unit plant, the first unit of which was commissioned by OPG in 1990. It remains under OPG ownership and operational control.

Before any licensing decision can be made concerning the new nuclear generating station, an EA must be performed to meet the requirements of the *Canadian Environmental Assessment Act (CEAA)* and be documented in an Environmental Impact Statement (EIS). An EIS is a document that allows a Joint Review Panel (JRP), regulators, members of the public and Aboriginal groups to understand the Project, the existing environment and the potential environmental effects of the Project. Guidelines for the preparation of the EIS were prepared by the Canadian Environmental Assessment Agency (the CEA Agency) and the CNSC (in consultation with Department of Fisheries and Oceans Canada (DFO), the Canadian Transportation Agency and Transport Canada). The Guidelines require that the proponent prepare the EIS and support it with detailed technical information which can be provided in separate volumes. Accordingly, OPG has conducted technical studies that will serve as the basis for the EIS. These technical studies are documented in Technical Support Documents (see Section 1.2 below).

1.1.1 The New Nuclear - Darlington Project

New Nuclear - Darlington (NND), a new generating station, is proposed to be located primarily on the easterly one-third (approximately) of the DN site, with reactor buildings and other related structures located south of the CN rail line. The proposed Project involves the construction and operation of up to four nuclear reactor units supplying up to 4,800 MW of electrical capacity to meet the baseload electrical requirements of Ontario. The proposed Project will include:

- Preparation of the DN site for construction of the new nuclear facility;
- Construction of the NND nuclear reactors and associated facilities;
- Construction of the appropriate nuclear waste management facilities for storage and volume reduction of waste;
- Operation and maintenance of the NND reactors and associated facilities for approximately 60 years of power production (i.e., for each reactor);
- Operation of the appropriate nuclear waste management facilities; and

- Development planning for decommissioning of the nuclear reactors and associated facilities, and eventual turn-over of the site to other uses.

For EA planning purposes, the following temporal framework has been adopted for the Project:

Project Phase	Start	Finish
Site Preparation and Construction	2010	2025
Operation and Maintenance	2016	2100
Decommissioning and Abandonment	2100	2150

1.1.2 The New Nuclear - Darlington Environmental Assessment

The EA considers the three phases of the NND Project (i.e., Site Preparation and Construction, Operation and Maintenance. Decommissioning and Abandonment is only handled at a conceptual stage in the main EIS document and not in the individual TSDs. In doing so, it addresses:

- The need for, and purpose of the Project;
- Alternatives to the Project;
- Alternative means of carrying out the Project that are technically and economically feasible, and the environmental effects of such alternatives;
- The environmental effects of the Project including of malfunctions, accidents and malevolent acts, and any cumulative effects that are likely to result from the Project in combination with other projects or activities that may be carried out;
- Measures to mitigate significant adverse environmental effects that are technically and economically feasible;
- The significance of residual (after mitigation) adverse environmental effects;
- Measures to enhance any beneficial environmental effects;
- The capacity of renewable resources that are likely to be significantly affected by the project, to meet the needs of the present and the future;
- The requirements of a follow-up program in respect of the Project;
- Consideration of community knowledge and Aboriginal traditional knowledge; and
- Comments that are received during the EA.

1.2 Technical Support Document

The EA studies were carried out and are documented within a framework of individual aspects or “components” of the environment. The environmental components are:

- Atmospheric Environment;
- Surface Water Environment;
- Aquatic Environment;
- Terrestrial Environment;

- Geological and Hydrogeological Environment;
- Land Use;
- Traffic and Transportation;
- Radiation and Radioactivity Environment;
- Socio-Economic Environment;
- Physical and Cultural Heritage Resources; and
- Aboriginal Interests;
- Health - Human; and
- Health – Non-Human Biota (Ecological Risk Assessment).

This Technical Support Document (TSD) relates to the Ecological Risk Assessment and Assessment of Effects on Non-Human Biota. It should be noted that the Ecological Risk Assessment and Assessment of Effects on Non-Human Biota follows some of the EA framework as it is assessing the environmental health under the EA process as well as components of an Ecological Risk Assessment (ERA). The ERA framework is presented in the report as seen in Section 3 and Section 4. It has been prepared by SENES Consultants Limited, the member firm of the EA Consulting Team with technical responsibility for the Ecological Risk Assessment component of the EA. This TSD is one of a series of related documents prepared for each environmental component to describe: i) existing (i.e., "baseline") environmental conditions throughout the study areas relevant to the Project; and ii) the changes and effects to these baseline conditions that will be likely as a result of implementing the Project. In most cases, separate TSDs have been prepared to describe existing conditions and likely effects of the Project. However, for some environmental components the description of existing environmental conditions and the assessment of environmental effects have been combined within one TSD.

A number of related TSDs have also been prepared to support the EIS. These include, but are not necessarily limited to:

- Scope of the Project for EA Purposes;
- Emergency Planning and Preparedness;
- Communications and Consultation;
- Malfunctions, Accidents and Malevolent Acts; and
- Nuclear Waste Management.

1.3 Description of the Ecological Risk Assessment Component

The methodology used in the evaluation of effects on non-human biota followed guidelines for ERA as outlined by various regulatory agencies including Environment Canada and the Canadian Council of Ministers of the Environment (CCME) as well as the United States Environmental Protection Agency (U.S. EPA 1992). The ERA considered four steps as provided in the various regulatory frameworks. They are:

- the problem formulation stage, in which the various chemicals of concern, receptors, exposure pathways, and scenarios are identified;
- the exposure assessment, where predicted exposures are calculated for the various receptors and COPC;
- the hazard assessment, in which exposure limits for the COPC are determined; and,
- the risk characterization stage, where the exposure and hazard assessment steps are integrated.

The exposures to the identified COPCs under existing conditions were determined for a selected group of ecological receptors. These ecological receptors were selected to cover a wide range of exposures and represent the characteristics of other ecological species within the environment. These exposures were then compared to published toxicity reference values for conventional constituents and reference dose rates for radionuclides. A screening index (SI) value approach was used to assess the effects on ecological receptors in the existing environment. A qualitative assessment of the potential effects of the NND Project on non-human biota (animals and plants) was also undertaken. It should be noted that the ERA only considers the effects of chemical and radiological exposure on non-human biota. Assessments of potential effects related to loss of habitat, thermal plume, fish impingement and other potential Project interactions with the environment can be found in the Terrestrial Environment and/or Aquatic Environment TSDs.

2.0 EA METHODOLOGY

2.1 Existing Environment Characterization Program

At the time of completing this TSD, three vendors were being considered by the Province of Ontario for supplying and installing the reactors and associated equipment for the Project. Accordingly, the specific reactor to be constructed and operated had not yet been determined. Therefore, for purposes of the EA, the Project was defined in a manner that effectively incorporated the salient aspects of all of the considered reactors. Similarly, the existing environmental conditions and the likely environmental effects of the Project were also determined in a manner that considered the range of reactor types and number of units that may comprise the Project.

The essential aspect of the method adopted for defining the "Project for EA Purposes" is the use of a bounding framework that brackets the variables to be assessed. This bounding framework is defined within a Plant Parameter Envelope (PPE). The PPE is a set of design parameters that delimit key features of the Project. The bounding nature of the PPE allows for appropriate identification of a range of variables within a project for the purpose of the environmental assessment while also recognizing the unique features of each design. For further information concerning the use of the PPE for this EA, the reader is directed to Section 2.1 of the EIS.

The information presented in this TSD is deemed to be appropriately bounding so as to facilitate the assessment of environmental effects that may be associated with any of the considered reactors. As both the EA studies and the vendor selection programs continue, it may be that aspects of this TSD are updated to respond to these evolving programs, in which case the updated information will be presented in an addendum to this TSD or in the EIS. The EIS itself will remain subject to edits until it has been accepted by the JRP as suitable for the basis of the public hearing that will be convened to consider the Project.

This TSD is a document prepared in support of the EIS. Where there may be differences in the information presented in the two documents, the EIS will take precedence for the reasons noted above.

2.1.1 Characterization Program Framework

The existing environmental conditions (i.e., environmental baseline) characterization program was carried out within the basic framework described in the following sub-sections. It should be noted that the characterization program used in this document interfaces with the Surface Water Environment, Geology and Hydrogeology Environment, Atmospheric Environment, Aquatic Environment and Terrestrial Environment TSDs.

2.1.1.1 Define the Baseline Data Requirements

A preliminary scope of required characterization for the environmental component was established. This was used to focus the subsequent gap analysis and work plan development on the relevant aspects (i.e., sub-components) of the environment. The preliminary scoping considered the following:

- Potential spatial extent of Project influence (i.e., study areas);
- Potential interactions between the Project and the environment;
- Expected range of environmental conditions in the study areas; and
- Environmental measurement indicators relevant in the environment.

2.1.1.2 Conduct Gap Analysis

When the preliminary scope of the required characterization had been defined, the availability of existing environmental data to meet the requirements was reviewed and gaps in the database were identified. The gap analysis is comprised of three steps: i) determine data requirements; ii) review existing information; and iii) compare required data against available data to identify deficiencies (i.e., gaps).

2.1.1.3 Develop Baseline Data Collection Program

A work plan was developed describing all aspects of the data collection requirement and implementation program, including the nature of the information needed; the required format and context for data collection (e.g., in terms of environmental sub-components); the level of required detail; collection program schedule, including frequency and timeframe of sampling and monitoring events; as well as protocols and methodologies to be applied in the program. Each component-specific data collection work plan also considered the possible overlapping requirements of other environmental components.

2.1.1.4 Implement Baseline Data Collection Program

The baseline data collection programs for the environmental components were carried out. For some environmental components, the data collection requirements considered seasonal variations and the program was staged appropriately to address changing conditions throughout the year. The data collection programs were re-evaluated on an ongoing basis throughout the baseline period and the information acquired during initial sampling and monitoring campaigns served to inform and provide revised focus for subsequent campaigns.

2.1.2 Characterization Program Design

The baseline characterization program was planned in a systematic manner using a "best practice" approach. This EA encompasses a number and range of environmental components, many of which can be characterised largely in quantitative terms while others can only be effectively characterised and described using qualitative information. Accordingly, a flexible approach was required to meet the basic objective of characterizing existing conditions for the various components of the environment with sufficient precision to allow the assessment of potential environmental effects to be carried out with confidence.

Environmental baseline characterization planning for the ERA Environment was carried out in a Data Quality Objectives (DQO) framework. The DQO framework for this project suggests a systematic protocol for consistent documentation of the rationale for selection of environmental parameters, the precision goals for this information, gaps analyses based on existing information and the design of a characterization program to fill these gaps.

The following generalized 7-step framework was applied for baseline characterization across all components of the environment. Where the baseline characterization involves quantitative information, reference is made to the *Data Quality and Design of Baseline Characterization Program Framework* (SENES, 2007). Where the information is based on more qualitative parameters, the program was derived considering best practice in the context of the applicable environmental component and the nature of the data to be collected.

- ***Step 1 - Define the Project and its interactions with the environment -*** as the means to focus the characterization requirements on the components and sub-components of the environment with potential to be affected by the Project;
- ***Step 2 – Determine environmental parameters that are useful as indicators of environmental change and effect -*** a determination of the features of the environment that are relevant to the environmental component as indicators for the assessment of potential effects of the Project;
- ***Step 3 – Estimate possible extent and magnitude of environmental effects -*** a preliminary judgement of the possible magnitude of effects in terms of severity (e.g., negligible, meaningful); and the potential spatial and temporal extent of effects in terms of physical area and time and duration;
- ***Step 4 – Establish baseline information quality objectives -*** the precision to which baseline conditions must be characterised so the EA can to be carried out to an appropriate level of confidence (these objectives may be quantitative, qualitative or both depending on the nature of the specific environmental components);
- ***Step 5 – Review existing information and identify data gaps -*** a comparison of the available information with that which will be required for the EA;
- ***Step 6 – Design baseline characterization program -*** designing the characterization program that required to address the data gaps; and
- ***Step 7 – Review and reiterate -*** on-going review and reiteration of the program to ensure it is developed effectively and can be practically implemented.

The 7-step framework as applied specifically for the assessment of non-human biota is described further in Section 3 of this TSD.

2.1.3 Project – Environment Interactions with the Assessment of Ecological Risk

For baseline planning purposes, a preliminary description of the Project was developed describing the works and activities likely to be associated with the Site Preparation and Construction, and the Operation and Maintenance phases as Decommissioning is only handled at a conceptual stage in the main EIS document and not in the individual TSDs. To focus the baseline data collection program for the assessment of effects on non-human biota, the technical team reviewed the preliminary description to consider where the Project was likely to interact with the environmental sub-components determined relevant for EA purposes. The potential Project/Environment interactions are described in Table 2.1-1. A more detailed assessment of effects by individual Project Works and Activities is given in Section 5 of this TSD.

Table 2.1-1 Potential Project Interactions in the ERA Environment

Environmental Sub-Component	Project Activity	Potential Interaction			Comment
		Low	Moderate	High	
Conventional – Terrestrial and Aquatic	Site Preparation & Construction		•		Construction and soil relocation activities may result in redistribution of chemical constituents on site and emissions to air from vehicle exhaust
	Operation & Maintenance		•		Potential chemical emissions to air and water from steam generator and standby power.
Radiological – Terrestrial and Aquatic	Site Preparation & Construction	•			Construction and soil relocation activities may result in redistribution of radiological constituents on site
	Operation & Maintenance		•		Potential radiological emissions to air and water from reactor operation

Note: Low – This indicates little or no potential effect; Moderate – indicates a likely potential effect and High-indicates a potential effect

2.1.4 Data Quality Objectives Related to the ERA

The sampling plan for the ERA Baseline Characterization program involved the collection of all samples in environmental media by other parts of the EA such as Atmospheric Environment, Surface Water Environment, Geology and Hydrogeology Environment, Terrestrial Environment, and Aquatic Environment. It was determined that the data quality objectives (DQOs) adopted for these work packages were also sufficient for the ERA. Therefore, no additional DQOs were developed for use by the ERA work group.

2.1.5 Existing Information and Gap Analysis in the Ecological Risk Assessment

Existing and available reference materials concerning the nature of existing conditions in the ERA throughout the applied study areas were reviewed. The objective of the review was to: i) compile a database of existing information related to the baseline characteristics; ii) comprehend the extent and utility of the existing information in terms of baseline characterization; and, iii) identify the gaps, if any, between the information required to appropriately characterise the baseline for EA purposes and that information which is currently available.

This section provides a summary of the gaps identified in the data required to carry out an ERA for the baseline at the DN site.

2.1.5.1 Review of Previous ERAs Conducted at the DN Site

ERAs at the DN site have been undertaken in the past, which provided an initial background in the development of the ERA conducted for this Project.

An Ecological Effect Review (EER) of the DN Site was undertaken in 2000-2001 (ESG International Inc. 2001). A series of stakeholder and public meetings were held to obtain input on the development of ecological receptors for use in the EER, resulting in the selection of 14 species. These species were considered in the development of the list of ecological receptors in this ERA (See Appendix C). The EER considered potential effects associated with the construction and operation of DNGS. Potential operational effects were assessed using an ERA based on existing monitoring data, atmospheric dispersion calculations and surface water dilution calculations. There were no risks identified to any biota due to chemical or radiological exposure. This EER was submitted for review by the CNSC.

In 2005, a risk assessment of the drainage ditch system south of the Bowmanville switching yard at the DN site (SENES 2005) was undertaken. This assessment estimated the potential exposure to people and ecological receptors that may have access to this area. The risk assessment followed the approach under Ontario Regulation 153/04 (Environmental Protection Act, MOE 2004) which is the legislation to address brownfield sites. Previous site investigations with respect to the drainage ditch were carried out by Kinectrics in 2002 and 2004 (Kinectrics Inc. 2002, 2004) and identified boron and zinc at levels above MOE Table 3 standards (Environmental Protection Act, 2004) within the drainage ditch system. Elevated boron concentrations were found at several locations on the DN site at depths up to 20 m; however, more recent soil samples from the ditch system showed that concentrations are below MOE standard for boron. The earlier samples were performed using an analytical method that provided total boron and not hot-water soluble boron (i.e. available boron) and thus the comparison of total boron concentrations to the MOE standard are not appropriate. The risk assessment postulated that zinc in the drainage ditch was suspected to be due to runoff from the Bowmanville switching yard (possibly from galvanized steel). The ERA conducted as part of this assessment concluded that there may be a potential issue with respect to exposure to warbler and earthworms in this limited area of the DN site. Site visits conducted during this study indicated that the study site supports a fully functioning and diverse selection of expected ecological receptors. In particular, field observations showed that the earthworms were abundant with no indication of reproductive impacts.

Since this is a very limited area, populations of ecological receptors will not be affected by any activities at the NND, there is no further consideration of the potential contamination in area.

2.1.5.2 Exposure Data Gaps

The results of these previous studies, and the data used in the assessments were considered in the development of the baseline characterization program. In addition, available environmental data for the site (e.g. REMP data) were reviewed. Some gaps were identified in the radiological and conventional (non-radiological) exposure information available. These included levels of radionuclides and non-radionuclides in soil, groundwater, sediment, surface water, and air. The data needs resulting from this gaps analysis were addressed in the design of the sampling program and were carried out as part of the Aquatic and Terrestrial work packages. Summaries of all data collected are presented in Appendix B.

2.1.5.3 Gaps in Pathway Development Information

In the development of the preliminary list of ecological receptors for the ERA (based, in part, on the previous ERAs), some gaps were noted in the dietary information available for the species in order to develop the food webs. Thus, concentrations of radionuclides and conventional constituents are needed in insects and terrestrial vegetation, for example. In some cases data were not available, and in these cases surrogate species were used so that a quantification of exposure was possible. For example, earthworms or caterpillars were used as a surrogate for insect species in the absence of any data since it is difficult to obtain a large enough sample on insects. This leads to some uncertainty in the assessment. However, given the conservatisms built into the assessment in that earthworms and caterpillars are more exposed than insects since they are not very mobile, it is unlikely that these assumptions will affect the overall conclusion of the assessment.

2.1.6 Baseline Characterization Data Requirements in the Ecological Risk Assessment

Considering the gaps between the existing information and that which was required to appropriately characterise the baseline conditions for EA purposes, an environmental data collection program for the ERA was designed. The program is described in Section 3.1.3. The results of the baseline characterization sampling program are summarized in Appendix B.

2.1.7 Review and Reiteration

Effective characterization program design involves a process of continuing review and reiteration to: i) ensure that it is complete and practicable; ii) to identify the bio-physical and socio-economic synergies, connections and dependencies among the various environmental components; and, iii) to maximize collaborative opportunities within the EA team to ensure that the overall baseline characterization program is complementary and cohesive.

These collaborative efforts are discussed briefly in Section 2.1.9.

2.1.8 Summary of Environmental Baseline Characterization Program

The environmental baseline characterization program as it has been designed for the ERA is summarized in Section 3.1.3 and Appendix B.

2.1.9 Interactions with Other Environmental Components

During development of the environmental baseline data collection program for the ERA, the following interfaces with other environmental components were identified and addressed:

- Aquatic Environment;
- Radiation and Radioactivity;
- Atmospheric Environment;
- Surface Water Environment;
- Geology and Hydrogeology;
- Malfunctions, Accidents and Malevolent Acts; and
- Terrestrial Environment.

These interfaces included an overlap in sampling programs and a need for information to be used in the assessment of the effects of the Project. To address the overlap in sampling programs, the ERA sampling program was developed as an extension of the sampling programs identified for the work packages identified above. This also allowed for a more consistent assessment of the existing environment and the effects of the Project.

2.2 Existing Environment and Effects Assessment

2.2.1 Analytical Methods for the Assessment

Assessment of effects across a wide range of environmental components and sub-components requires the use of a variety of different analytical methods (e.g., computer models, manual calculations, relevant project experiences, formal case studies, comparison against relevant benchmarks, professional judgement). The ERA is comprised of an assessment using the data (such as concentrations in various environmental media and biota) collected by other technical disciplines. Therefore, the specific analytical methods used in the assessment of environmental effects in the ERA can be found in the TSDs for other technical disciplines in the EA team. The methodology used to assess the effects specific to non-human biota from the Project using the data from the other technical disciplines can be found in Section 3.

2.2.2 Criteria for the Assessment

To assess Project-related effects on the various components of the environment, it is necessary to identify the criteria against which the effects of the Project will be compared and judged. These criteria are collectively referred to as the criteria of assessment, and include values such as the

Toxicity Reference Values (TRV) for conventional COPC and Reference Dose Rates for radionuclides. The criteria relevant to assessment of the effects on non-human biota are described in the Hazard Assessment Section which is part of ERA framework in Section 4.3.

2.2.3 Characterizing the Existing Environment

Prior to determining the effects of the NND Project on non-human biota, an assessment was completed to determine the effects on non-human biota from the existing environmental conditions. The results of the baseline sampling program provided by the Surface Water, Aquatic, Terrestrial, Atmospheric and Geology and Hydrogeology work groups are used as the basis for determining the effects of the existing environment on non-human biota utilizing the ERA framework. The methodology used for this assessment is detailed in Section 3.1 of this TSD.

2.2.4 Process Steps for Determination of Likely Environmental Effects of the Project

2.2.4.1 Detailed Screening for Potential Project-Environment Interactions

A preliminary screening for potential interactions was conducted during baseline characterization studies to ensure the appropriate focus of those studies. A more detailed screening was subsequently conducted for each component of the environment based on the Description of the Project (as summarized in the Basis for the EA in Appendix A) to direct the effects assessment effort. The screening approach allows the EA studies to focus on the aspects of key importance, thus minimizing assessment effort where there is low potential for Project-related effect.

Each of the relevant Project works and activities was considered individually to determine if there was a plausible mechanism for the Project to interact with the environment.

2.2.4.2 Evaluation for Likely Measurable Changes in the Environment

Each potential interaction was evaluated to determine if it would be likely to result in a "measurable" change to the environment. For purposes of the EA, a measurable change to the environment is defined as a change that is real, observable or detectable compared with existing (baseline) conditions. A predicted change that is trivial, negligible or indistinguishable from background conditions is not considered to be measurable.

The determination of likely measurable changes in the environment is completed in the Surface Water, Atmospheric, Aquatic, Terrestrial and Geology and Hydrogeology TSDs. The ERA uses a tiered methodology in the determination if a change to the environment would result in a measurable change to the health of non-human biota. This approach is discussed further in Section 3.2.

2.2.4.3 Assessment of Likely Effects on the Environment

Each Project interaction likely to result in a measurable change to the environment was evaluated further to identify the likely effect of the change on ecological receptors selected for the ERA, or on a pathway to other environmental components. Ecological receptors relevant to the ERA are described in Section 4.1.2 of this TSD.

Each likely effect was identified and described as either beneficial or adverse. Where the likely effect was determined to be beneficial, no further assessment was conducted. Similarly, where the likely effect was determined to be adverse, but clearly not of concern with respect to potential effects on non-human biota, no further assessment was conducted. This could occur for example when an effect is predicted but the weight-of-evidence from biomonitoring studies indicates that populations of ecological receptors are not being affected. Rationale was provided in each case where further assessment was not considered to be warranted. All other likely adverse environmental effects were carried forward for consideration of mitigation opportunities.

2.2.4.4 Consideration of Mitigation and Determination of Likely Residual Effects

For each likely adverse effect (other than those clearly of no concern), possible means that were technically and economically feasible were identified and considered for mitigating (i.e., eliminating, reducing or controlling) the effect. Each likely adverse effect was re-evaluated assuming implementation of the identified mitigation measures, to determine the residual effect that would remain after mitigation.

By advancing through the assessment in the methodical manner described above, the wider range of potential Project-environment interactions identified at the beginning of the process were progressively screened and evaluated to result in a narrower range of residual adverse effects identified as likely at the end of the process. This progression from potential interactions through to likely residual adverse effects is an important aspect of the overall assessment methodology used, especially as it relates to the subsequent determination of significance of the likely residual adverse effects.

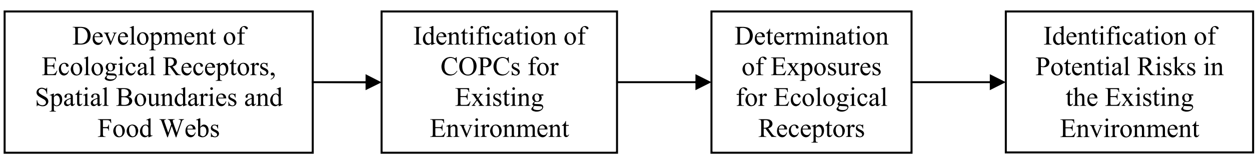
3.0 METHODOLOGY USED FOR EVALUATING ECOLOGICAL EFFECTS

The following Section describes the methodology specific to the development of the baseline (existing conditions) and effects assessments for the NND Project EA. The methodology described below combines the elements of an EA as well as the framework used for an Ecological Risk Assessment. The Ecological Risk Assessment for the existing conditions at the DN site is presented in Section 4 which provides details on each element of the ERA framework. Section 5 provides a qualitative evaluation of the ecological effects associated with the NND Project.

3.1 Methodology For Characterizing Existing Conditions (Baseline)

Figure 3.1-1 shows the high level methodology applied to the characterization of potential risks associated with the existing (baseline) environment at the DN site. This methodology is discussed in further detail in the following sections.

Figure 3.1-1 High Level Methodology for Evaluating Risks for Existing Conditions



3.1.1 Ecological Receptors Considered in the ERA

As the ERA is an evaluation of the potential risks to non-human biota, it was necessary to identify ecological receptors in the environment that could be used to develop a conceptual site model for assessment of the baseline environmental characteristics. Information from past ERA work conducted at the DN site and information from the Terrestrial Environment Existing Environmental Conditions TSD and the Aquatic Environment Existing Environmental Conditions TSD were used in the selection of ecological receptors (see Appendix C).

Ecological receptors were selected to evaluate a range of species potentially exposed to radiological and conventional constituent releases from the NND Project. An ERA does not evaluate all the species present at the site (i.e., the whole bioinventory) rather it evaluates a smaller number of species that are representative of the various feeding habits and characteristics of the species present at the site. Thus, the selected ecological receptors are representative of various levels of ecological hierarchy that may be located in the most exposed areas. The selected ecological receptors are listed in Section 4.1.2. The rationale for the selection of the ecological receptors can be found in Appendix C along with brief ecological profiles of the selected species.

3.1.2 Spatial Boundaries Considered in the ERA

The possible extent and magnitude of potential effects in the ERA will be a function of the characteristics of the sources and pathways. Each Project work and activity is a possible source of an effect; and each Project/Environment interaction is a potential pathway for an effect on ecological receptors. The spatial boundaries of the Project are important in determining whether a potential effect is considered to be significant from an ecological perspective.

3.1.2.1 Identification of Study Area Boundaries

To establish the geographic study areas appropriate for the ERA, the possible geographic extent of Project-related effects was considered. Typical of EA practice, the study areas for the ERA encompass the study areas defined for the terrestrial and aquatic environmental components and are as follows (see Figure 3.1-2):

- **Site Study Area:** The Site Study Area (SSA) was generally adopted without change from the generic SSA, however to capture the surface water environment, the Lake Ontario portion of the SSA has been extended approximately 2 km from the DN site boundaries in both directions along the shoreline and into the Lake from the shoreline to account for the potential range of locations for the cooling water intake and outfall diffuser(s).
- **Local Study Area:** The Local Study Area (LSA) for the ERA corresponds to the LSA for the Surface Water Effects Assessment TSD. Surface water data from the LSA were used to characterize background surface water concentrations; and
- **Regional Study Area:** The Regional Study Area (RSA) for the ERA corresponds to the RSA for the Surface Water Effects Assessment TSD. Surface water data from the RSA were used to characterize background surface water concentrations.

3.1.2.2 Development of Assessment Areas at DN Site

For the purposes of this assessment, the Site Study Area was broken down into smaller units to identify potential areas of similar habitat (polygons) for the development of a conceptual site model. The rationale for the use of smaller areas is as follows.

The DN site landscape is a mosaic of various communities of non-human biota. This is typical of the landscapes found in southern Ontario (Riley and Mohr 1994). However, the DN site landscape has unique characteristics as a result of the works and activities that have occurred on the site in the past due to the construction and operation activities of the DNGS and ancillary facilities.

An intuitive approach was used to evaluate the terrestrial environment at the DN site. This involved using the assumption that NND may have a comparable effect as DNGS has on the environment. It should be noted that the area which contains DNGS was excluded from further consideration since it is highly industrialized and will be largely unaffected by the Project. The remainder of the Site Study area was broken down into five different areas (called polygons) for ease of assessment. These polygons are divided by physical barriers (e.g. roads, railways) and have somewhat different physical characteristics and therefore represent different communities of non-human biota. The characteristics of the five identified polygons are given in Table 3.1-1.

Table 3.1-1 Characteristics of the Different Assessment Areas (Polygons)

Polygon Identifier	Characteristics
A	Historical landfill usage, currently covered by meadows; Coot's Pond
B	Mainly ditches with some aquatic areas
C	Dominated by the switchyard, includes several downstream ditches
D	Agricultural areas with woodlots, meadows and thickets and shallow Ponds such as Treefrog Pond, Polliwog Pond and Dragonfly Pond.
E	Coastal wetland, swamps
Lake	Nearshore Lake Ontario

Note: Effects within Polygon E are not considered further in the existing environment evaluation since non-human biota will largely be removed from this area during the site preparation activities.

Upon further consideration, due to their geographical proximity and similarities, polygons A and B were merged to form polygon AB. These polygons, and the related sampling areas, can be seen in Figure 3.1-3. Coot's Pond is located in Polygon AB. Coot's Pond was originally a stormwater management pond for the construction landfill at DNGS and has naturalized over time. Polygon D contains small ponds such as Treefrog Pond, Polliwog Pond and Dragonfly Pond. In addition a small section of Darlington Creek crosses the north east corner of Polygon D. For the aquatic environment, Lake Ontario is considered a distinct habitat and was divided into nearshore and offshore areas for the purposes of sampling. For the ERA, only the nearshore was considered. More information on the aquatic sampling locations is given in Appendix B.

Both polygons D and E will be substantively changed during the site preparation and construction phase of the Project. The physical effects on non-human biota is physical in nature (loss of habitat, etc.), and is discussed in the Terrestrial and Aquatic Effects Assessment TSDs.

Polygon D will be largely worked (soil placement, construction of parking, laydown areas etc.) and the existing small ponds in Polygon D will be removed. Therefore only terrestrial ecological receptors are considered in this area; however there is a commitment to offset habitat loss where possible. Effects on Darlington Creek are not considered in the assessment since Darlington Creek only intersects a small portion of the upper northeast corner of the DN site property boundary. Any interaction with Darlington site is expected to be minimal and not expected to change the water quality within the creek. Portions of Polygon D may be available for restoration after the site preparation activities.

Figure 3.1-2 Study Area Boundaries Considered in the Assessment

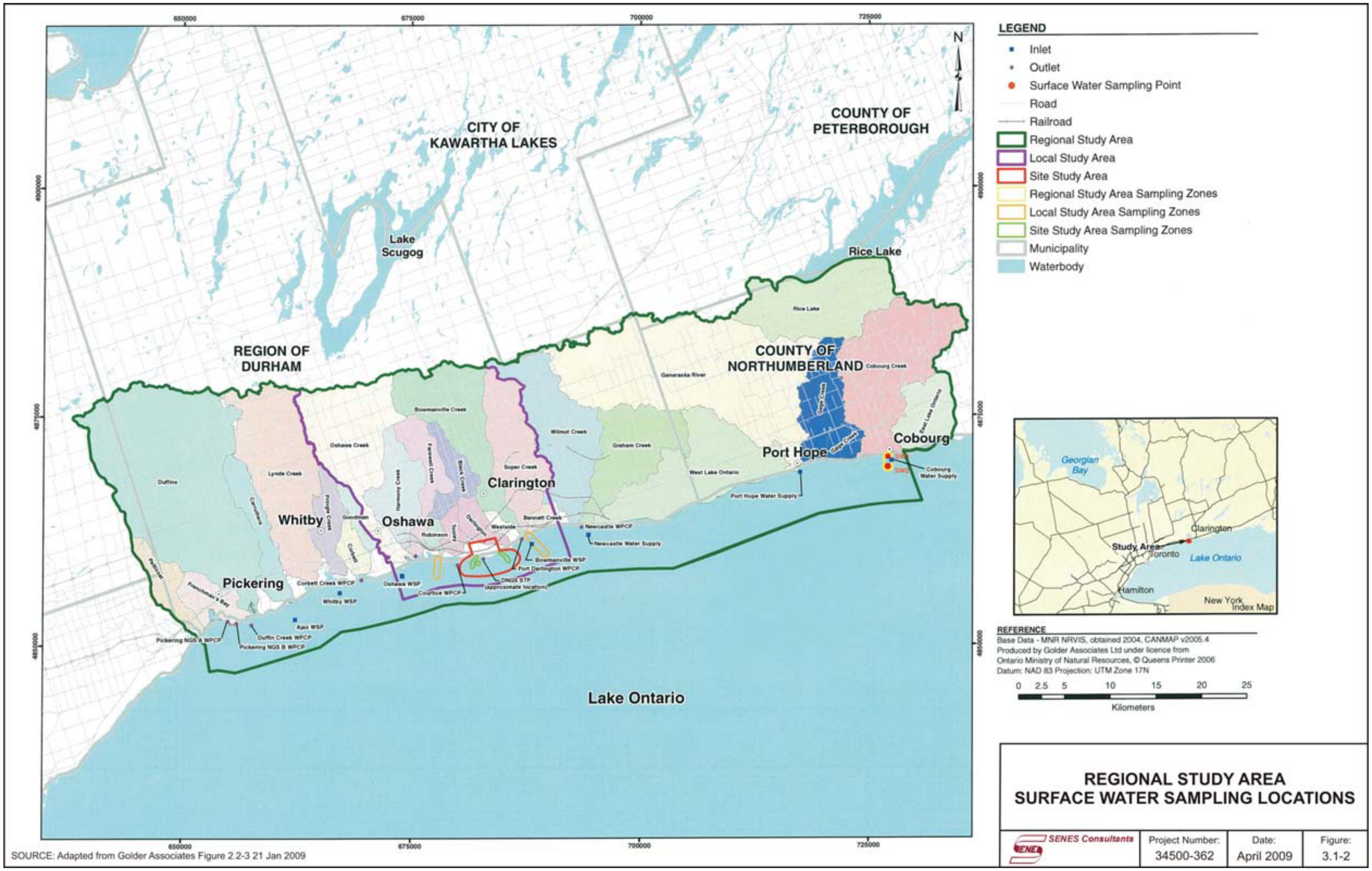
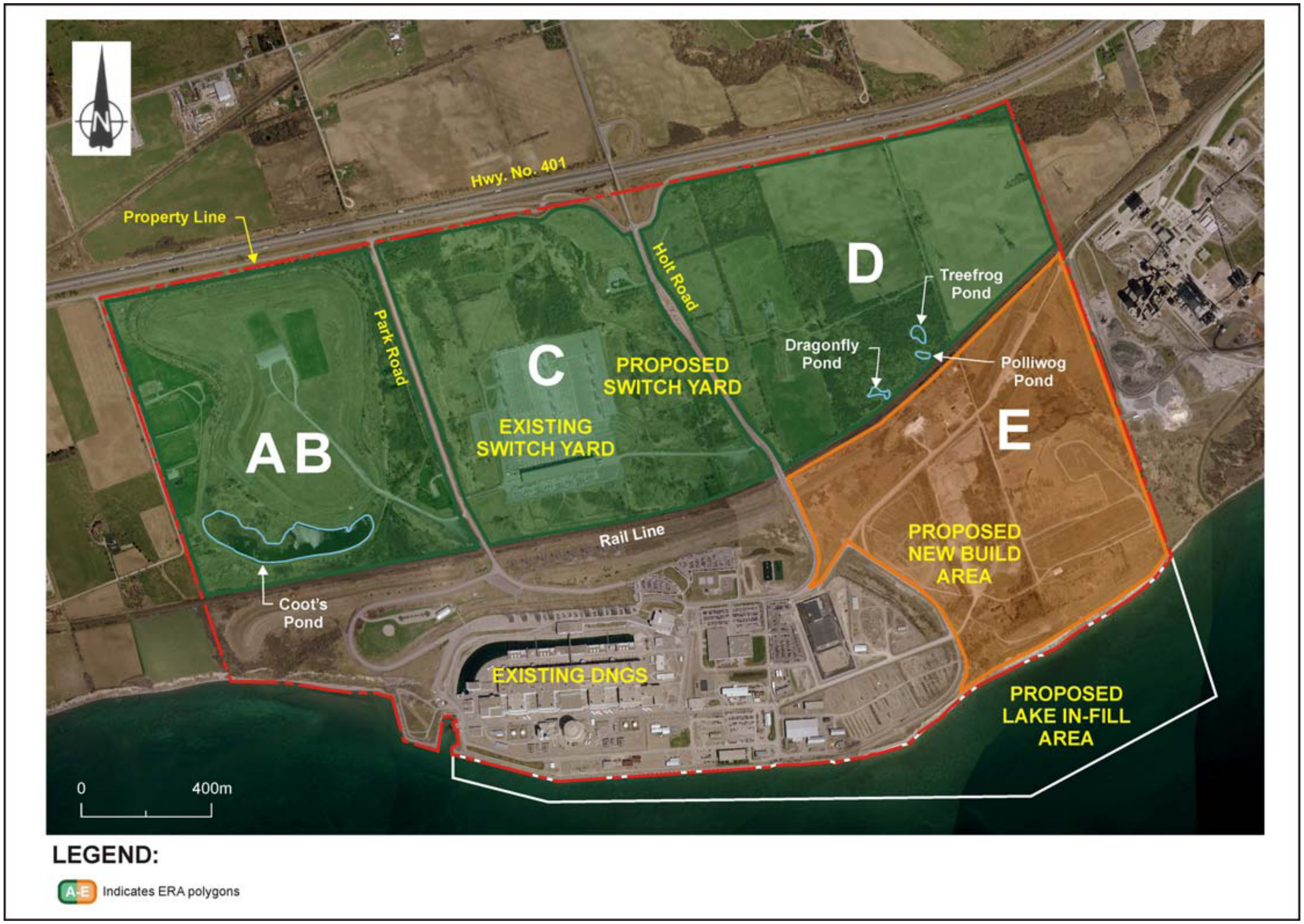


Figure 3.1-3 Assessment Areas Considered at the Darlington Nuclear Site



Polygon E is the proposed location for the NND facilities and there will be little to no habitat for biota in Polygon E post construction and thus no further consideration of effects to non-human biota within Polygon E under existing conditions is given in this report. However, it may be possible to provide some on-land ponds in Polygon E as an offset for the loss of the ponds in Polygon D. Construction of new naturalized pond areas to offset the ponds in Polygon D is discussed in Section 5.5.

3.1.3 Development of the Baseline Characterization Program

A baseline sampling program was developed to address the gaps identified in Section 2.1.5 and to provide sufficient information to carry out an ERA for the existing environment.

3.1.3.1 Considerations in the Development of the Baseline Program

The zebra mussel, an aquatic invasive species, is considered as an indicator species for the DNGS. It is consumed by another aquatic invasive species, the round goby, which is in turn consumed by the walleye. According to U.S. Fish and Wildlife Service (2007a), zebra mussels were accidentally introduced to the Great Lakes in the ballast water of ships from Eurasia. They have become abundant in some areas, filtering large amounts of water and threatening native mussel communities. Zebra mussels colonize hard structures and have clogged water systems of power plants, water treatment facilities, irrigation systems, and industrial water intake structures at large cost to industry. Zebra mussels also filter plankton, a food source for small fish, out of the water column. A variety of fish and ducks eat zebra mussels, although not enough to effectively control them. There is some concern that zebra mussels may concentrate constituents from the sediment and the water column into their body mass and may transfer these constituents to fish and wildlife who feed on them (U.S. Fish and Wildlife 2007a). Therefore, data collection on zebra mussels was added to the baseline program. These data were considered in the ERA.

The round goby was also accidentally released into the Great Lakes from the ballast water of ships from Eurasia, and its population has been growing (U.S. Fish and Wildlife 2007b). Concerns about the round goby are primarily related to its aggressive nature, which allows the round goby to out-compete native species for food resources and spawning habitat. Round goby also feed on small native fish and fish eggs (U.S. Fish and Wildlife 2007b). Therefore, data collection on round goby was added to the baseline program. These data were considered in the ERA.

Transfer factors for terrestrial food chain components such as insects and seeds are not readily available. Therefore, the baseline program was designed so that site-specific data were obtained by sampling and analysis of radionuclides and non-radionuclides in food chain components (i.e. insects and seeds) . The seeds data are useful for modelling the uptake of constituents by some birds and mice. For insects, a large enough sample could not be obtained to achieve the appropriate analytical levels of detection. In addition, there were not enough samples collected for small mammals. The baseline characterization program was also developed to facilitate the use of measured concentrations in tissues of caterpillars and earthworms.

3.1.3.2 Sampling Program Outline

The sampling program was developed to characterise the baseline (existing conditions) concentrations of radiological and conventional constituents in the existing environment and the baseline exposures to ecological receptors at the DN site to ensure that the assumptions and evaluation in the ERA was reasonable and reflected what was occurring in the environment. This sampling program included the following media and biota:

- Surface Water;
- Groundwater;
- Soil;
- Air;
- Sediment;
- Terrestrial and Aquatic Biota, and
- Terrestrial and Aquatic Vegetation.

An overview of the baseline sampling program and a summary of the results of the sampling program can be found in Appendix B of this TSD. The baseline sampling program began in the Spring of 2007 and encompassed four (4) seasons before ending in the Fall (November) of 2008. Summaries of the concentrations of conventional constituents in soil, water and sediments are provided in Tables 3.1-2 to 3.1-6 summarize these concentrations. As noted above, the concentrations of conventional constituents in other media are presented in Appendix B. Radionuclide concentrations in all media are also presented in Appendix B and Section 4.2.1 provides a summary of the concentrations in various media of the radiological constituents used in this assessment.

Table 3.1-2 Summary of the Surficial Soil Data at the DN Site

		Polygon AB			Polygon C			Polygon D			Polygon E		
Number of Samples		13			6			6			7		
Constituent	**Units**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Max**
Aluminum	µg/g	6930	16387	25200	15100	21317	28200	11600	20083	32200	5850	7733	13700
Antimony	µg/g	0.056	0.203	0.296	0.139	0.146	0.159	0.129	0.149	0.193	0.144	0.157	0.180
Arsenic	µg/g	3.68	6.60	12.32	3.15	3.70	4.14	2.29	2.67	3.22	2.11	2.62	3.12
Barium	µg/g	99.5	342.1	409.0	387.0	402.7	428.0	243.0	393.0	525.0	389.0	421.1	449.0
Beryllium	µg/g	0.74	1.06	1.18	1.18	1.24	1.35	0.87	1.08	1.31	1.09	1.13	1.18
Bismuth	µg/g	0.100	0.147	0.200	0.118	0.125	0.132	0.101	0.118	0.135	0.080	0.119	0.193
Boron	µg/g	16.97	25.75	31.70	31.54	38.46	45.85	16.88	23.20	35.93	10.52	15.76	25.10
Boron-hot water	µg/g	0.061	0.156	0.24	0.059	0.490	1.13	0.589	1.012	1.51	0.076	0.338	0.84
Cadmium	µg/g	0.28	0.35	0.40	0.19	0.22	0.25	0.19	0.21	0.24	0.18	0.21	0.23
Calcium	µg/g	15300	22300	40200	27400	31583	36900	57900	62050	67400	11600	13743	17100
Cesium	µg/g	0.69	1.12	2.05	1.14	1.26	1.32	0.69	1.07	1.55	0.78	0.89	1.12
Chromium	µg/g	27.1	34.6	39.2	40.8	45.5	53.0	33.2	35.8	39.3	31.5	32.9	34.5
Cobalt	µg/g	6.35	7.25	8.05	8.86	9.45	10.40	7.06	7.57	8.09	6.93	7.28	7.75
Copper	µg/g	8.03	13.26	23.70	11.70	13.17	14.80	11.00	11.93	13.30	5.48	7.27	9.23
Iron	µg/g	17300	20423	22400	22600	24083	26900	19200	20583	22800	18700	19743	20500
Lead	µg/g	18.42	34.61	54.11	15.35	16.71	18.35	14.01	16.74	22.13	12.81	18.40	30.90
Lithium	µg/g	8.94	15.90	29.06	19.23	22.01	24.97	13.66	14.74	17.12	8.76	11.66	18.27
Magnesium	µg/g	2940	4758	6120	5220	6142	6890	5200	6707	8580	2650	2906	3440
Manganese	µg/g	418	523	659	619	647	714	489	512	559	469	497	521
Mercury	µg/g	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Molybdenum	µg/g	0.50	0.71	1.00	0.84	1.14	1.46	0.71	0.84	1.10	0.46	0.53	0.61
Nickel	µg/g	11.7	14.1	15.9	18.9	21.3	25.2	14.4	15.9	18.2	12.0	12.9	13.9
Phosphorus	µg/g	565	704	938	629	666	690	539	730	921	373	454	517
Potassium	µg/g	4020	11994	15100	15400	16467	17000	10400	15233	20500	12200	13200	14600
Selenium	µg/g	0.261	0.498	0.706	0.211	0.303	0.385	0.086	0.334	0.566	0.207	0.292	0.435
Silver	µg/g	0.077	0.173	0.221	0.162	0.210	0.258	0.134	0.209	0.271	0.149	0.210	0.281
Sodium	µg/g	375	7620	9970	7180	7727	8200	3910	9192	15200	9420	10421	11500
Strontium	µg/g	42.1	145.0	200.0	158.0	166.2	180.0	145.0	220.8	304.0	147.0	159.6	169.0
Thallium	µg/g	0.23	0.35	0.41	0.40	0.46	0.64	0.29	0.36	0.45	0.26	0.36	0.61
Thorium	µg/g	0.81	1.93	6.49	1.14	1.45	1.87	1.51	2.49	4.65	0.58	0.85	1.32
Tin	µg/g	1.43	3.03	4.70	1.92	9.16	15.41	4.69	7.82	10.85	1.41	1.99	2.58
Titanium	µg/g	966	1486	1810	1370	1577	1820	1190	1705	2540	1570	1787	1960
Tungsten	µg/g	0.013	0.209	0.295	0.184	0.215	0.236	0.134	0.313	0.479	0.204	1.035	2.735
Uranium	µg/g	0.81	1.12	1.67	1.09	1.14	1.23	0.90	1.04	1.28	0.78	1.29	2.62
Vanadium	µg/g	41.7	54.2	60.9	61.6	65.4	73.7	51.7	56.1	62.6	52.2	54.8	57.2
Zinc	µg/g	62.1	74.6	84.3	63.4	67.6	72.5	59.4	65.0	75.3	52.9	57.8	63.7
Zirconium	µg/g	22.1	61.2	74.0	57.8	65.0	74.1	42.0	59.7	78.7	64.4	71.1	75.1

Table 3.1-3 Summary of the Water Quality in Lake Ontario (Site)

Constituent	N	Units	Minimum	Mean	Maximum
Alkalinity	140	ppm($CaCO_3$)	39.8	92.3	101.9
Aluminum	140	ppm	0.004	0.09	3.52
Aluminum (Filtered)	140	ppm	0.0020	0.0064	0.0147
Ammonia (Total)	140	ppm	0.005	0.020	0.064
Ammonia (unionised)	140	ppm	0.0002	0.0007	0.0027
Antimony	140	ppm	0.0005	0.00051	0.00179
Arsenic	140	ppm	0.0005	0.00061	0.00200
Barium	140	ppm	0.017	0.040	0.644
Benzene	35	ppb	0.05	0.05	0.05
Beryllium	140	ppm	0.0005	0.0005	0.0005
Bismuth	140	ppm	0.0005	0.0005	0.0005
Boron	140	ppm	0.019	0.130	6.864
Bromodichloromethane	14	ppb	0.05	0.05	0.05
Bromoform	14	ppb	0.05	0.05	0.05
Cadmium	140	ppm	0.00005	0.00005	0.00005
Calcium	140	ppm	30.6	35.3	41.1
Cesium	140	ppm	0.00005	0.00005	0.00021
Chloroform	14	ppb	0.05	0.05	0.05
Chromium	140	ppm	0.00005	0.0006	0.0017
Chromium (Trivalent)	35	ppm	0.00005	0.0004	0.0017
Chromium (Hexavalent)	35	ppm	0.0025	0.0025	0.0025
Cobalt	140	ppm	0.00005	0.0004	0.0023
Copper	140	ppm	0.0006	0.0011	0.0037
Dibromochloromethane	14	ppb	0.05	0.05	0.05
Ethylbenzene	35	ppb	0.05	0.05	0.05
Hardness	140	ppm $CaCO_3$	108.0	127.6	147.4
Hydrazine	56	ppm	0.0025	0.0025	0.0025
Iron	140	ppm	0.006	0.028	0.129
Lead	140	ppm	0.00005	0.00014	0.00363
Lithium	140	ppm	0.0018	0.0029	0.0045
Magnesium	140	ppm	7.60	9.58	11.05
Manganese	140	ppm	0.0003	0.0014	0.0048
Mercury	56	ppm	0.00005	0.00005	0.00005
Molybdenum	140	ppm	0.0011	0.0014	0.0020
Morpholine	84	ppm	0.0005	0.0005	0.0020
Nickel	140	ppm	0.00052	0.00072	0.00119
PCBs (Total)	56	ppb	0.025	0.025	0.025
Petroleum Hydrocarbons F1	56	ppb	50	50	50
Petroleum Hydrocarbons F2	56	ppb	50	50	50
Petroleum Hydrocarbons F3	56	ppb	50	50	50
Petroleum Hydrocarbons F4	56	ppb	50	50	50
pH	140	units	6.6	8.2	8.6
pH (In-Situ)	30	units	7.77	8.14	8.74

Constituent	N	Units	Minimum	Mean	Maximum
Potassium	140	ppm	1.38	1.79	3.54
Selenium	140	ppm	0.0005	0.0005	0.0010
Silver	140	ppm	0.00005	0.00005	0.00005
Sodium	140	ppm	11.2	15.2	20.7
Strontium	140	ppm	0.17	0.20	0.22
Thallium	140	ppm	0.00005	0.00005	0.00005
Thorium	140	ppm	0.00005	0.00006	0.00062
Tin	140	ppm	0.00005	0.00007	0.00156
Titanium	140	ppm	0.00075	0.00222	0.01594
Toluene	35	ppb	0.050	0.051	0.100
Total Residual Chlorine (In-Situ)	21	ppm	0.001	0.001	0.001
Tungsten	140	ppm	0.00005	0.00008	0.00032
Uranium	140	ppm	0.00028	0.00038	0.00058
Vanadium	140	ppm	0.00005	0.00032	0.00100
Zinc	140	ppm	0.00005	0.00245	0.01122
Zirconium	140	ppm	0.00005	0.00095	0.05685

Table 3.1-4 Summary of the Water Quality in Coots Pond

Constituent	N	Units	Minimum	Mean	Maximum
Alkalinity	20	ppm($CaCO_3$)	94.3	184.9	281.0
Aluminum	20	ppm	0.013	0.729	2.936
Aluminum (filtered)	20	ppm	0.007	0.042	0.189
Ammonia	20	ppm	0.005	0.280	1.212
Ammonia (unionised)	20	ppm	0.0008	0.0130	0.0485
Antimony	20	ppm	0.0005	0.00053	0.0011
Arsenic	20	ppm	0.0005	0.0009	0.002
Barium	20	ppm	0.014	0.050	0.102
Benzene	5	ppb	0.05	0.05	0.05
Beryllium	20	ppm	0.0005	0.0005	0.0005
Bismuth	20	ppm	0.0005	0.0005	0.0005
Boron	20	ppm	0.24	0.35	0.53
Bromodichloromethane	2	ppb	0.05	0.05	0.05
Bromoform	2	ppb	0.05	0.05	0.05
Cadmium	20	ppm	0.00005	0.00005	0.00005
Calcium	20	ppm	19.1	49.2	85.9
Cesium	20	ppm	0.00005	0.00008	0.00016
Chloroform	2	ppb	0.05	0.075	0.1
Chromium	20	ppm	0.0001	0.0014	0.0044
Chromium (III)	5	ppm	0.0001	0.0017	0.0044
Chromium(VI)	5	ppm	0.0025	0.0025	0.0025
Cobalt	20	ppm	0.0002	0.0011	0.0036
Copper	20	ppm	0.0005	0.0011	0.0015
Dibromochloromethane	2	ppb	0.05	0.05	0.05
Ethylbenzene	5	ppb	0.05	0.05	0.05

Constituent	N	Units	Minimum	Mean	Maximum
Hardness	20	ppm $CaCO_3$	182.5	256.0	374.3
Hydrazine	8	ppm	0.0025	0.0025	0.0025
Iron	20	ppm	0.018	0.377	1.308
Lead	20	ppm	0.00005	0.00032	0.00116
Lithium	20	ppm	0.0052	0.0087	0.0116
Magnesium	20	ppm	25.0	32.3	38.7
Manganese	20	ppm	0.015	0.041	0.068
Mercury	8	ppm	0.00005	0.00005	0.00005
Molybdenum	20	ppm	0.0002	0.0007	0.0015
Morpholine	12	ppm	0.0005	0.0005	0.0005
Nickel	20	ppm	0.00054	0.001107	0.00190
PCBs (Total)	8	ppb	0.025	0.025	0.025
Petroleum Hydrocarbons F1	8	ppb	50	50	50
Petroleum Hydrocarbons F2	8	ppb	50	50	50
Petroleum Hydrocarbons F3	8	ppb	50	50	50
Petroleum Hydrocarbons F4	8	ppb	50	50	50
pH	20	units	8.01	8.49	9.37
pH (In-Situ)	4	Units	8.29	8.62	9.33
Potassium	20	ppm	4.92	7.66	11.99
Selenium	20	ppm	0.0005	0.0005	0.0005
Silver	20	ppm	0.00005	0.00005	0.00005
Sodium	20	ppm	27.4	38.0	43.8
Strontium	20	ppm	0.27	0.51	0.73
Thallium	20	ppm	0.00005	0.00005	0.00005
Thorium	20	ppm	0.00005	0.00012	0.00037
Tin	20	ppm	0.00005	0.00005	0.00005
Titanium	20	ppm	0.0029	0.0271	0.0919
Toluene	5	ppb	0.05	0.05	0.05
Tungsten	20	ppm	0.00005	0.00007	0.00013
Uranium	20	ppm	0.00029	0.00089	0.00196
Vanadium	20	ppm	0.0001	0.0007	0.0017
Zinc	20	ppm	0.0007	0.0041	0.0136
Zirconium	20	ppm	0.0001	0.0006	0.0022

Table 3.1-5 Summary of the Sediment Quality in Lake Ontario (Site)

Constituent	N	Units	Minimum	Mean	Maximum
Aluminum	16	mg/kg	1313.3	7801.9	34862.6
Antimony	16	mg/kg	0.04	0.16	0.93
Arsenic	16	mg/kg	1.16	2.32	8.63
Barium	16	mg/kg	124.0	261.8	415.1
Beryllium	16	mg/kg	0.85	1.18	1.62
Bismuth	16	mg/kg	0.08	0.23	0.74
Boron	16	mg/kg	10.5	16.3	55.1
Boron-hot water	16	mg/kg	0.03	0.17	2.30
Cadmium	16	mg/kg	0.10	0.20	1.30
Calcium	16	mg/kg	47025	77083	148826
Cesium	16	mg/kg	0.19	0.43	2.66
Chromium	16	mg/kg	12.7	28.5	49.3
Cobalt	16	mg/kg	3.57	7.56	12.39
Copper	16	mg/kg	1.6	5.4	44.6
Iron	16	mg/kg	8229	24519	48742
Lead	16	mg/kg	6.7	12.3	39.2
Lithium	16	mg/kg	6.1	8.1	26.2
Magnesium	16	mg/kg	3039	6358	12500
Manganese	16	mg/kg	241	545	876
Mercury	16	mg/kg	0.005	0.014	0.150
Molybdenum	16	mg/kg	0.19	0.50	1.05
Nickel	16	mg/kg	4.0	7.9	29.6
PCBs (Total)	16	mg/kg	0.025	0.025	0.025
Petroleum Hydrocarbons F1	16	mg/kg	5	5	5
Petroleum Hydrocarbons F2	16	mg/kg	5	5	5
Petroleum Hydrocarbons F3	16	mg/kg	5	24	244
Petroleum Hydrocarbons F4	16	mg/kg	5	14	135
Phosphorus	16	mg/kg	249	562	1251
Potassium	16	mg/kg	4310	8149	15887
Selenium	16	mg/kg	0.17	1.12	2.04
Silver	16	mg/kg	0.025	0.069	0.730
Sodium	16	mg/kg	4815	7877	10811
Strontium	16	mg/kg	185	267	377
Thallium	16	mg/kg	0.09	0.21	0.56
Thorium	16	mg/kg	0.96	2.91	6.41
Tin	16	mg/kg	0.25	1.99	5.15
Titanium	16	mg/kg	619	1686	3069
Tungsten	16	mg/kg	0.06	0.22	1.08
Uranium	16	mg/kg	0.96	2.13	3.21
Vanadium	16	mg/kg	20.6	59.2	107.7
Zinc	16	mg/kg	20.9	37.4	124.1
Zirconium	16	mg/kg	22.8	84.5	168.7

Table 3.1-6 Summary of the Sediment Quality in Coots Pond

Constituent	N	Units	Minimum	Mean	Maximum
Aluminum	5	mg/kg	24147	26282	28715
Antimony	5	mg/kg	0.20	0.35	0.41
Arsenic	5	mg/kg	2.11	2.80	3.35
Barium	5	mg/kg	330	337	342
Beryllium	5	mg/kg	1.29	1.36	1.41
Bismuth	5	mg/kg	0.20	0.24	0.27
Boron	5	mg/kg	29.8	48.4	55.1
Boron-hot water	5	mg/kg	0.89	5.16	12.24
Cadmium	5	mg/kg	0.14	0.23	0.25
Calcium	5	mg/kg	136332	179021	201620
Cesium	5	mg/kg	1.15	2.10	2.46
Chromium	5	mg/kg	19.1	22.9	25.3
Cobalt	5	mg/kg	7.6	9.3	9.9
Copper	5	mg/kg	13.4	24.0	26.9
Iron	5	mg/kg	11462	13374	14387
Lead	5	mg/kg	13.4	16.7	19.0
Lithium	5	mg/kg	15.6	25.4	29.2
Magnesium	5	mg/kg	8947	9849	10257
Manganese	5	mg/kg	368	461	503
Mercury	5	mg/kg	0.0137	0.0237	0.0334
Molybdenum	5	mg/kg	0.48	1.16	1.41
Nickel	5	mg/kg	8.5	11.3	12.7
PCB in solid	5	mg/kg	0.025	0.025	0.025
Petroleum Hydrocarbons F1	5	mg/kg	5	5	5
Petroleum Hydrocarbons F2	5	mg/kg	5	5	5
Petroleum Hydrocarbons F3	5	mg/kg	209.0	268.8	313.0
Petroleum Hydrocarbons F4	5	mg/kg	38.0	49.0	59.0
Phosphorus	5	mg/kg	592	651	673
Potassium	5	mg/kg	10756	11479	11959
Selenium	5	mg/kg	0.23	0.77	1.06
Silver	5	mg/kg	0.025	0.025	0.025
Sodium	5	mg/kg	5403	6313	8949
Strontium	5	mg/kg	452	608	702
Thallium	5	mg/kg	0.30	0.37	0.40
Thorium	5	mg/kg	3.76	5.36	5.99
Tin	5	mg/kg	1.24	1.78	2.17
Titanium	5	mg/kg	779	940	1103
Tungsten	5	mg/kg	0.29	0.55	0.74
Uranium	5	mg/kg	1.46	2.21	2.62
Vanadium	5	mg/kg	31.5	38.1	40.9
Zinc	5	mg/kg	43.5	70.7	82.8
Zirconium by ICP	5	mg/kg	22.1	26.8	35.9

3.1.4 Determination of Exposure for Ecological Receptors from Existing Conditions

The data collected in the baseline sampling program (where available) in conjunction with predicted concentrations were used to determine the exposures to the ecological receptors from concentrations in the existing environment (baseline). The process to select the constituents of potential concern that are carried through the exposure calculations is provided in Section 4.2.

3.2 Levels of Ecological Risk Assessment

Following the calculation of exposures, the potential risks associated with these exposures are assessed using a multi-tiered assessment process. The objective of this process is to determine whether the exposure to a COPC for ecological receptors could potentially cause harm to that receptor, through a process of comparison with reference dose rates (for radionuclides) or toxicity reference values (for conventional constituents). A Screening Index value (SI) is used to provide a quantitative measure of risk. In simple terms, the SI is the ratio of an estimated exposure level (or an environmental concentration) divided by a reference dose rate or a concentration deemed unlikely to have a substantial ecological effect. For conventional constituents these are termed toxicity reference values (TRVs). For radiological constituents, reference dose rates below which there is unlikely to be an effect on populations of non-human biota were used in calculating the SI. The TRVs and reference dose rates used for the COPCs are provided in Section 4.3. These TRVs and reference dose rates form the criteria of assessment for the ERA.

There are various levels of assessment considered within the ERA. A Tier 1 assessment is generally a qualitative assessment where as a Tier 2 assessment is a semi- quantitative evaluation using site-specific data and existing site information and in general uses very conservative assumptions. A Tier 3 assessment is the least conservative of the assessments and uses data from field surveys, less conservative assumptions and more detailed modelling. More details are provided below.

Tier 1 Assessment

In the Tier 1 assessment, a qualitative assessment of the potential risks is carried out. This is based on expert opinion, literature review and existing site information. After, this qualitative evaluation, if there is no potential for ecological risk then no more assessment is necessary. However, if the qualitative assessment indicates that there is a potential for an adverse effect then a Tier 2 assessment which is quantitative is necessary. A Tier 1 assessment was carried out for chemical constituents emitted from the proposed NND due to limited information on chemical releases associated with all of the activities at the proposed site.

Tier 2 Assessment

Following the Tier 1 assessment, a quantitative Tier 2 assessment is carried out to determine whether there is a potential for an adverse effect. A Tier 2 assessment uses conservative assumptions.

For the Tier 2 assessment, the 95th percentile of the concentrations or the 95th percentile Upper Confidence Level of the mean concentrations (95thUCLM) determined through the sampling program may be used (depending on the number of samples) instead of the individual maxima. The use of the 95th percentile reduces outliers that may have been atypical of the local (spatially important) concentrations. A number of regulatory agencies (i.e. Environment Canada, Health Canada and U.S. EPA) consider that the 95thUCLM a reasonable estimate of the maximum exposure. Additionally, where available, actual measured concentrations in biota (insects, earthworms and terrestrial and aquatic vegetation) may be used. This reduces the error that may be introduced by using generic (and conservative) transfer factors in the determination of exposure. In addition, TRVs based on no observed adverse effects (NOAEL) or reference dose rates representing no effects are used in the assessment. If the ensuing SI values for a COPC (conventional constituent or radionuclide) and a given ecological receptor are below a value of 1, then the COPC is not assessed further as there is a very low probability of an adverse effect. If the SI values are above 1, indicating the possibility of an adverse effect, then the COPC is carried through a Tier 3 assessment. A Tier 2 assessment was conducted for the existing conditions (baseline) at the DN site.

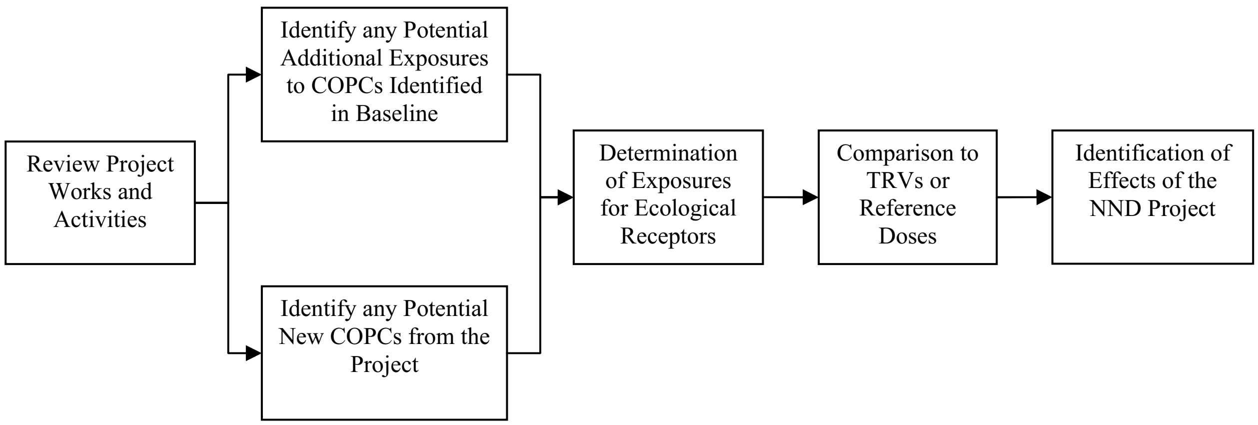
Tier 3 Assessment

Following the Tier 2 assessment, COPCs that were found to have exposures exceeding reference values in any of the ecological receptors are forwarded to a Tier 3 assessment for further evaluation. A Tier 3 assessment considers more realistic assumptions than the Tier 2 assessment, in order to determine whether an effect may actually occur. In the Tier 3 assessment, probabilistic modelling or population effects modelling may be necessary. In addition, population information and data (empirical or observational) are also considered in the effects assessment. Field surveys were used in the assessment of existing conditions to provide a line of evidence to the SI values that were above 1 from the Tier 2 assessment.

3.3 Methodology For Characterizing Effects Related for Project Activities

Figure 3.3-1 shows the high level methodology applied to the assessment of the potential effects arising from the NND Project. This methodology is discussed in further detail in the sections that follow.

Figure 3.3-1 High Level Methodology for the ERA Effects Assessment Program



3.3.1 Screening of Project Works and Activities

The first step in the assessment of potential effects from the NND Project is a review of the Project Works and Activities identified in the Scope of Project for EA Purposes TSD. This list of Project Works and Activities, which can also be found in Appendix A of this TSD, which includes the Basis for the EA, was reviewed and a list of potential emissions from NND was developed. The constituents on this list were evaluated using the same methodology for identifying COPCs that was given in Section 4.1.1. In general, COPCs from the baseline assessment are considered for NND Project as well as any additional COPCs that may arise from the Project as described below.

3.3.1.1 Identification of Continuing COPCs from the Baseline Program

COPCs previously identified in the existing environment (baseline program) that will also arise from future NND activities (e.g., radionuclides) were considered even if no effect was identified from the Tier 2 assessment of the existing environment. These COPCs were evaluated and the Project effects were considered to be additive to the baseline evaluation.

3.3.1.2 Identification of New COPCs from the Project Works and Activities

Additional COPC could potentially be added to the list if they were present in a release from the NND Project and may not have been considered a COPC from a baseline perspective. New constituents introduced into the environment as a result of the NND Project are also considered constituents and are screened to determine if they are COPCs using the methodology outlined in Section 4.1.1. No additional COPC were considered for the NND Project.

3.3.2 Identification of Potential Effects of the NND Project

For the NND Project, the exposures to ecological receptors are calculated using the methodology discussed in Section 3.1.4. These risks are then assessed using the tiered methodology addressed in Section 3.2. For the NND Project a Tier 1 assessment was carried out. Those COPCs that result in exposures that are above criteria or reference values are considered to be of potential concern as a result of the Project. These effects are forwarded for an assessment of residual adverse effects.

3.3.3 Screening of Potential Effects and Determination of Residual Effects

The potential effects (risks) identified above represent the effects of the Project without the implementation of mitigation measures. In order to reduce the effects on non-human biota to bring the exposures within acceptable levels, mitigation measures (e.g. treatment of discharges) are generally proposed at this stage of the effects assessment. Sampling or monitoring programs to verify the results of the assessment can also be implemented.

Those effects that still remain after the implementation of mitigation measures are determined to be residual adverse effects of the Project and are forwarded to Chapter 9 of the EIS for an assessment of significance.

4.0 ECOLOGICAL RISK ASSESSMENT OF THE EXISTING CONDITIONS (BASELINE)

4.1 Problem Formulation

The problem formulation aspect of an ERA is not a simple problem statement but a process for the prediction of ecological effects. This includes identification of the potential chemical and radiological constituents that may be of concern (COPCs) from an ecological perspective, the ecological receptors that may be subjected to these COPCs, the routes of exposure by which the ecological receptors may encounter the COPCs and the potential effects of these exposures. A Tier 2/3 evaluation was carried out for the existing conditions.

4.1.1 Constituents of Potential Concern (COPC) Selection

A Constituent of Potential Concern (COPC) is a constituent in the environment that may be of potential concern for the ecological receptors. A selection process for conventional constituents was used to identify the COPCs that were carried through the ERA. Figure 4.1-1 outlines the process used for the determination of COPCs for conventional constituents. This process is described in further detail below.

All of the radionuclides identified in the baseline characterization program were determined to be a COPC for the assessment of the radiological effects of the NND Project on non-human biota. Of this list of radionuclides, seven in particular were selected to be used in the risk assessment due to their prevalence in the environment, historical concerns regarding environmental concentrations and relevance to nuclear power generation. These radionuclides are given in Table 4.1-1 along with the rationale for their selection for this assessment.

Table 4.1-1 Rationale for the Selection of Radionuclides for the ERA

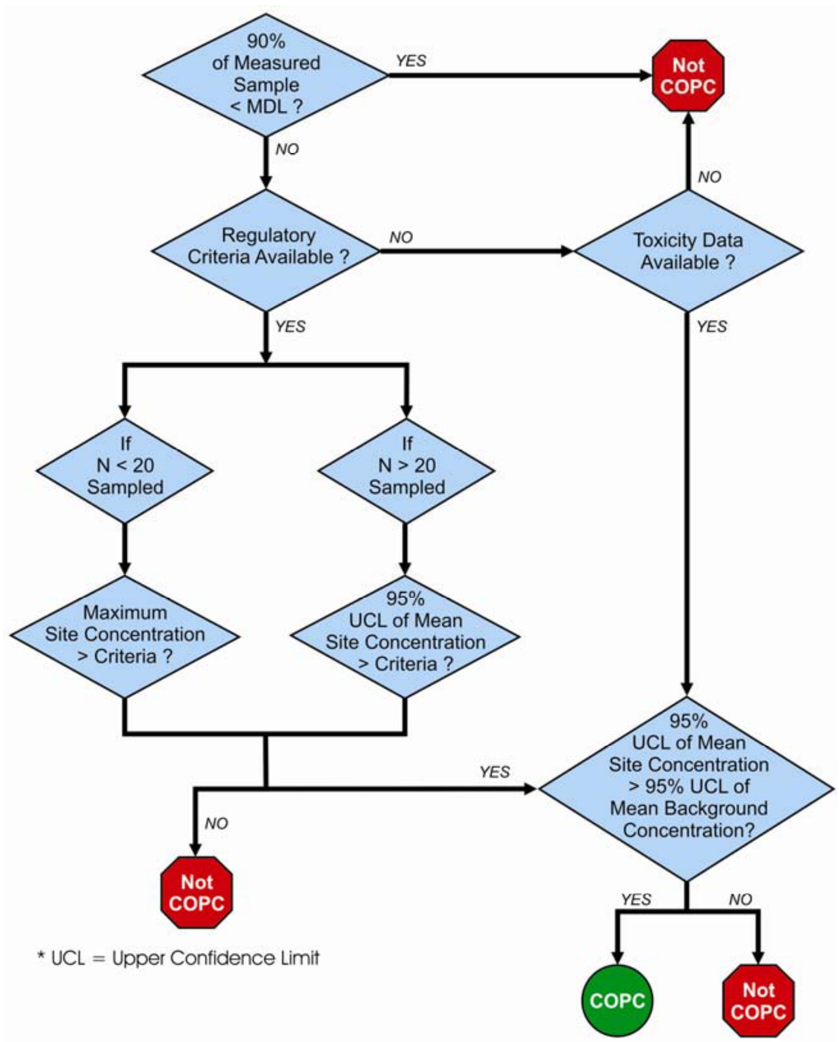
Radionuclide	Rationale
C-14	C-14 is a radionuclide that is typically released in the airborne and waterborne emissions from nuclear generating facilities. C-14 releases are controlled through monitoring and mitigating measures.
H-3	Tritium is commonly released from nuclear facilities into the air as well as liquid effluent streams. Tritium releases are controlled through monitoring and mitigation measures.
Sr-90	Strontrium-90 (Sr-90) is not reported separately but rather included in the gross beta/gamma emissions to water and the particulate emissions to air for the existing facility. However, since Sr-90 is reported separately for the PWR reactor technology, it was selected as the surrogate for beta emitters in this assessment to determine the potential effects of its release.
Co-60	Cobalt-60 (Co-60) is not reported separately but rather included in the gross beta/gamma emissions to water and the particulate emissions to air for the existing facility. However, since Co-60 is reported separately for the PWR reactor technology, it was selected as the surrogate for gamma emitters in this assessment to determine the potential effects of its release.
Cs-134	Cs-134 and Cs-137 are persistent radionuclides that have the potential to contribute to long term doses. These Cs isotopes were also included as they are identified in the regulatory release limits for nuclear accident scenarios.
Cs-137	
I-131	I-131 is a contributor to short term dose and thus was included in this assessment. I-131 was also included as it was identified in the regulatory release limits for nuclear accident scenarios.

The following steps were used for selection of the conventional COPCs:

1) If more than 90% of the sample concentrations for a particular constituent are less than the Method Detection Limit (MDL), then that constituent is not considered to be a COPC. If concentrations are above the MDL, the constituent is forwarded to Step 2.
2) If there are regulatory criteria available (generally CCME guidelines for: the protection of aquatic life, soil quality and sediment quality) for the constituent, then forward to Step 3. If there are no criteria available, but there are toxicity data available, forward to Step 4. If neither is available, the constituent is not considered to be a COPC. This adds to the uncertainty of the assessment; however, if no toxicity data or criteria are available then regulatory agencies do not generally consider these constituents to be toxic.
3) In Step 3, if there are greater than or equal to 20 samples available for this constituent, then the 95th percentile Upper Confidence Limit of the mean concentration (95th UCLM) is assessed against the criteria. If there are less than 20 samples available, then the maximum concentration is used for comparison. If the maximum or 95th UCLM concentration is greater than regulatory criteria, then the constituent is forwarded to Step 4. If the 95th UCLM or maximum is less than the regulatory criteria, the constituent is not considered to be a COPC.
4) Step 4 involves a comparison to a background concentration. This ensures that COPC are not selected due to the natural background conditions of the area. The background

concentrations used in this TSD are the 95th UCLM concentrations of the constituent in the Local and Regional Study Area for water and sediment. For soil, the Ministry of the Environment (MOE) background concentrations (98th percentile) were used. If the 95th UCLM of the constituent data is greater than the background concentration, then the constituent is considered to be a COPC.

Figure 4.1-1 Process for the Selection of COPC



The COPC process was used for constituents found in soil, surface water and sediment samples. Predicted air quality concentrations from the operation of DNGS were screened against air quality criteria and reference benchmarks. Further discussion of the COPC screening process, including the process for screening for contaminants in air, is provided in Appendix D.

The primary media considered in the development of the COPC list for the NND were the surface water, sediment and soil monitoring data collected during the baseline monitoring programs (data summarized in Appendix B) for the NND.

For the water screening process, it was first determined if the data in Lake Ontario were heavily censored (i.e., 90% of the measured samples were below the method detection limit (MDL)). If the data were heavily censored, then the constituent was not considered to be a COPC. This eliminated 27 of the 53 potential COPC. The remaining constituents were then compared to regulatory criteria. Of the 26 potential COPC, 19 had regulatory criteria and all maximum concentrations were below criteria. This screening process resulted in no COPC being identified. For the 7 samples where no regulatory criteria were available, 4 of the constituents did not have toxicity data. These constituents were calcium, lithium, magnesium and titanium and were not assessed further as potential COPC. Calcium and magnesium are considered part of the earth's crust and thus are not considered to be toxic. The three remaining constituents are manganese, potassium and strontium. However, the measured 95th percentile Upper Confidence level of the mean concentrations of manganese and strontium are below the 95th percentile UCL of background and thus these concentrations are no different than background. Therefore, manganese and strontium are not considered as COPC. Potassium concentrations exceed background but potassium is considered to be ubiquitous and is also regulated in biological systems and is therefore not considered further.

Hydrazine concentrations were below a detection limit of 0.005 mg/L and thus were considered to be heavily censored and therefore would have been dropped from further consideration. However, given that hydrazine is of concern in the aquatic environment, a further screening was done comparing the detection limit to the No Observable Effects Level (NOEL) of 0.001 mg/L for fat head minnow eggs (WHO 1987). The detection limit is above the NOEL and therefore, hydrazine is considered to be a COPC in Lake Ontario.

The same screening process was used for Coots Pond, an on-site surface pond. In Coots Pond, 53 constituents have been measured. Of these 53 constituents, 24 were heavily censored leaving 29 constituents with measured concentrations. 15 of these constituents have criteria and boron, cobalt and iron concentrations exceed criteria and are considered COPC. Manganese, potassium and strontium concentrations exceed background (95th percentile UCLM) and have toxicity data; however potassium is dropped as a COPC due to its metabolic nature and natural presence in the environment. For Coots Pond, background concentrations were obtained from Lake Ontario. This is a conservative assumption since the background concentrations in Lake Ontario would generally be lower than for in-land ponds. In summary, boron, cobalt, iron, manganese and strontium are considered to be COPC in Coots Pond. Hydrazine was also considered to be a COPC since the MDL was higher than the NOAEL for fat head minnow eggs.

For sediment samples in Lake Ontario, most of the concentrations in the samples were above the MDL, only 6 of the 42 measured constituents were heavily censored. Of the remaining constituents, fifteen had available regulatory criteria and all had less than 20 samples taken. Therefore, the maximum site concentration was compared to the criteria value (in this case the lowest guideline value). It was determined that 12 of the constituents exceeded criteria and thus are considered COPC. However, arsenic, iron, manganese, nickel, phosphorous, vanadium and zinc are below background levels. Thus cadmium, copper, lead, and selenium were identified as

COPC based on sediments in Lake Ontario. The same screening process was used to determine the COPC in Coots Pond and only copper was found to be a COPC in sediment in the existing environment.

For soil, all of the site data were considered together in the screening process. Only mercury had measured concentrations below the MDL. Therefore, the remaining constituents were advanced for further screening as potential COPC. In the case of the soil screening, background concentrations were obtained from the Ontario Ministry of the Environment (MOEE 1993). These background concentrations are known as the Ontario Typical Range (OTR) and the MOE generally selects the 98th percentile of this range to represent background. This value was selected as the background for the soil screen. All measured concentrations were below criteria (where available). For constituents without criteria, only strontium and zirconium have available toxicity data and therefore these two constituents are identified as COPC from the soil screening.

Table 4.1-2 summarizes the COPC in the existing environment that were identified for this assessment from the water, sediment and soil screening steps.

Table 4.1-2 COPC Selected in Existing Environment

Location	COPC in the Existing Environment
Water Screen	
Lake Ontario	hydrazine
Coots Pond	boron, cobalt, iron, hydrazine, manganese, strontium
Sediment Screen	
Lake Ontario	cadmium, copper, lead, selenium
Coots Pond	copper
Soil Screen	
Site-Wide	strontium and zirconium

4.1.2 Selection of Ecological Receptors

Ecological receptors were selected to evaluate ecological species potentially exposed to radioactive and non-radioactive releases from the New Nuclear – Darlington project. As discussed previously, an ERA does not evaluate all the species present at the site (i.e., the whole bioinventory) rather it evaluates a smaller number of species that are representative of the various feeding habits and characteristics of the species present at the site. Thus, the selected ecological receptors are representative of various levels of ecological hierarchy that may be located in the most exposed areas. The selected ecological receptors are listed in Table 4.1-3. The rationale of ecological receptors derivation can be found in Appendix C along with brief ecological profiles of the selected species.

Table 4.1-3 Ecological Receptors Selected for the Ecological Risk Assessment

Environmental Subcomponent	Ecological Receptor
Terrestrial Environment	
Terrestrial Vegetation	Terrestrial Vegetation (various)[a]
Insects and Terrestrial Invertebrates	Earthworm[b]
Birds and Waterfowl	American Crow
	American Robin
	Bank Swallow
	Bufflehead
	Mallard
	Pied-billed Grebe
	Red-eyed Vireo
	Song Sparrow
	Yellow Warbler
Mammals	Deer Mouse
	Eastern Cottontail
	Meadow Vole
	Muskrat
	Raccoon
	Red Fox
	Short-tailed Weasel
	White-tailed Deer
Amphibians and Reptiles	Midland Painted Turtle, Northern Leopard Frog, Green Frog and American Toad[c]
Aquatic Environment	
Benthic Invertebrates	Benthic Invertebrates (various)[d]
Aquatic Vegetation	Aquatic Plants (various)[e]
Fish	Forage Fish [f]
	Predator Fish [f]

Note:
a - Terrestrial Vegetation is a surrogate for individual species (i.e. Sugar Maple and Canada Bluejoint and Canary Reed Grasses) since there is a lack of information to evaluate on an individual basis.
b - Earthworm is a surrogate for all insects and invertebrates (i.e. dragonfly, butterfly) since there is a lack of information to evaluate on an individual basis.
c - TRVs are not available for individual species (i.e. Green Frog and Northern Leopard Frog, Midland Painted Turtle) and so these ecological receptors are analyzed as 'Amphibians and Reptiles'.
d - TRVs and transfer factors are not available for individual species and so benthic invertebrates are analyzed as 'Benthic Invertebrates'.
e - TRVs are not available for individual species (i.e. Pond weed, Giant Bur-reed/Greenfruit Bur-reed) and so these ecological receptors are analyzed as 'Aquatic Plants'.
f - Individual fish species are evaluated as 'forage fish' or 'predator fish' as TRVs are not available for individual species.

4.1.2.1 Selection of Ecological Receptors for Assessment Areas

Another step in the development of the conceptual site model was the determination of which ecological receptors were expected to be found in the various assessment areas (polygons) at the DN site. Table 4.1-4 summarizes the locations of the terrestrial ecological receptors among the assessment areas, as well as within the lake. Table 4.1-5 shows the locations of the aquatic ecological receptors.

Table 4.1-4 Locations of Terrestrial Ecological Receptors in Site Study Area

Terrestrial Ecological Receptors		Presence within Polygon			
		AB	C	D	Lake
Birds	American Crow	•	•	•	
	American Robin	•	•	•	
	Bank Swallow	•			
	Bufflehead	•			•
	Mallard	•			•
	Pied-billed Grebe	•			•
	Song Sparrow	•	•	•	
	Yellow Warbler	•	•	•	
	Red-eyed Vireo	•	•	•	
Mammals	Deer Mouse	•	•	•	
	Meadow Vole	•	•	•	
	Eastern Cottontail	•	•	•	
	Muskrat	•			
	Raccoon	•	•	•	
	Short-Tailed Weasel	•	•	•	
	Red Fox	•	•	•	
	White-tailed Deer	•	•	•	
Insects & Invertebrates	Earthworms	•	•	•	
Amphibians & Reptiles	Painted Turtle	•		•	
	Leopard Frog	•		•	
	Green Frog	•		•	
	American Toad	•		•	
Terrestrial Vegetation	Sugar Maple			•	
	Grass (Canada Bluejoint and Reed Canary)	•	•	•	

Table 4.1-5 Locations of Aquatic Ecological Receptors

Aquatic Ecological Receptors		Lake Ontario	Coot's Pond
Aquatic Plants	Aquatic Vegetation	•	•
Benthic Invertebrates	Amphipods	•	•
	Oligochates / chironomids	•	•
	Molluscs	•	•
	Crayfish	•	
	Zebra mussels	•	
Forage Fish	Spottail shiner	•	
	Emerald shiner	•	
	Round goby	•	
	Round Whitefish	•	
	N. Redbelly Dace		•
	Alewife	•	
	White sucker	•	
	Lake sturgeon	•	
Predator Fish	Lake trout	•	

4.1.2.2 Consideration of Species at Risk

Species at Risk are recorded at the DN site through incidental observations and rare breeding bird species have been documented at the DN site through the DN site Biodiversity Program which has generally focused on the area north of the CN railway. A total of 20 species have been listed either by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the Committee on the Status of Species at Risk in Ontario (COSSARO) in the Regional Study Area (RSA). Some of the migratory species are American White Pelican, Great Gray Owl, Bald Eagle, Golden Eagle to name a few. All reptilian species are designated as by both COSEWIC and COSSARO. The Blanding's Turtle is designated as a threatened species and the Ribbon Snake, Eastern Milk snake and Map Turtle are all Species of Special Concern. The Gray Fox is the only mammal species that is listed as Threatened both nationally and provincially (see Terrestrial Environment TSD for more details). The ERA was carried out for the existing conditions and the COPC identified were strontium and zirconium. There are no TRVs for birds for these COPC; therefore no evaluation could be carried out for any rare and endangered bird species.

4.1.3 Development of Food Webs for the ERA

4.1.3.1 Development of Food Web Information for Ecological Receptors

The characteristics of ecological receptors were based on typical eating habits and expected consumption of food and water. Information on species home range was collected from past ERAs completed for the DN site as well as other sources to determine the fraction of the year that the ecological receptors would be found within the different assessment areas (polygons). In addition, information on consumption patterns was also gathered on these species in order to determine the appropriate food webs. A summary of the characteristics of the ecological receptors is provided in Table 4.1-6 (See Appendix C for further details).

Some ecological receptors are not evaluated within a pathways assessment but by direct comparison to a soil, sediment or water concentrations. This is typically how these receptors are evaluated in the ERA. These species are typically found in the aquatic environment or are found lower in the food chain in the terrestrial environment. These species include:

- Aquatic Vegetation;
- Fish (Forage and Predator);
- Frogs and Toads;
- Benthos;
- Earthworms (groundwater and soil);and,
- Terrestrial Vegetation (including berries).

As such, information on these species is not provided in Table 4.1-6.

Table 4.1-6 Characteristics of Ecological Receptors Selected for ERA

Ecological Receptors	Water Intake (L/day)	Soil Intake (gDW/day)	Sediment Intake (gDW/day)	Food Intake (gFW/day)	Body Weight (kg)	Fraction of Year at DN	Fraction of Diet from Source								
							Benthos	Aquatic Vegetation	Fish	Terrestrial Vegetation	Earthworms	Rabbit	Birds	Mouse	Insects
American Crow	0.03	3.4	0	115	0.45	0.5	0	0	0	0.5	0.4	0	0.1	0	0
American Robin	0.01	1.9	0	93	0.077	0.5	0	0	0	0.6	0.4	0	0	0	0
Bank Swallow	0.004	0.2	0	13	0.015	0.5	0	0	0	0	0	0	0	0	1.0
Bufflehead	0.04	0	3.9	179	0.473	0.5	0.9	0.1	0	0	0	0	0	0	0
Eastern Cottontail	0.12	5	0	269	1.22	1	0	0	0	1.0	0	0	0	0	0
Deer Mouse	0.004	0.02	0	3.7	0.019	1	0	0	0	0.5	0.5	0	0	0	0
Mallard	0.06	0	1.7	250	1.082	0.5	0.75	0.25	0	0	0	0	0	0	0
Meadow Vole	0.007	0.09	0	13	0.04	1	0	0	0	1.0	0	0	0	0	0
Muskrat	0.12	0	2.4	360	1.2	1	0.02	0.98	0	0	0	0	0	0	0
Pied-billed Grebe	0.03	0	0.7	173	0.45	0.5	0.5	0	0.5	0	0	0	0	0	0
Raccoon	0.47	27	0	958	5.7	1	0.1	0	0	0.4	0	0	0	0.1	0.4
Red-eyed Vireo	0.004	0.2	0	14	0.017	0.5	0	0	0	0.1	0	0	0	0	0.9
Red Fox	0.4	2.6	0	313	4.54	1	0	0	0	0.15	0	0.4	0.2	0.25	0
Song Sparrow	0.004	0.2	0	16	0.021	0.8	0	0	0	0.9	0	0	0	0	0.1
Short-tailed Weasel	0.02	0.8	0	56	0.18	1	0	0	0	0	0	0	0	1.0	0
White-tailed Deer	6.8	66	0	10,900	110	1	0	0	0	1.0	0	0	0	0	0
Yellow Warbler	0.003	0.15	0	10	0.01	0.5	0	0	0	0.1	0	0	0	0	0.9

Note: Derived based on the information presented in Appendix C.2.

4.1.3.2 Development of Food Webs

Based on the information presented in the previous section, a food web was developed for each polygon that shows the pathways a COPC would take through the food chain. These food webs provide illustrations of the pathways considered in the exposure calculations. Figures 4.1-2 to 4.1-5 show the food webs developed for the different assessment areas (polygons AB, C and D) and Lake Ontario.

4.1.4 Conceptual Site Model

The information from the food webs was used to develop an overall Conceptual Site Model. Figure 4.1-6 provides the overall conceptual model for the ERA and illustrates the pathways of exposure for Coots Pond and Lake Ontario as well as the DN site.

Figure 4.1-2 Schematic of Food Web for Polygon AB

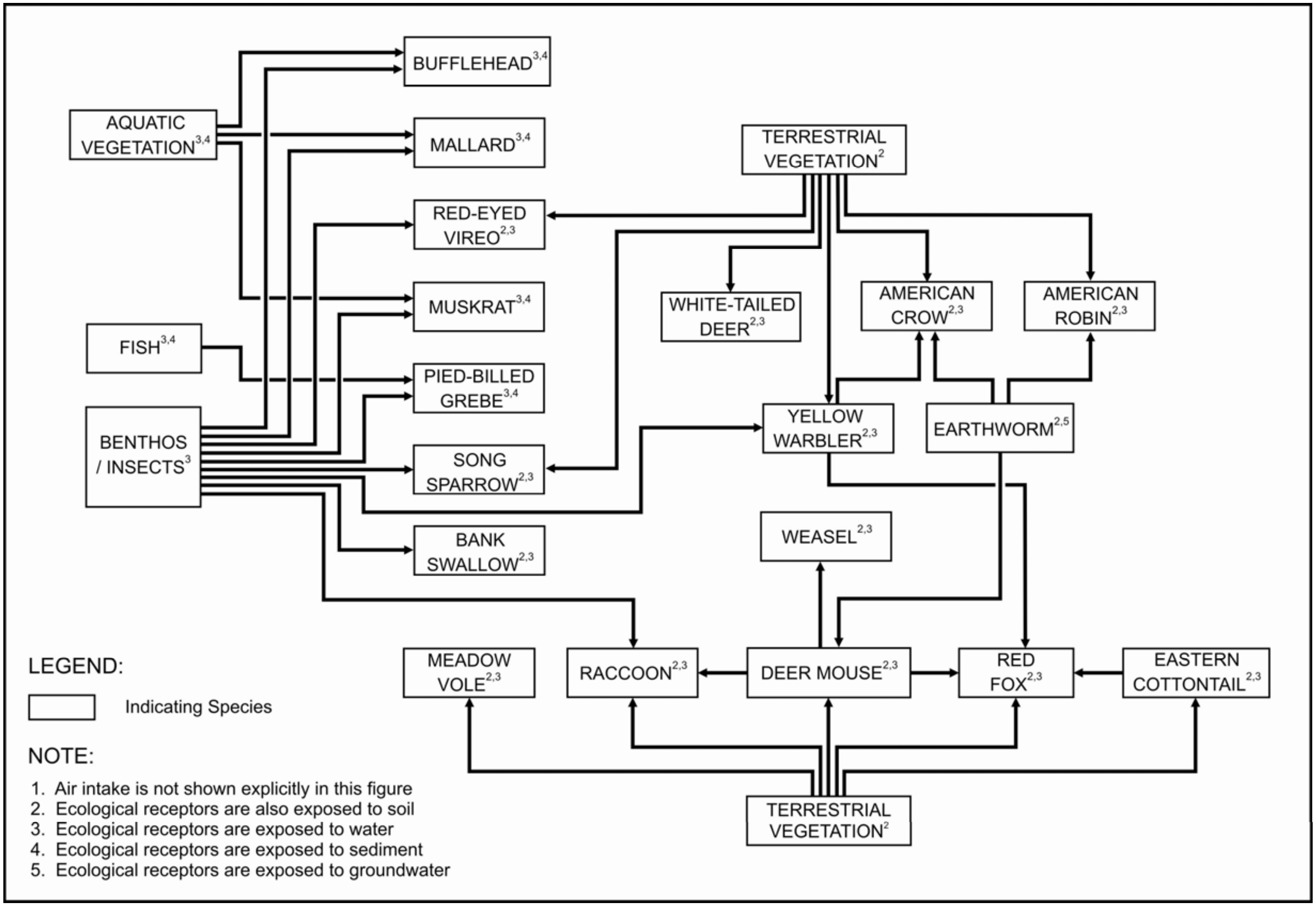


Figure 4.1-3 Schematic of Food Web for Polygon C

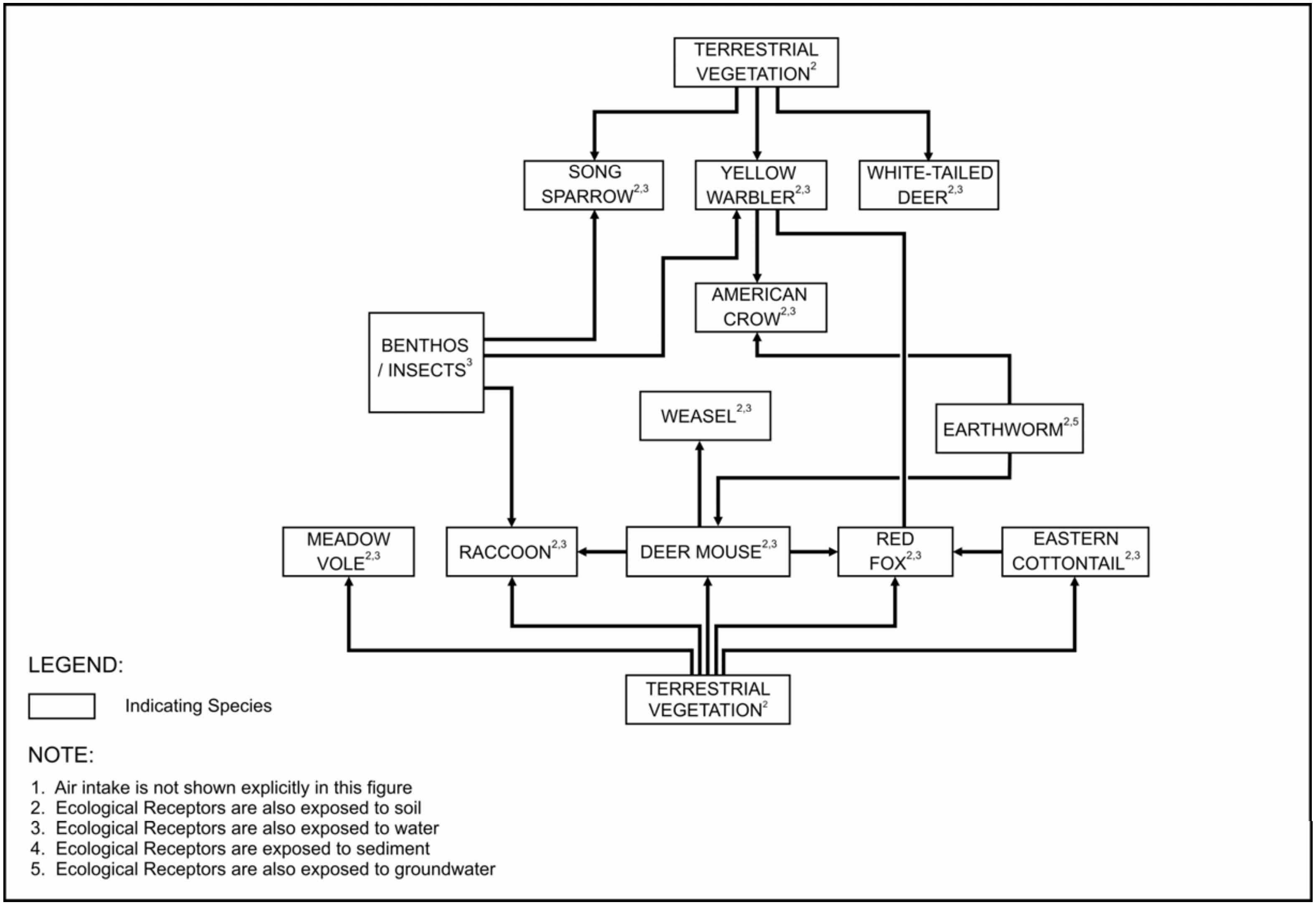


Figure 4.1-4 Schematic of Food Web for Polygon D

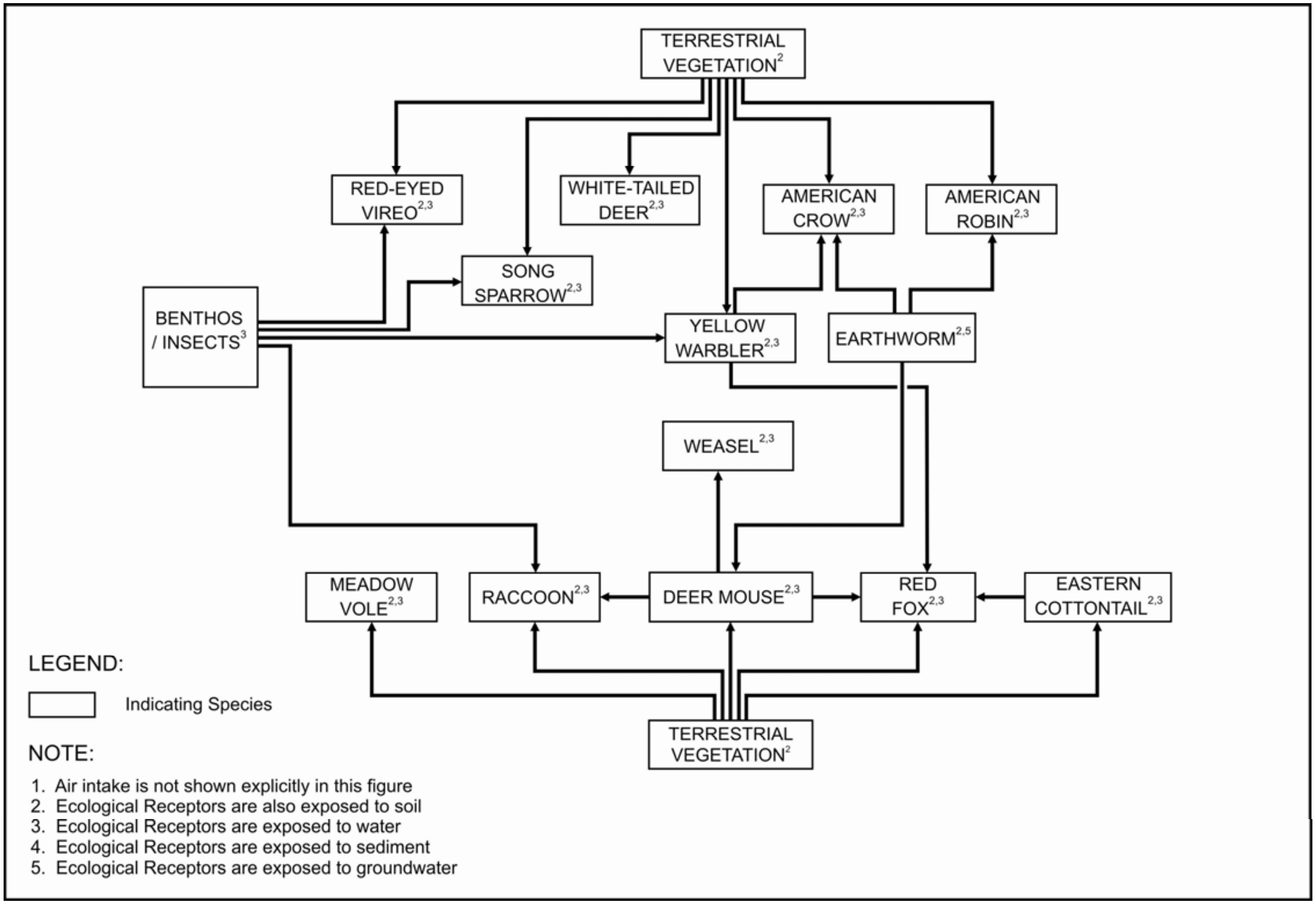


Figure 4.1-5 Schematic of Food Web for Lake Ontario

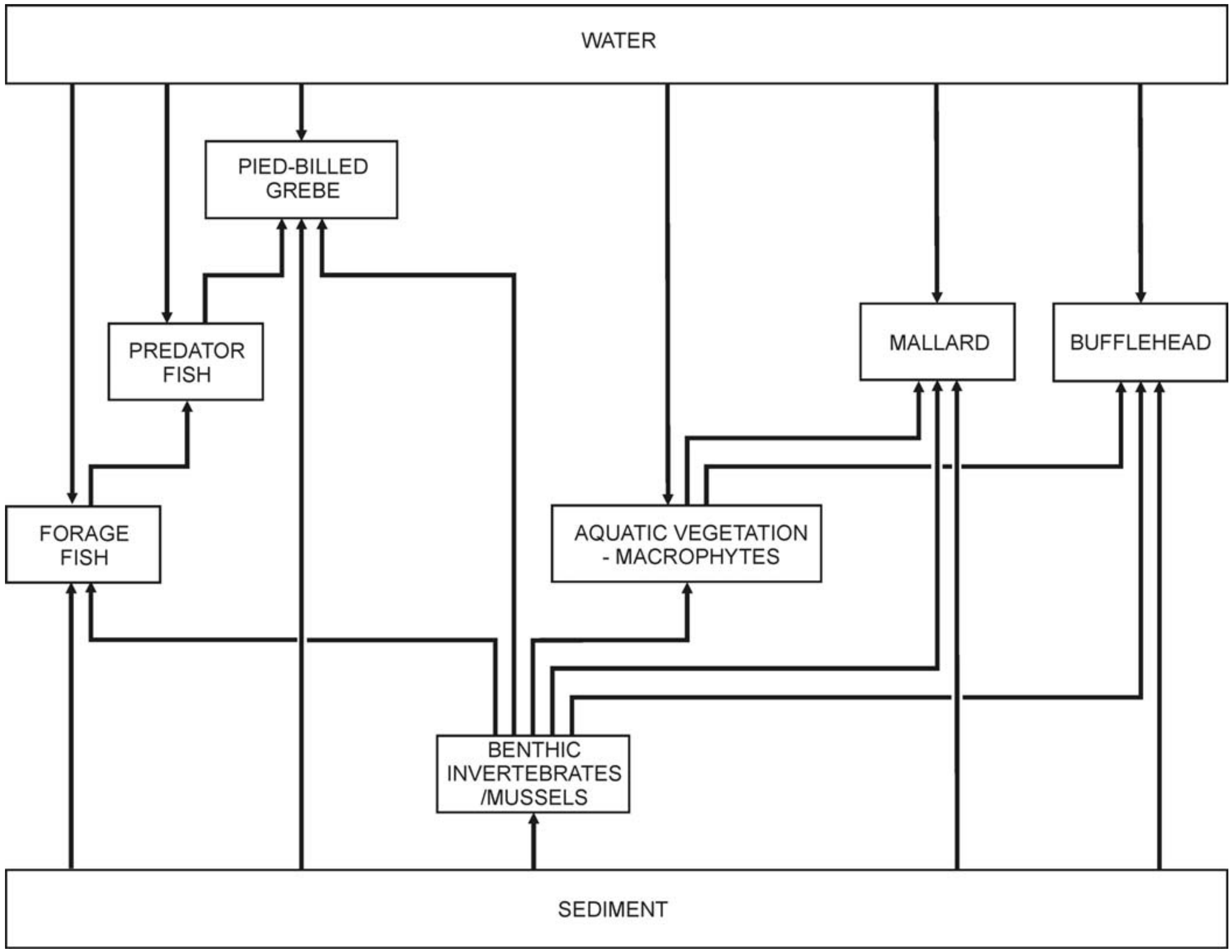
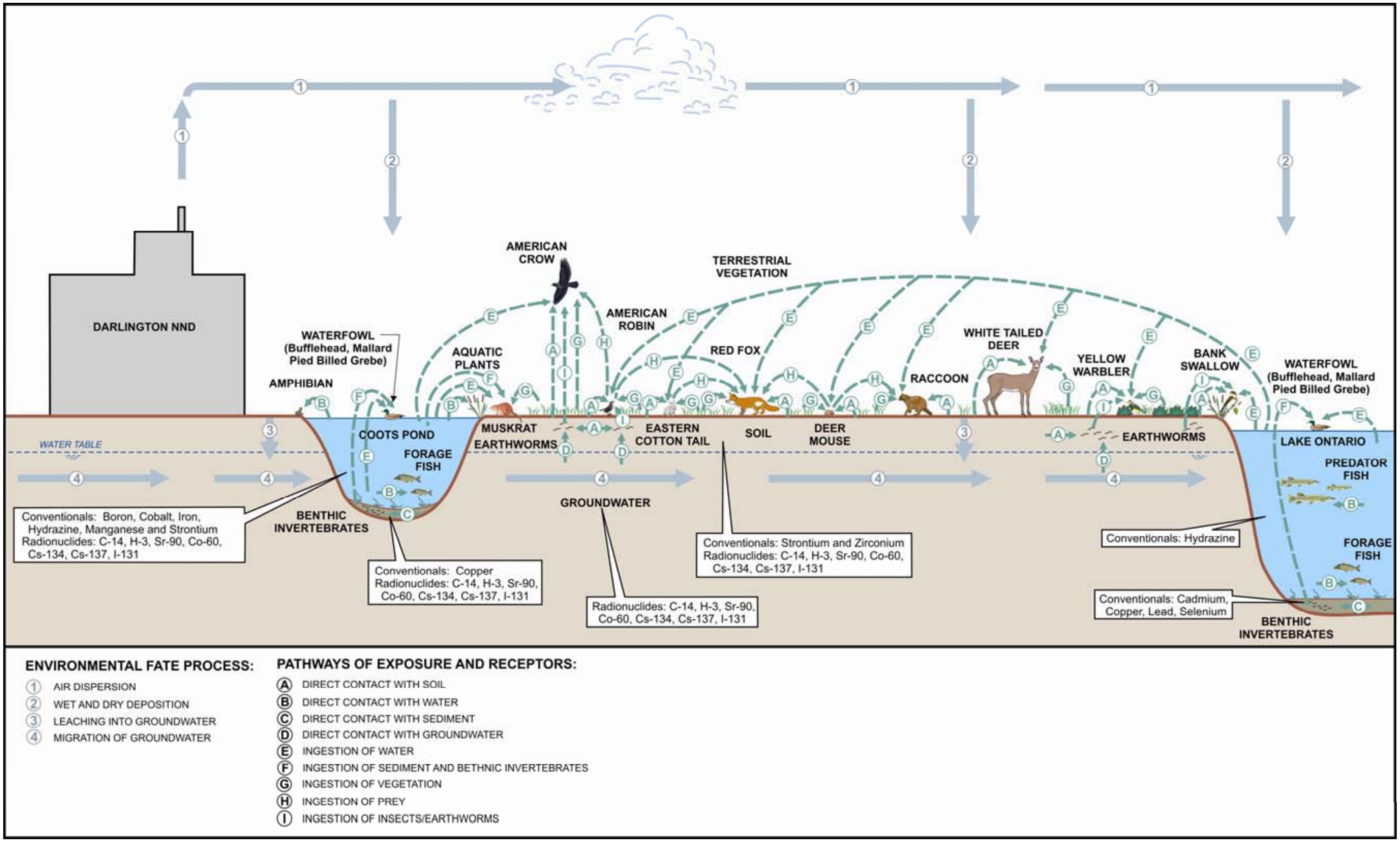


Figure 4.1-6 Conceptual Site Model for DN Site



4.1.5 Ecological Pathways

Several different pathways were considered in the ecological assessment. The potential pathways of exposure for the ecological receptors which are carried through the pathways assessment are shown in Table 4.1-7, along with their relevance for this site. Some pathways identified in Table 4.1-7 as potential exposure routes were not included in the quantitative assessment. For example, dermal exposure is generally not a significant pathway of exposure as fur and feathers are effective at blocking direct contact with skin. Earthworms are evaluated by a direct comparison to soil, so they are not considered in the pathways assessment. Frogs and toads are evaluated by a direct comparison to water concentrations. Though the air pathway was considered in the development of the food webs, a complete quantitative assessment was not carried out for inhalation of conventional COPC in particulates or vapours by animals as exposures from the inhalation route are typically much less than from the ingestion pathway and hence unlikely to affect the predicted exposure. In addition, there are no appropriate toxicity reference values for assessing inhalation exposure. Thus, inhalation pathways were not assessed for ecological receptors for conventional COPC. This is standard practice in ERA and stems from the assumption that this route is insignificant. The inhalation pathway was considered for tritium exposure only as the inhalation pathway associated with the other radionuclides is insignificant (see Appendix F for calculation).

The Radiation and Radioactivity Environment Existing Environmental Conditions TSD reports 2007 annual average gamma dose rates at monitoring locations within the Site Study Area range from 54.0 to 58.1 nGy/h (i.e., 0.054 to 0.058 μGy/h), levels which are indistinguishable from background radiation. The only area where gamma radiation measurements are elevated is within the fence line of the used fuel dry fuel storage building. The gamma radiation level at the fence line of the used fuel storage area is less than 0.5 μGy/h. While gamma radiation levels within the used fuel dry storage building fence line may be higher, these areas are paved and therefore do not provide appropriate habitat for any ecological receptors. Within about 150 m the dose rates will drop to background levels. Thus, external gamma radiation is not considered further. However, the Uncertainty Section (Section 6.1) provides further discussion on gamma radiation.

Table 4.1-7 Summary of Relevant Pathways of Exposure for Ecological Receptors

Potential Pathway of Exposure for Mammals and Birds	Comment
Dermal contact	There is the potential to contact contaminated soil. However, a quantitative assessment of dermal exposure was not undertaken as exposure from this pathway is limited due to blockage by fur and feathers.
Inhalation	There is a potential for inhalation of particulates and vapours from volatile from soil contamination. For conventional COPC, the inhalation pathway is relatively minor and appropriate TRVs are not available, thus this exposure was not included in the quantitative assessment of conventional COPC. For radionuclide COPC, the inhalation pathway was evaluated only for tritium as the pathway was insignificant for the other radionuclides.
Soil/sediment ingestion	There is the potential to ingest contaminated soil/sediment through inadvertent ingestion while consuming food.
Soil inhalation	There is the potential for particulates to be generated. However, the inhalation pathway is relatively minor and appropriate TRVs are not available, thus this exposure was not included in the quantitative assessment.
Water ingestion	There is the obvious potential to drink water from water bodies at the site.
Ingestion of prey/food	There is the potential for contaminant intakes as a result of ingestion of prey/food from the site. The food webs show the interactions that will be considered in the assessment. For example, a mouse or a vole will be exposed to contaminated soil and vegetation (food). A raccoon on the other hand will be exposed to vegetation, soil, insects and mice.

4.2 Exposure Assessment

A quantitative estimate of the exposure was conducted for the ecological receptors that were carried through the pathways assessment. For some receptors (i.e., amphibians, reptiles, terrestrial vegetation and earthworm as well as aquatic receptors such as aquatic plants, benthic invertebrates and fish), the toxicity reference values are based on media (soil, water and sediment) concentrations. Therefore, an estimation of the intake for these receptors is not necessary.

Intakes for each of the mammalian and avian receptors exposed to conventional COPC were estimated. In essence, the total intake of the conventional COPC for the selected receptors is equal to the sum of COPC intake from all the appropriate pathways including the ingestion of soil, terrestrial vegetation, aquatic vegetation, invertebrates (e.g., earthworms or benthic invertebrates) and prey. The general equation used to calculate each of the intake routes is as follows:

$$I_n = C_n \times IR_n \times f_{loc}/1000 \tag{4-1}$$

Where:

I_n	=	Intake of chemical via pathway “n” where “n” can represent all exposure routes such as water, soil, vegetation, soil invertebrates (mg/d)
C_n	=	chemical concentration in “n” media (mg/kg or mg/L for water)
IR_n	=	intake rate of “n” by the receptor (g/d or L/d for water, see Table 4.1-6)
f_{loc}	=	fraction of time at site (see Table 4.1-6)
1000	=	unit conversion (g/kg)

The intake rates by the individual pathways can be summed to provide a total intake for the receptor. Finally, in order to compare the total COPC intake to the toxicological reference value (which has the unit of mg/kg-d), the total intake is divided by the body weight of the ecological receptor (BW), which was provided in Table 4.1-6.

4.2.1 Concentrations of COPC Used in the Exposure Assessment

Table 4.2-1 provides a summary of the COPC that were evaluated in a given location for the groups of ecological receptors selected for the ERA. For example, for Coots Pond in Polygon AB, the exposure to boron, cobalt, iron, hydrazine, manganese and strontium were evaluated for both aquatic species and reptiles and amphibians. For sediment dwellers (i.e. benthic invertebrates) and waterfowl, exposures to copper were evaluated. Exposures to strontium and zirconium were quantified for the terrestrial species.

Table 4.2-1 Summary of Conventional COPC and Locations Evaluated for Ecological Receptors

Location	**Summary of Conventional COPC Evaluated for Ecological Receptors**					
	Aquatic Species	**Reptiles and Amphibians**	**Sediment Species**	**Waterfowl**	**Terrestrial Species - Mammals**	**Terrestrial Species - Birds**
Polygon AB (Coots Pond)	boron, cobalt, iron, hydrazine, manganese and strontium	boron, cobalt, iron, hydrazine, manganese and strontium	copper	copper	strontium and zirconium	Not evaluated because TRVs unavailable for strontium and zirconium
Polygon C	No waterbody present	No waterbody present	No waterbody present	No waterbody present	strontium and zirconium	Not evaluated because TRVs unavailable for strontium and zirconium
Polygon D (Tree Frog Pond)	Tree Frog Pond not considered to have aquatic species and will be removed for the NND	boron, cobalt, iron, hydrazine, manganese and strontium	Tree Frog Pond will be removed for the NND	Tree Frog Pond not considered large enough to support waterfowl	strontium and zirconium	Not evaluated because TRVs unavailable for strontium and zirconium
Lake Ontario adjacent to DNGS and NND	hydrazine	Lake Ontario considered to not have adequate habitat to support amphibians and reptiles.	cadmium, copper, lead, selenium	cadmium, copper, lead, selenium	strontium and zirconium	Not evaluated because TRVs unavailable for strontium and zirconium

The concentrations of the various COPC that were used in the pathways assessment of the ERA are provided in the following Tables 4.2-2 to 4.2-13. Tables 4.2-2 to 4.2-5 provides a summary of the concentrations for the conventional COPC and Tables 4.2-6 to 4.2-12 provides a summary of the radionuclide COPC. As seen from Tables 4.2-2 to 4.2-5 and Table 4.2-12, measured data for biota were used where available. Table 4.2-12 provides a summary of the maximum biota concentrations used for the radiological assessment. These biota concentrations were the maximum concentrations selected from any of the assessment locations (i.e. Polygons AB, C or D) and therefore the radiological assessment evaluates the maximum dose that can be experienced at the site regardless of location. In cases where there are no measured data, predicted concentrations using literature based transfer factors were used.

Radionuclide in air concentrations were measured at the air quality monitoring stations, located along the DN site perimeter, described in the Atmospheric Environment Existing Environmental Conditions TSD. However, the measured concentrations were all below the method detection limit. Therefore, an air dispersion model, described in the Atmospheric Environment Assessment of Effects TSD, was used to predict air concentrations at a series of receptor locations across the site, see Table 4.2-11. Radionuclide emission rates used in the calculations are described in the Radiation and Radioactivity Environment Assessment of Environmental Effects TSD (Appendix N) and are based on the emission rates from 2007. The maximum predicted tritium in air concentration across the site was used in the dose rate calculations since this was higher than the measured tritium concentrations at the site boundary.

For radionuclides, with the exception of C-14 and Cs-137, the measured soil concentrations are all below the detection limit; therefore an air dispersion and soil build-up model was used to predict the contribution of radionuclides associated with the existing DN site. Table 4.2-13 provides a summary of the predicted soil concentrations for the radionuclides selected in the assessment. As seen from the table, the predicted soil concentrations associated with the DN site are lower than the measured soil concentrations (Table 4.2-6); therefore the use of the measured soil values as was done in this assessment would tend to overestimate the doses.

It should be noted that although Polygon E is not being evaluated, the maximum predicted radionuclide concentrations were used in the assessment of radiological risks. In some cases, these maximum concentrations occurred in Polygon E.

Table 4.2-2 Summary of Concentrations of Conventional COPC in Polygon AB

Polygon AB

Media	Units	COPC			Comments
		Copper	Strontium	Zirconium	
Water	mg/L	0.0015	0.73	0.0022	maximum concentration of 20 samples from Coots Pond
Sediment	µg/g dw	26.9	701.6	35.9	maximum concentration of 5 samples from Coots Pond
Soil	µg/g dw	23.7	200	74.0	maximum concentration of 13 samples from Polygon AB
Fish	µg/g ww	4.59	186	1.36	maximum concentration from 3 fish samples from Coots Pond
Benthic Invertebrates	µg/g ww	1.5	330.3	2.16	estimated using water-to-benthic transfer factor
Aquatic Vegetation	µg/g ww	1.5	190.8	6.5×10^{-6}	estimated using water-to-aquatic vegetation transfer factor
Terrestrial Vegetation	µg/g dw	13.1	155.8	0.853	maximum concentration of 6 samples from Polygon AB
	µg/g ww	3.93	46.7	0.256	converted from dw to ww using assumed 70% moisture content
Earthworms	µg/g ww	7.84	104.2	3.39	maximum concentration of 2 samples from Polygon AB
Insects	µg/g ww	5.72	18.38	0.025	maximum concentration of 2 samples from Polygon AB
Birds	µg/g ww	0.72	1.78	1.6×10^{-5}	maximum of estimated bird concentration using feed-to-flesh transfer factor of all species
Mouse	µg/g ww	0.0005	0.003	1.0×10^{-8}	maximum of estimated concentration using feed-to-flesh transfer factor of deer mouse and meadow vole
Rabbit	µg/g ww	0.012	0.068	5.0×10^{-7}	estimated rabbit concentration using feed-to-flesh transfer factor

Table 4.2-3 Summary of Concentrations of Conventional COPC in Polygon C

Polygon C

Media	Units	COPC		Comments
		Strontium	**Zirconium**	
Soil	µg/g dw	180	74.1	maximum concentration of 6 samples from Polygon C
Terrestrial Vegetation	µg/g dw	52.1	0.15	maximum concentration of 3 samples from Polygon C
	µg/g ww	15.63	0.044	converted from dw to ww using assumed 70% moisture content
Earthworms	µg/g ww	26.0	1.10	maximum concentration of 1 samples from Polygon C
Insects	µg/g ww	2.04	0.025	concentration of 1 sample from Polygon C
Birds	µg/g ww	0.36	1.2×10^{-5}	maximum of estimated bird concentration using feed-to-flesh transfer factor of all species
Mouse	µg/g ww	0.001	7.2×10^{-9}	maximum of estimated concentration using feed-to-flesh transfer factor of deer mouse and meadow vole
Rabbit	µg/g ww	0.026	3.8×10^{-7}	estimated rabbit concentration using feed-to-flesh transfer factor

Table 4.2-4 Summary of Concentrations of Conventional COPC in Polygon D

Polygon D

Media	Units	COPC		Comments
		Strontium	Zirconium	
Water	mg/L	0.3	0.02	maximum concentration of samples from Tree Frog Pond
Soil	µg/g dw	304	78.7	maximum concentration of 6 samples from Polygon D
Benthic Invertebrates	µg/g ww	787.5	42.2	estimated using water-to-benthic transfer factor
Terrestrial Vegetation	µg/g dw µg/g ww	83.0 24.9	0.295 0.089	maximum concentration of 3 samples from Polygon D converted from dw to ww using assumed 70% moisture content
Earthworms	µg/g ww	55.8	16.38	maximum concentration of 2 samples from Polygon D
Insects	µg/g ww	7.56	0.025	concentration of 1 sample from Polygon D
Birds	µg/g ww	4.26	2.1×10^{-4}	maximum of estimated bird concentration using feed-to-flesh transfer factor of all species
Mouse	µg/g ww	0.0018	1.1×10^{-8}	maximum of estimated concentration using feed-to-flesh transfer factor of deer mouse and meadow vole
Rabbit	µg/g ww	0.042	4.2×10^{-7}	estimated rabbit concentration using feed-to-flesh transfer factor

Table 4.2-5 Summary of Concentrations of Conventional COPC in Lake Ontario

Lake Ontario

Media	Units	COPC				Comments
		Cadmium	Copper	Lead	Selenium	
Water	mg/L	0.00005	0.0012	0.0002	0.0005	95% UCL of mean from 140 samples (Table D-5)
Sediment	µg/g dw	1.30	44.6	39.2	2.04	maximum concentration from 16 samples
Fish	µg/g ww	0.097	3.65	0.54	1.53	maximum concentration from 24 fish samples in Lake Ontario Site Study Area
Benthic Invertebrates/Mussels	µg/g ww	0.22	2.12	0.78	0.58	maximum concentration from 4 mussel samples in Lake Ontario
Aquatic Vegetation	µg/g ww	0.038	1.17	0.028	0.032	estimated using water-to-aq veg transfer factor

Table 4.2-6 Summary of Concentrations of Radiological COPC in Water, Sediment and Soil

Radionuclide	Surface Water (Bq/L)		Sediment (Bq/kg (DW))		Soil (Bq/kg (DW))			
					Polygon			
	Lake Ontario – Site Study Area	Coots Pond	Lake Ontario – Site Study Area	Coots Pond	AB	C	D	E
C-14	0.25	0.25	8.3[1]	10.9[1]	14.1[1]	11.4[1]	8.35[1]	15.1[1]
Tritium	7.5	78	7.5	298	N/A	N/A	N/A	N/A
Sr-90	0.05	0.05	10	10	10	10	10	10
Co-60	0.5	0.5	5.0	5.0	0.56[2]	N/A	0.56[2]	0.56[2]
Cs-134	0.5	0.5	5.0	5.0	0.56[2]	N/A	0.56[2]	0.56[2]
Cs-137	0.5	0.5	12	5.0	8.4[2]	N/A	5.1[2]	9.2[2]
I-131	2	2	10	10	4.4[2]	N/A	2.8[2]	3.9[2]

Note: N/A – Not analyzed

[1] Assumed soil sediment carbon content of 5%

[2] Converted from wet weight based on an average soil water content of 10% (Geological and Hydrogeological Environment Existing Environmental Conditions TSD)

Table 4.2-7 Summary of Concentrations of Radiological COPC in Aquatic Biota in On-Land Ponds (Bq/kg ww)

Radionuclide	Coots Pond		Treefrog Pond	
	Fish - NRR Dace	Aquatic Vegetation	Aquatic Vegetation	Frogs
C-14	35[1]	30[2]	43.7[2]	33.9[1]
Tritium	77	43	58	38
Sr-90	0.5	1.3	0.5	N/A
Co-60	0.5	0.5	0.5	0.5
Cs-134	0.5	0.5	0.5	0.5
Cs-137	0.5	0.5	0.5	0.5
I-131	159	1.0	1.5	11

Note: N/A – Not analyzed

[1] Converted from Bq/kg C using freshwater fish tissue 122 gC/kg FW (CSA N288.1)

[2] Converted from Bq/kg C using dry plant tissue 500 gC/kg dry weight; dry/fresh weight ratio (forage) 0.19 (CSA N288.1)

Table 4.2-8 Summary of Concentrations of Radiological COPC in Aquatic Biota in Lake Ontario (Bq/kg)

Radionuclide	Site Study Area					
	Zebra Mussels	Alewife	Round White-fish	Round Goby	White Sucker	Walleye
C-14	27.8[2]	35.6[1]	N/A	36.6	N/A	N/A
Tritium	10	23	N/A	9.0	N/A	N/A
Sr-90	22.3	0.5	0.5	0.5	0.5	N/A
Co-60 by gamma	0.5	0.5	0.5	0.5	0.5	0.5
Cs-134 by gamma	0.5	0.5	0.5	0.5	0.5	0.5
Cs-137 by gamma	0.5	0.5	0.5	0.5	0.5	0.5
I-131 by gamma	54.1	6.5	4	5.5	1.5	13.1

Note: N/A – Not analyzed

[1] Converted from Bq/kg C using freshwater fish tissue 122 gC/kg FW (CSA N288.1)

[2] Converted from Bq/kg C using marine molluscs tissue 88 gC/kg FW (CSA N288.1)

Table 4.2-9 Summary of Concentrations of Radiological COPC in Caterpillars and Earthworms

Radionuclide	Max Concentration for Caterpillars (Bq/kg ww)			Max Concentration for Earthworms (Bq/kg ww)		
	AB	C	D	AB	C	D
C-14	33.4[1]	52.2[1]	35.3[1]	33.1[1]	37.9[1]	38.4[1]
Tritium	53	185	92	7.5	37	19
Sr-90	0.5	0.5	0.5	0.5	N/A	0.5
Co-60 by gamma	0.5	0.5	0.5	0.5	0.5	0.5
Cs-134 by gamma	0.5	0.5	0.5	0.5	0.5	0.5
Cs-137 by gamma	0.5	0.5	0.5	0.5	0.5	0.5
I-131 by gamma	3	4	2	5	4.5	6

Note: N/A – Not analyzed

[1] Converted from Bq/kg C using insect tissue 0.48 kgC/kg dry weight (Elser et al., Nature Nov. 2000); dry/fresh weight ratio 0.25 (assumed based on Edwards and Bohlen, 1996).

Table 4.2-10 Summary of Concentrations of Radiological COPC in Terrestrial Vegetation

Radionuclide	Maximum Concentration in Terrestrial Vegetation in Polygon (Bq/kg ww)			Maximum Concentration in On-site Fruit in Polygon (Bq/kg ww)				Maximum Concentration in REMPFruit (Bq/kg ww)
	AB	C	D	AB	C	D	E	
C-14	27.4[1,2]	54.8[1,2]	54[1,2]	11.8[1,3]	12.7[1,3]	14.6[1,3]	14.9[1,3]	N/A
Tritium	495	266	55	86	151	93	186	N/A
Sr-90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.5
Co-60 by gamma	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cs-134 by gamma	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cs-137 by gamma	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
I-131 by gamma	8.5	7	11.5	1	1	1	1	1

Note: N/A – Not analyzed
[1] Converted from Bq/kg C using dry plant tissue 500 gC/kg dry weight;
[2] dry/fresh weight ratio (forage) 0.19 (CSA N288.1)
[3] dry/fresh weight ratio (fruit/veg) 0.1 (CSA N288.1)

Table 4.2-11 Summary of Predicted Air Concentrations Used in the Radiological Assessment

Radionuclide	Maximum Measured Concentration - Baseline Program (Site Perimeter)	Predicted Air Quality Concentrations (Bq/m^3)			
		Polygon AB	Polygon C	Polygon D	Polygon E
C-14	<6 x 10^{-5}	8.97 x 10^{-3}	7.60 x 10^{-3}	6.29 x 10^{-3}	0.020
Tritium	1.8[1]	1.10	0.94	0.77	2.46
Sr-90	<1.0 x 10^{-4}	1.04x 10^{-8}	9.35 x 10^{-9}	7.25 x 10^{-9}	2.31 x 10^{-8}
Co-60	<1.0 x 10^{-4}	7.51 x 10^{-8}	8.77 x 10^{-9}	5.26 x 10^{-8}	1.67 x 10^{-7}
Cs-134	<1.0 x 10^{-4}	1.98 x 10^{-8}	6.36 x 10^{-8}	1.39 x 10^{-8}	4.42 x 10^{-8}
I-131	<4.0 x 10^{-4}	8.28 x 10^{-7}	1.68 x 10^{-8}	5.80 x 10^{-7}	1.85 x 10^{-6}
Cs-137	<1.0 x 10^{-4}	3.10 x 10^{-8}	2.63 x 10^{-8}	2.17 x 10^{-8}	6.91 x 10^{-8}

Note: [1] Obtained from REMP Samples

Table 4.2-12 Summary of Maximum Measured Biota Concentrations (Bq/kg FW) Used in the Radiological Assessment

	C-14	Tritium	Sr-90	Co-60	Cs-134	Cs-137	I-131
Zebra Mussels - Lake Ontario (used for benthic invertebrates)	27.8	10	22.3	0.5	0.5	0.5	54.1
Fish - Lake Ontario	36.6	23	0.5	0.5	0.5	0.5	13.1
Fish - On Land Ponds	35.0	77	0.5	0.5	0.5	0.5	159
Aquatic Vegetation	43.7	58	1.3	0.5	0.5	0.5	1.5
Frogs	33.9	38	N/A	0.5	0.5	0.5	11.0
Caterpillars (used for insects)	52.2	185	0.5	0.5	0.5	0.5	4.0
Earthworms	38.4	37	0.5	0.5	0.5	0.5	6.0
Terrestrial Vegetation	54.8	495	N/A	0.5	0.5	0.5	11.5
Fruit (used for berries)	14.9	186	0.5	0.5	0.5	0.5	1.0

Note: The concentrations presented in this table are the maximum measured concentrations regardless of location within the site study area
N/A – Not analyzed

Table 4.2-13 Predicted Soil Concentrations of Radiological COPC Associated with the Operation of DNGS

Radionuclide	Predicted Soil Concentrations (Bq/kg)			
	Existing Conditions			
	Polygon			
	AB	C	D	E
C-14	-	-	-	-
Tritium	-	-	-	-
Sr-90	0.0004	0.0003	0.0003	0.0008
Co-60	0.012	0.010	0.008	0.027
Cs-134	0.002	0.002	0.001	0.004
Cs-137	0.009	0.008	0.006	0.020
I-131	0.0005	0.0004	0.0003	0.0011

Note: C-14 and Tritium soil concentrations are not predicted since exposure to these radionuclides is dominated by transfer from the atmosphere.

Transfer factors (TFs) were used to estimate the exposures to species high on the food chains as indicated by the food webs. TFs are values that are derived using measured values in a given media and species in question. An example of this would be the use of a TF to determine the concentrations in fish as a result of the concentration of a constituent in water (i.e., $C_{fish} = C_{water} \times TF$). The TF is specific to each constituent, media and, in some cases, species. TFs were used to support the estimation of exposures of COPCs to various ecological receptors where measured data were not available or where concentrations were measured below the detection limit. Further information on TFs and the approach to estimating exposures (or doses) to non-human biota are found in Appendices E and F for conventional constituents and radiological constituents respectively.

The transfer factors used in the assessment to estimate the conventional COPC intakes are provided in Table 4.2-14.

Table 4.2-14 Transfer Factors for Conventional COPC used in the ERA

COPC	**Water-to-Benthic**		**Water-to-Aq. Veg**		**Feed-to-Flesh (Mammal)**		**Feed-to-Flesh (Bird)**	
	L/kg (ww)	**Reference**	**L/kg (ww)**	**Reference**	**d/kg (ww)**	**Reference**	**d/kg (ww)**	**Reference**
Cadmium	272	U.S. EPA 2001	760	U.S. EPA 2001				
Copper	1000	U.S. EPA 1979	1000	ORNL 1976	0.01	IAEA 1994, Baes *et al.* 1984, U.S. EPA 1998, 1999	0.5	IAEA 1994, Baes *et al.* 1984, U.S. EPA 1998. 1999
Lead	100	U.S. EPA 1979	150	Bird and Schwartz 1996 (1000 L/kg DW and 85% moisture)				
Selenium	680	U.S. DOC 1985 and measured data from Northern Ontario, Elliot Lake	63	Santschi and Honeyman 1989				
Strontium	450	Bird and Schwartz 1996	260	Bird and Schwartz 1996 (2700 L/kg dw and 85% moisture)	0.005	IAEA 1994, Baes *et al.* 1984, U.S. EPA 1998, 1999	0.06	IAEA 1994, Baes *et al.* 1984, U.S. EPA 1998. 1999
Zirconium	1000	assumed same as sediment; Bechtel Jacobs 1998 and IAEA 1994	0.003	assumed same as soil-to-Terr. Veg; NCRP 1996	0.000001	IAEA 1994, NCRP 1996	0.00006	IAEA 1994

Note: Shade means that this information is not needed in the ERA.

4.3 Hazard Assessment

The hazard assessment phase of ecological risk assessments involves identification of constituent concentrations or intakes which have been shown to have adverse effects on the receptors (ecological species) of concern.

The objective of an ecological risk assessment is to evaluate the potential for adverse effects on a population basis. Due to the difficulty in measuring direct effects on assessment endpoints, "*measurement endpoints*" are adopted to provide a framework for the evaluation of predicted effects. A measurement endpoint is defined as "*…a quantitative summary of the results of a toxicity test, a biological study, or other activity intended to reveal the effects of a substance*" (Suter 1993). In lieu of direct assessment endpoint effects measures, the adoption of measurement endpoints provides a consistent basis for the evaluation of potential effects due to exposure of assessment endpoints.

4.3.1 Toxicity Reference Values

Measurement endpoints are commonly selected at the individual level of biological organization, and are typically based on exposure responses that are meant to act as a proxy for key population and community characteristics such as reproduction and abundance (Environment Canada 1997). Such measurement endpoints are commonly based on literature-derived toxicity dose-response relationships, examined through laboratory experimentation (i.e., the response of a particular organism to a certain level of exposure). When derived from toxicity studies, such measurement endpoints are often referred to as toxicity benchmarks or toxicity reference values (TRVs).

These toxicity reference values are used in risk assessments to judge whether the predicted (estimated) exposures (or doses or intakes) may potentially have an adverse effect on ecological species. A discussion of selected literature and the associated toxicity reference values consulted in this assessment is provided in the following sections.

4.3.1.1 Toxicity Reference Values for Plant and Earthworm Species

There are no available studies to assess the effect of strontium and zirconium on plants and invertebrates, therefore no assessment was carried out for these species.

4.3.1.2 Toxicity Reference Values for Avian and Mammalian Species

The background information for the TRVs developed for the test species are provided in Table 4.3-1 for mammals and Table 4.3-2 for birds. To determine possible effects on terrestrial ecological receptors, Lowest Observable Adverse Effect Level (LOAEL) toxicity reference values, No Observable Adverse Effect Level (NOAEL) toxicity reference values and Estimated No-Effects Values (ENEVs) from the CNSC are used. NOAELs and ENEVs are generally used for screening level type assessments where as LOAELs are used to determine potential effects on ecological receptors since more realistic assumptions have been made to obtain an estimate of COPC exposure (Sample *et al.* 1996). In this assessment, NOAELs are used for the Tier 2 evaluation and if any issues have been identified, then a second evaluation using the LOAEL is completed.

For terrestrial mammals, there is a lack of data available on the individual terrestrial mammals. In the absence of species specific toxicity data, data for laboratory animals (usually mice and rats) are generally used. For avian receptors, the test species are generally ducks or chicks. Toxicity reference values (LOAELs, NOAELs and ENEVs) used to evaluate the mammalian and avian populations were collected from the U.S. DOE database by Sample *et al.* (1996). The general consensus in the risk assessment community is that scaling up from the body weight of the laboratory animal to the test animal species is no longer necessary. Thus, the TRVs from laboratory species are directly applicable to wildlife. In this assessment, no scaling of laboratory TRVs was completed. The TRVs provided by Sample *et al*. (1996), which are reproduced in the following tables were deemed to be appropriate for the ERA.

Table 4.3-1 Selected TRVs for Surrogate Mammalian Species

COPC	MAMMAL					
	LOAEL (mg/kg-d)	**NOAEL (mg/kg-d)**	**Test Species**	**Endpoint**	**Reference**	**ENEV (mg/kg-d)**
Strontium	--	263	Rat	Body weight and bone changes	Skoryna (1981)	--
Zirconium	--	1.74	Mouse	Lifespan, longevity	Schroeder *et al.* (1968)	--

Note: -- means no data available

As seen from Table 4.3-2, there are no avian TRVs for evaluating risks to birds from exposure to strontium and zirconium in the terrestrial environment. Therefore, risks associated with the American Robin, Bank Swallow, Red-Eyed Vireo, Song Sparrow and Yellow Warbler could not be evaluated.

Table 4.3-2 Selected TRVs for Surrogate Avian Species

COPC	BIRD					
	LOAEL (mg/kg-d)	**NOAEL (mg/kg-d)**	**Test Species**	**Endpoint**	**Reference**	**ENEV (mg/kg-d)**
Cadmium	20	1.45	mallard duck	Reproduction	White and Finley (1978)	--
Copper	61.7	47	1 day old chicks	Growth, mortality	Mehring *et al.* (1960)	20.57
Lead	11.3	1.13	Japanese quail	Reproduction	Edens *et al.* (1976)	1.13
Selenium	1	0.5	mallard duck	Reproduction	Heinz *et al.* (1987)	0.271
Strontium	--	-	--	--	--	--
Zirconium	--	-	--	--	--	--

Note: --There are no avian TRVs for strontium and zirconium, therefore the risks for terrestrial birds from exposure to these two COPC could not be evaluated.

4.3.1.3 Aquatic Toxicity Reference Values

Table 4.3-3 summarizes the aquatic toxicity reference values used in the ERA. This table outlines the references from which the toxicity reference values were obtained, the test species and the rationale for selecting the appropriate toxicity reference values.

It was not the intent of this assessment to extensively search the primary literature to obtain toxicity reference values; rather, this assessment relied on values that have been collated by various agencies for use in risk assessments. The U.S. EPA database AQUIRE provides much of the information on the aquatic toxicity reference values.

Decision rules for the selection of test species were conservatively based on the lowest values from the available data. Such conservatism aims for the protection of the most sensitive ecological species present at the site, and also to protect any species at risk that may be present at the site. For example, choosing the lowest available values for aquatic plants attempts to protect the most sensitive aquatic plant species at the site.

Chronic effects concentration (EC_{25} or EC_{20}) reference values were selected as recommended by Environment Canada (1997). The EC_{25} is the lowest concentration that would result in 25% of the population being affected (i.e., population effect such as growth). Where possible, effects concentration (EC) data were collected over mortality (LC) data. Different models exist for translating chemical exposure (or dose) to toxic responses. For EC_{50} toxicity values, in the absence of detailed dose-response functions, a linear approximation can be established with a single toxicity reference value assuming zero effect at zero exposure. This linearization is pessimistic since the predicted effect will be greater than that observed using the commonly encountered sigmoidal dose-response function for low dose exposures. For acute toxicity values (LC_{50} values for 96 hour tests), a factor of 10 was applied to derive a toxicity reference value that would approximate an EC_{20} (Environment Canada & Health Canada 2003). For LC_{50} data derived from chronic tests, a factor of 4 was applied to derive a toxicity reference value that would approximate an EC_{20}. The factors of 4 and 10 are empirical factors based on the results of other toxicity tests. It should be noted that the aquatic toxicity values presented in Table 4.3-3 for benthic invertebrates are all based on water exposure only. In addition, TRVs for amphibians are provided. There are no TRVs for reptiles and it has been assumed that the TRVs for amphibians can be used as a surrogate for the TRVs for reptiles.

Table 4.3-3 Aquatic Toxicity Reference Values used in ERA

Aquatic Receptor	Boron (mg/L)				
	Test Species	**LC/EC_{50}**	**Toxicity Reference Value**	**Reference**	**Comments**
Aquatic Plants	*Myriophyllum spicatum*	40	20	Butterwick *et al*. 1989	50% inhibition of root growth after 32 days; used an EC_{25} from linear extrapolation
Phytoplankton	*Scenedesmus quadricauda*		0.58	Bringmann and Kuhn, 1978	LOEC for population growth rate
Benthic Invertebrates	*Chironomus decorus*	1376	137.6	Maier and Knight (1991)	48-h LC_{50} for mortality; derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and EC_{50}
Zooplankton	*Daphnia magna.*	141	14.1	Maier and Knight (1991)	48- h LC_{50} for mortality; derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and EC_{50}
Predator Fish	Coho salmon (*O. kisutch*)	447	45	Hamilton and Buhl (1990)	Acute LC_{50}; derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and EC_{50}
Forage Fish	--	--	--	--	no data available
Amphibians and Reptiles	Fowlers Toad	123	12.3	Birge and Black (1977)	Acute LC_{50}; derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and EC_{50}

Aquatic Receptor	**Cobalt (mg/L)**				
	Test Species	**LC/EC_{50}**	**Toxicity Reference Value**	**Reference**	**Comments**
Aquatic Plants	--	--	--	--	no data available
Phytoplankton	*Chlorella*	0.55	0.27	Coleman *et al.* (1971)	from MOE (1996); EC_{50} 21-d; derived EC_{25} by linear extrapolation
Benthic Invertebrates	Cyclops	16	1.6	Baudouin and Scoppa (1974)	from MOE (1996); this value is the lowest value for all test invertebrate species and is the same as the value for a mayfly. LC_{50} 48-hr (acute); derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and an EC_{20}
Zooplankton	*Daphnia* sp.	--	0.005	Kimball (n.d.)	from Suter and Tsao (1996); lowest chronic test EC_{20} – 28-d life-cycle tests; used as TRV
Predator Fish	Rainbow Trout	0.47	0.12	Birge (1978)	from MOE (1996); LC_{50} embryos 28-d; derived TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}
Forage Fish	Goldfish	0.81	0.20	Birge (1978)	from MOE (1996); lowest value of fathead minnow, tilapia, stickleback and goldfish. LC_{50} 7-d; derived TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}
Amphibians and Reptiles	*Gastrophryne carolinensis*	0.050	0.013	Birge *et al.* (1979)	7 day LC50 based on reproductive endpoints; TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}

Aquatic Receptor	**Hydrazine (mg/L)**				
	Test Species	**LC/EC_{50}**	**Toxicity Reference Value**	**Reference**	**Comments**
Aquatic Plants	--	--	--	--	no data available
Phytoplankton	*Chlorella pyrenoidosa*	10	1	Heck *et al.* 1963	48-hr LC_{50}; derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and EC_{20}
Benthic Invertebrates	*Daphnia pulex*	2.3	0.92	Bringmann &Kuhn, 1982	48-hr EC_{50}; derived TRV by linear extrapolation assuming that a linear dose response occurs at the low end of the curve
Zooplankton	--	--	--	--	no data available
Predator Fish	Largemouth bass	3.6	0.36	Heck *et al.* 1963	48-hr LC_{50}; derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and EC_{20}
Forage Fish	*Pimephales promelas*	1.0	0.1	Henderson *et al*, 1981	48-hr LOEL based on deformities in fish eggs; the TRV was derived by dividing the LOEL by a factor of 10.
Amphibians and Reptiles	*Ambystoma opercum*	2.3	0.23	Harfenist *et al.*, 1989	96-hr LC_{50}; derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and EC_{20}

Aquatic Receptor	Iron (mg/L)				
	Test Species	**LC/EC_{50}**	**Toxicity Reference Value**	**Reference**	**Comments**
Aquatic Plants	--	--	--	--	--
Phytoplankton	--	--	--	--	--
Benthic Invertebrates	--	--	--	--	--
Zooplankton	*Daphnia* sp.	5.9	1.48	Biesinger and Christensen (1972)	from CCME (1995); LC_{50} (mortality) 3-week; derived TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}.
Predatory Fish	Brook Trout	--	7.5	Sykora *et al.* (1972), Smith *et al.* (1973)	from CCME (1995); safe concentration based on mortality of juveniles
Forage Fish	Fathead minnow	1.5	0.75	Sykora *et al.* (1972)	from CCME (1995); EC_{50} based on 50% reduction in hatchability of fathead minnow eggs; derived EC_{25} by linear extrapolation
Amphibians and Reptiles	*Rana hexadactyla*	17.62	4.41	Khangarot, B.S. *et al.* (1985)	From U.S. EPA AQUIRE: 4-d LC_{50} based on tadpoles; derived TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}.

Aquatic Receptor	Manganese (mg/L)				
	Test Species	**LC/EC_{50}**	**Toxicity Reference Value**	**Reference**	**Comments**
Aquatic Plants	*Lemna minor*	31	15.5	Wang (1986)	from U.S. EPA AQUIRE; 4-d EC_{50} (growth); derived EC_{25} by linear extrapolation
Phytoplankton	*Spirostomum ambiguum*	92.8	46.4	Nalecz-Jawecki and Sawicki (1998)	from U.S. EPA AQUIRE; 24-hr EC_{50} (deformation); derived EC_{25} by linear extrapolation
Benthic Invertebrates	*Dugesia gonocephala*	46	46	Palladini *et al.* (1980)	from U.S. EPA AQUIRE; 8-d NOEC (locomotion)
Zooplankton	*Daphnia magna*	4.7	2.35	Baird *et al.* (1991)	lowest value from U.S. EPA AQUIRE; 48-hr EC_{50} (immobility); derived EC_{25} by linear extrapolation
Predator Fish	Rainbow Trout	2.91	0.73	Birge (1978)	lowest value from U.S. EPA AQUIRE; 28-d LC_{50} (mortality); derived TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}
Forage Fish	Goldfish	8.22	2.06	Birge (1978)	from U.S. EPA AQUIRE; 7-d LC_{50} (mortality); derived TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}
Amphibians and Reptiles	*Gastrophryne carolinensis*	1.42	0.355	Birge *et al.* (1979)	7 day LC_{50} based on reproductive endpoints; TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}

Aquatic Receptor	Strontium (mg/L)				
	Test Species	**LC/EC_{50}**	**Toxicity Reference Value**	**Reference**	**Comments**
Aquatic Plants	--	--	--	--	no data available
Phytoplankton	*Chlorella vulgaris*		150	Den Dooren de Jong (1965)	from U.S. EPA AQUIRE; LOEC (general population changes)
Benthic Invertebrates	*Biomphalaria glabrata*	--	10	Harry and Aldrich (1963)	from U.S. EPA AQUIRE; observed stress in snails, endpoint not reported but value is lower than other chronic values so is treated as a chronic EC value
Zooplankton	*Daphnia sp.*	--	42	Biesinger and Christensen (1972)	from Suter and Tsao (1996); results from a 21-d test resulting in 16% reproductive impairment
Predatory Fish	Striped bass	92.8	9.3	Dwyer *et al.* (1992)	from U.S. EPA AQUIRE; LC_{50} 96-h; derived TRV using a factor of 10 based on an empirical relationship between an acute LC_{50} and an EC_{20}
Forage Fish	Goldfish	8.5	4.3	Birge (1978)	from U.S. EPA AQUIRE; LC_{50} 7-d; derived an EC_{25} by linear extrapolation
Amphibians and Reptiles	*Gastrophryne carolinensis*	0.04	0.01	Birge *et al.* (1979)	7 day LC_{50} based on reproductive endpoints; TRV using a factor of 4 based on an empirical relationship between a chronic LC_{50} and an EC_{20}

Aquatic Receptor	Zirconium (mg/L)				
	Test Species	**LC/EC_{50}**	**Toxicity Reference Value**	**Reference**	**Comments**
Amphibians and Reptiles	Tadpole	Not reported	1.226	Sanville *et al.* (1982)	From U.S. EPA AQUIRE; unreported endpoint and effect after 609 days of exposure in a field setting; no adjustment

4.3.1.4 Sediment Toxicity Benchmarks

Sediment toxicity evaluations involve comparison of measured or predicted levels of constituents of potential concern in sediments to sediment quality guidelines. Canadian Federal guidelines for sediment quality are derived by the Canadian Council of Ministers of the Environment (CCME 2003, 2007). Some provinces, including Ontario, also establish Provincial guidelines. In Ontario, Provincial guidelines for sediment quality are derived by the Ministry of the Environment (MOE) (MOE 2008a). In addition to Federal and Provincial guidelines, sediment quality guidelines have also been derived by Thompson *et al.* (2005) for application to uranium mining areas, and have been adopted by the Canadian Nuclear Safety Commission (CNSC). These guidelines include a greater number of constituents than the CCME guidelines. Table 4.3-4 summarizes relevant sediment quality guidelines for the COPC selected in this assessment.

The national CCME guidelines provide what are designated as Interim Sediment Quality Guidelines (ISQGs) and Probable Effect Levels (PELs). The ISQG for a chemical represents the concentration below which adverse biological effects are expected to occur rarely (i.e., fewer than approximately 25% of adverse effects records occur below the ISQG) (CCME 2003, 2007). The PEL for a chemical defines the level above which adverse effects are expected to occur frequently (i.e., more than approximately 50% of adverse effects records occur above the PEL). The CCME notes that the use of sediment quality guidelines (ISQGs) to the exclusion of other information (such as background concentrations of naturally occurring substances and biological tests) can lead to erroneous conclusions about the likelihood of biological effects.

The Ontario MOE (2008a) provides two levels of sediment quality guidelines. The Lowest Effect Level (LEL) indicates a level of sediment contamination that can be tolerated by the majority of benthic organisms. This level has been adopted as the sediment standard by the MOE (2004). The 2008 document also provides a Severe Effect Level (SEL), which is defined as the level at which pronounced disturbance of the sediment-dwelling community can be expected. The LELs and SELs are derived using the Screening Level Concentration (SLC) approach which involves review of sediment quality data for samples that cover a full range of concentrations for the chemical of interest, from no-effect levels for sensitive species to effect levels for tolerant species. For each species, the subset of samples with the species present is found, and the 90th percentile concentration of that data set is determined. This is considered to be the threshold level for effects on the species (the species SLC). Then the 5th percentile of the distribution of species SLCs is determined. This LEL value estimates the concentration that can be tolerated by 95% of the species considered. The SEL is determined as the 95th percentile of the same distribution.

The MOE advises that further investigation using biomonitoring or toxicity testing is appropriate to resolve questions of biological effect when LEL values are exceeded.

Thompson *et al.* (2005) used the Screening Level Concentration (SLC) approach to derive Lowest Effect Level (LEL) and Severe Effect Level (SEL) concentrations for nine metals and metalloids (arsenic, chromium, copper, lead, molybdenum, nickel, selenium, uranium and vanadium) which are naturally occurring substances often released to the aquatic environment during the mining and milling of uranium ore. The data were collected in uranium ore-bearing regions of northern Saskatchewan and Ontario where most Canadian decommissioned or operating uranium mines and mills are located.

Two statistical methods were used by Thompson *et al.* (2005) to define the percentiles corresponding to LEL and SEL. A "weighted method" produced somewhat higher values than a "closest observation method". When the predictive ability of the sediment quality guidelines was assessed, all of the LELs derived using the weighted method, with the exception of the chromium LEL, were found to be highly reliable (>85% accuracy) in predicting sites unimpacted by uranium mining/milling.

The PEL values from the CCME and the SEL values from the MOE and Thompson et al (2005) were used in this assessment.

Table 4.3-4 Sediment Quality Guidelines

COPC	CCME [1]		Thompson *et al.* [2]		MOE [3]	
	ISQG	PEL	LEL	SEL	LEL	SEL
Cadmium	0.6	3.5	-	-	0.6	10
Copper	35.7	197	22.2	268.8	16	110
Lead	35.0	91.3	36.7	412.4	31	250
Selenium	-	-	1.9	16.1	-	-

Notes:
Guidelines are reported in mg/kg dry weight.
[1] Canadian Council of Ministers of the Environment – Canadian Sediment Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME 1999; updated September 2007).
[2] Thompson, P.A., J. Kurias and S. Mihok (2005) – Sediment quality guidelines derived for application to uranium ore bearing regions of northern Saskatchewan and Ontario; the LEL and SEL values shown have been derived using the "weighted method".
[3] Ontario Ministry of the Environment (2008a) – Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario: An Integrated Approach. May.
ISQG – Interim Sediment Quality Guideline; PEL – Probable Effect Level; LEL – Lowest Effect Level; SEL – Severe Effect Level.

4.3.2 Radiological Assessment Reference Dose Rates

The radiological assessment methodology for ecological receptors takes into account the radiation dose received from various pathways including ingestion of food, water, sediments or soil. The assessment of potential effects on ecological species involves comparison of dose estimates to reference values reported by the CNSC and other scientific bodies. The radiation dose benchmarks selected for the ERA are discussed below.

4.3.2.1 Radiation Dose Benchmarks for Aquatic Organisms

For radioactivity, the International Atomic Energy Agency (IAEA 1992) suggests a dose rate of 10 mGy/d as the reference dose level below which population effects to aquatic biota would not be expected (IAEA 1992). This value is also suggested in UNSCEAR (1996). These benchmarks are widely utilized by national agencies responsible for radiological protection (e.g. U.S. DOE, 2002). An EC/HC (2003) priority substance assessment has used taxon-specific benchmarks that are generally in the 1-10 mGy/d range. The following paragraphs outline the ongoing debate on the appropriate dose rate limit to use in ecological risk assessments.

The NCRP (National Council on Radiation Protection and Measurements) in Report 109 (NCRP 1991) recommends 0.4 mGy/h (9.6 mGy/d) for the protection of aquatic biota. The NCRP state that a chronic dose rate of no more than 0.4 mGy/h (9.6 mGy/d) to the maximally exposed individual in a population would ensure protection of the population. The NCRP report also includes recommendations that if modelling and/or dosimetric measurements indicate a dose level of 0.1 mGy/h (2.4 mGy/d), then a more detailed evaluation of the potential ecological consequences to the endemic population should be conducted. The 1992 review by the IAEA (Technical Report No. 332) also concluded that limiting the dose rate to individuals in an aquatic population to a maximum of 10 mGy/d would provide adequate protection for the population.

A number of reviews on the effects of radiation on aquatic organisms were published prior to the publication of NCRP 109 (Anderson and Harrison 1966; Polikarpov 1966; Templeton *et al*. 1971; Chipman 1972; IAEA 1976; Blaylock and Trabalka 1978; Egami 1980; NRCC 1983; Woodhead 1984). In those reviews, deleterious effects of chronic irradiation were not observed in natural populations at dose rates of 0.4 mGy/h (9.6 mGy/d) or less, over the entire history of exposure to ionizing radiation. Taking into consideration the combined results from laboratory and field studies, it appears that reproductive and early developmental systems of vertebrates are most sensitive to chronic irradiation in both aquatic and terrestrial environments. Invertebrates appear to be relatively radioresistant. Effects on aquatic organisms, not necessarily detrimental when evaluated in the context of population dynamics, were detected at dose rates in the range of 1 to 10 mGy/d.

The U.S. DOE (2000) concluded that applying the aquatic reference dose rates suggested by the NCRP (1991) and IAEA (1992) would ensure protection of aquatic populations. UNSCEAR

(1996) suggests that chronic dose rates of up to 400 µGy/h (10 mGy/d) to individuals in aquatic populations are unlikely to have a detrimental effect at the population level.

The CNSC has recommended that a reference dose rate of 0.6 mGy/d be used for fish, a value of 3 mGy/d be used for aquatic plants (algae and macrophytes) and a value of 6 mGy/d be applied for benthic invertebrates (Bird *et al*. 2002; EC/HC 2003). The reference dose rate for fish was based on a reproductive effects study in carp in the Chernobyl cooling pond (Makeyeva *et al.,* 1995). A value of 0.6 mGy/d was found to be in the range where both effects and no effects were observed. The aquatic plant benchmark was based on information related to terrestrial plants (conifers), which are considered to be sensitive to the effects of radiation. Reproductive effects in polychaete worms were used to derive the dose limit for benthic invertebrates. For amphibians, the CNSC recommends a value of 3mGy/d.

The European Group known as Protection of the Environment from Ionising Radiation in a Regulatory Context (PROTECT 2008) has provided a deliverable on numeric benchmarks where they recommended the use of the species sensitivity distribution approach (SSD) to develop numeric benchmark values and suggested "*The application of a generic screening value of 10 µGy h^{-1} until sufficiently robust organism group values can be generated.*" In developing the screening value, PROTECT use (an arbitrary) application factor to account for uncertainties. PROTECT goes on to indicate that the screening level is not proposed as a prescriptive limit which must not be exceeded, but rather a value suggestive of a more refined assessment.

The forthcoming UNSCEAR Annex reviewed available information on "*The Effects of Ionizing Radiation on Non-Human Biota*" (UNSCEAR 2008), including the SSD method which was developed for the European ERICA Project, and concluded that at the ecosystem level, the ERICA Integrated Approach screening dose rate value lies in the dose range giving rise to minor effects and that such effects are not expected to be directly relevant at higher organizational levels, such as the structure and functioning of ecosystems. As noted by UNSCEAR, this view is consistent with that of FASSET, a predecessor to ERICA. FASSET, reviewed the same data available to the ERICA project and concluded that the information available on the effects of radiation on non-human biota from low dose rates (less than about 100 µGy/h or 2.4 mGy/d) for continuous irradiation is reasonable for both plants and animals and that for chronic exposure conditions "*the reviewed effects data give few indications for readily observable effects at chronic dose rates below 100 µGy h^{-1}*". However, it was advised that "*using this information for establishing environmentally 'safe levels' of radiation should be done with caution, considering that the database contains large information gaps for environmentally relevant dose rates and ecologically important wildlife groups"*

In its review of the SSD method espoused by PROTECT, UNSCEAR (2008) concluded that at this time, limited data are available for application of such methods but acknowledged that as new effects information become available in the future, the application of analyses such as the SSD method will facilitate future re-evaluations of effects of ionizing radiation on non-human biota. Overall, UNSCEAR (2008) concluded that chronic dose rates of less than 100 µGy/h (2.4 mGy/d) to the most highly exposed individuals would be unlikely to have significant effects on most terrestrial communities and that maximum dose rates of 400 µGy/h (10 mGy/d) to any individual in aquatic populations of organisms would be unlikely to have any detrimental effect at the population level.

As indicated by the brief reviews of the literature cited above, the selection of reference dose levels for aquatic biota is a topic of ongoing discussion. Based on the reviews, the dose rate limits for aquatic biota that are recommended for assessment use are summarized below in Table 4.3-5. In this evaluation the lowest reference dose rates as prescribed by the CNSC are used. The use of these limits will tend to overestimate the potential risks.

Table 4.3-5 Selected Reference Dose Rates for Aquatic Organisms

Aquatic Organism	Reference Dose Rate
Aquatic plants (algae and macrophytes)	3 mGy/d and 10 mGy/d
Benthic invertebrates	6 mGy/d and 10 mGy/d
Fish	0.6 mGy/d and 10 mGy/d
Amphibians (Reptiles)	3 mGy/d

4.3.2.2 Radiation Dose Benchmarks for Terrestrial Organisms

A reference dose rate of 1 mGy/d is generally used as an acceptable level for terrestrial biota. In 1992, the IAEA (1992) published the results of an assessment of the effects of acute and chronic radiation on terrestrial populations and communities. They reached several general conclusions regarding chronic radiation: reproduction is likely to be the most limiting endpoint in terms of population maintenance, and irradiation at chronic dose rates of 1 mGy/d or less does not appear likely to cause observable changes in terrestrial animal populations. Also, they concluded that irradiation at chronic dose rates of 10 mGy/d or less does not appear likely to cause observable changes in terrestrial plant populations. However, reproductive effects in long-lived species with low reproductive capacity may require further consideration. The U.S. DOE (2000) has suggested that applying the terrestrial reference dose rates suggested by IAEA (1992) would be protective of terrestrial species populations. UNSCEAR (1996) suggests that chronic dose rates below 400 µGy/h (10 mGy/d) would not likely produce any significant effects in natural plant communities; that for terrestrial mammals, dose rates below 400 µGy/h (10 mGy/d) to the most exposed animal are unlikely to affect mortality in the population and that dose rates below 40 µGy/h (1 mGy/d) are unlikely to cause a loss of reproductive capacity.

The CNSC has provided a reference dose rate of 3 mGy/d for small mammals and terrestrial plants (Bird *et al*. 2002; EC/HC 2003). This reference dose rate is based on reproductive endpoints for small mammals. In the absence of data for avian species, the CNSC suggest that the reference dose rate for small mammals should also apply.

From the above discussion, it is recognized that the selection of reference dose rates for terrestrial biota is a topic of ongoing debate. Based on the reviews, the reference dose rates for terrestrial biota that are recommended for use in the assessment are summarized below in Table

4.3-6. In this evaluation, the lowest reference dose rates as prescribed by the IAEA are used. The use of these limits will tend to overestimate the potential risks.

Table 4.3-6 Selected Reference Dose Rates for Terrestrial Organisms

Terrestrial Organism	Dose Rate Limit
Terrestrial biota (Birds and mammals)	1 mGy/d and 3 mGy/d

4.3.2.3 Relative Biological Effectiveness Factors

Radiation effects on biota depend not only on the absorbed dose, but also on the relative biological effectiveness (RBE) of the particular radiation (i.e. alpha, beta or gamma radiation). For example, alpha particles can produce observable damage at lower absorbed doses than gamma radiation. Thus, in order to estimate the potential harm to non-human biota from a given absorbed dose, the absorbed dose is multiplied by an appropriate radiation weighting factor. This in turn is derived from experimentally determined RBE. In this report, the terms "RBE" and "radiation weighting factor" are used interchangeably. For this report, the issue of RBE is primarily of interest for tritium taken into an organism.

From a review of 33 studies on tritium RBE, Straume and Carsten (1993) estimated arithmetic mean RBEs of 1.8 based on X- rays as the reference radiation, and 2.3 with Cs-137 or Co-60 gamma rays as the reference radiation. (This means that the biological effects of tritium were 1.8 to 2.3 larger than the effects of X-rays or gamma radiation, for the same absorbed dose.) As part of a recent report of the UK Health Protection Agency (HPA) (2007) on tritium, RBE studies and risks from tritium were reviewed along with a wide variety of experimental studies using X-rays and gamma rays as reference radiations. These authors note that RBEs generally range from 1 to 2 when compared to X-rays and from 2 to 3 when compared with gamma rays (HPA 2007). Little and Lambert (2008) have also reviewed the experimental studies of cancer, chromosomal aberration, cell death and various other end points and arrive at similar conclusions for the RBE of tritium in water.

FASSET (2003), in commenting on RBE, suggested that in order to illustrate the effect of RBE on internally deposited radionuclides the use of an RBE of 3 for low energy beta radiation energies < 10 keV (tritium for example), and 1 for both beta radiation with energies greater than 10 keV and for gamma radiation.

The ICRP in commenting on the RBE for tritium, indicated that given all the uncertainties in theoretical and practical experiments and the fact that an internal dose calculation inherently holds at best a factor of 2 error associated with it, there is insufficient reasons to double the RBE for tritium appear to be insufficient at this time (ICRP 2008).

For the assessment described in this report, an RBE of 3 has been assumed for internally deposited tritium. Based on the foregoing discussion, this may result in an overestimate of the dose accruing to an organism from internally deposited tritium.

4.4 Risk Characterization

The risk characterization phase combines the information gathered in the exposure and hazard assessment phases and characterises the potential for adverse ecological effects. This section will discuss the risk characterization for conventional COPCs and radiological COPCs for the existing environment.

4.4.1 Evaluation of Risks for Conventional COPC

Potential adverse effects on ecological receptors were examined by using a simple screening index value approach. In the aquatic environment, the screening index value was determined by comparing the reasonable maximum measured water and sediment concentrations to aquatic and sediment toxicity reference values. In the terrestrial environment, predicted intakes for various ecological receptors were compared to the respective toxicity reference values to derive a screening index value. Screening index values provide an integrated description of the potential hazard, the exposure (or dose) response relationship and the exposure evaluation (U.S. EPA 1992, AIHC 1992).

Screening index values provide an integrated description of the potential hazard, the exposure (or dose) -response relationship, and the exposure evaluation (U.S. EPA 1992, AIHC 1992). In this study, potential adverse ecological effects from exposure to COPC were characterised by the value of a simple screening index. This index was calculated by dividing the expected exposure concentration by the toxicity reference value for each ecological receptor, as shown in equation (4-2).

$$Screening\ Index = \frac{Exposure}{Toxicity\ Reference\ Value} \tag{4-2}$$

The screening index values reported in this section are not estimates of the probability of ecological impact. Rather, the index values are positively correlated with the potential of an effect, i.e., higher index values imply greater potential of an effect. Different magnitudes of the screening index have been used in other studies to screen for potential ecological effects. A screening index value of 1.0 has typically been used in ecological risk assessments (e.g., Suter 1991). In other work, Cadwell *et al.* (1993) suggested an index value of 0.3, based upon a conservative approach designed to account for potential chronic toxicity and chemical synergism; in addition, a screening index value of 0.3 is used if all the exposure pathways are not considered. In this study, an index value of 1.0 was used to examine the impacts of COPC for aquatic receptors and for terrestrial receptors because background levels and all significant pathways are incorporated within the calculations.

4.4.1.1 Evaluation of Potential Risks in the Aquatic Environment

This section discusses the results of the evaluation of potential risks in the aquatic environment. The risks, as represented by a screening index value, are calculated by the ratio between the measured water concentration and the TRV for a given aquatic ecological receptor. Lake Ontario and Coots Pond were the only waterbodies that can support a wide range of aquatic ecological receptors and therefore these two waterbodies were evaluated from an aquatic perspective. Table 4.4-1 provides the screening index values for Lake Ontario. As discussed in Section 4.1-1, hydrazine was the only COPC selected in Lake Ontario since all concentrations were measured at the method detection limit (MDL) which was above a NOAEL value for fat head minnow eggs. Table 4.4-1 demonstrates that the hydrazine concentrations at the MDL are below the aquatic TRVs (in general EC_{20} values) that were selected for this assessment; thus, hydrazine concentrations measured at the MDL in Lake Ontario are not a cause for concern in the existing environment.

Table 4.4-1 Summary of Aquatic Screening Index Values for Lake Ontario

COPC and Aquatic Receptor	Aquatic Toxicity Reference Value (mg/L)	Maximum Concentration (mg/L)	Screening Index Values
Hydrazine			
Aquatic Plants	-	0.005	-
Phytoplankton	1	0.005	0.005
Benthic Invertebrates	0.92	0.005	0.005
Zooplankton	-	0.005	-
Predator Fish	0.36	0.005	0.014
Forage Fish	0.1	0.005	0.050

Table 4.4-2 provides the screening index values for Coots Pond. As discussed in Section 4.1.1, 7 COPC were selected in Coots Pond (boron, cobalt, iron, hydrazine (measured at the MDL), manganese and strontium). Table 4.4-2 indicates that SI values are below 1 for aquatic receptors in the existing environment for exposures to boron, cobalt, hydrazine, manganese and strontium in Coots Pond. Therefore, there are no risks to aquatic receptors for these COPC present in Coots Pond.

Table 4.4-2 Summary of Aquatic Screening Index Values for Polygon AB – Coots Pond

COPC and Aquatic Receptor	Aquatic Toxicity Reference Value (mg/L)	Maximum Concentration (mg/L)	Screening Index Values
Boron			
Aquatic Plants	20	0.53	0.026
Phytoplankton	0.58	0.53	0.91
Benthic Invertebrates	137.6	0.53	0.0038
Zooplankton	14.1	0.53	0.037
Forage Fish	45*	0.53	0.012*
Cobalt			
Aquatic Plants	-	0.0036	-
Phytoplankton	0.27	0.0036	0.014
Benthic Invertebrates	1.6	0.0036	0.002
Zooplankton	0.005	0.0036	0.729
Forage Fish	0.2	0.0036	0.018
Hydrazine			
Aquatic Plants	-	0.005	-
Phytoplankton	1	0.005	0.005
Benthic Invertebrates	0.92	0.005	0.005
Zooplankton	-	0.005	-
Forage Fish	0.1	0.005	0.050
Iron			
Aquatic Plants	-	1.31	-
Phytoplankton	-	1.31	-
Benthic Invertebrates	-	1.31	-
Zooplankton	1.48	1.31	0.88
Forage Fish	0.75	1.31	**1.7**
Manganese			
Aquatic Plants	15.5	0.068	0.0044
Phytoplankton	46.4	0.068	0.0015
Benthic Invertebrates	46	0.068	0.0015
Zooplankton	2.35	0.068	0.029
Forage Fish	2.06	0.068	0.033
Strontium			
Aquatic Plants	-	0.73	-
Phytoplankton	150	0.73	0.0049
Benthic Invertebrates	10	0.73	0.073
Zooplankton	42	0.73	0.0175
Forage Fish	4.3	0.73	0.171

Note: Values in bold and shade exceed an SI value of 1
* For boron the TRV for predator fish has been used as a surrogate for forage fish due to a lack of data

For iron, the SI value for forage fish in Coots Pond in Polygon AB is above a value of 1 (SI = 1.7). Coots Pond is not hydraulically linked to Lake Ontario and therefore no fish should be present in this waterbody. However, the Aquatic Environment Technical Support Document (TSD) indicates that the Northern Redbelly Dace which is a forage fish is found in large congregations in Coots Pond. It is unclear as to the source of the elevated of iron in Coots Pond as it is not the result of emissions from the Darlington station; however, Coots Pond was constructed as a storm water management pond for the construction landfill at the Darlington station and thus the presence of iron may be as a result of construction debris placed in the landfill. The site-specific field data indicates that there are large numbers of forage fish in Coots Pond and therefore indicates that the use of the non-site specific literature TRV for forage fish is predicting the potential for effects that are not being observed. Based on the weight-of-evidence from the field surveys, there are no risks to aquatic species in Coots Pond.

4.4.1.2 Evaluation of Potential Risks in the Sediment Environment

This section discusses the results of the evaluation of potential risks in the sediment environment in Lake Ontario and Coots Pond in Polygon AB. Table 4.4-3 provides the screening index values for sediments in Lake Ontario. As discussed in Section 4.1-1, cadmium, copper, lead and selenium were the COPC selected in sediments in Lake Ontario. As seen in Table 4.4-3, the SI values are all below a value of 1 compared to an effects level concentration (probable effects level (PEL) or severe effects level (SEL)) and therefore, adverse effects on benthic invertebrates in the sediments in Lake Ontario are not expected.

Table 4.4-3 Summary of Sediment Screening Index Values for Lake Ontario

COPC, Source and Type of Sediment Toxicity Benchmark		Sediment Toxicity Benchmark (µg/g)	Maximum Concentration (µg/g)	Screening Index Values
Cadmium				
CCME 2007	PEL	3.5	1.3	0.37
MOE 2008a	SEL	10	1.3	0.13
Copper				
CCME 2007	PEL	197	44.6	0.23
MOE 2008a	SEL	110	44.6	0.41
Thompson *et al.* 2005	SEL	268.8	44.6	0.17
Lead				
CCME 2007	PEL	91.3	39.2	0.43
MOE 2008a	SEL	250	39.2	0.16
Thompson *et al.* 2005	SEL	412.4	39.2	0.10
Selenium				
Thompson *et al.* 2005	SEL	16.1	2.04	0.13

Note: PEL – Probable Effects Level; SEL – Severe Effects Level

Table 4.4-4 provides the screening index values for Coots Pond. As discussed in Section 4.2-2, copper is the only COPC selected in sediments in Coots Pond. As seen in Table 4.4-4, the SI values are all below a value of 1 compared to an effects level concentration (probable effects level (PEL) or severe effects level (SEL)) and therefore, adverse effects on benthic invertebrates in the sediments in Coots Pond due to copper exposure are not expected.

Table 4.4-4 Summary of Sediment Screening Index Values for Polygon AB – Coots Pond

COPC, Source and Type of Sediment Toxicity Benchmark		Sediment Toxicity Benchmark (µg/g)	Maximum Concentration (µg/g)	Screening Index Values
Copper				
CCME 2007	PEL	197	26.9	0.14
MOE 2008a	SEL	110	26.9	0.24
Thompson *et al.* 2005	SEL	268.8	26.9	0.10

Note: PEL – Probable Effects Level; SEL – Severe Effects Level

4.4.1.3 Evaluation of Potential Risks for Amphibians and Reptiles

This section discusses the results of the evaluation of potential risks to amphibians and reptiles in Coots Pond and TreeFrog Pond. It was assumed that Lake Ontario would not have the appropriate habitat to support reptiles and amphibians and therefore these species were not considered in Lake Ontario. The calculations were based on a comparison of measured water concentrations to TRVs for amphibians and reptiles. As discussed in Section 4.1-1, the COPC selected in Coots Pond from the water screen were boron, cobalt, iron, hydrazine (measured at the MDL), manganese and strontium. Table 4.4-5 provides a summary of the Screening Index Values for amphibians and reptiles. There are only TRVs reported for amphibians and it was assumed that the TRVs for amphibians could be used as a surrogate for evaluating potential effects in reptiles.

As seen from Table 4.4-5, strontium concentrations result in SI values above 1 (SI = 73.4) for amphibians and reptiles in Coots Pond; however, it should be noted that the literature based TRV for amphibians is based on one study conducted in 1978 on Eastern Narrow Mouth toad eggs. The Eastern Narrow Mouth toad is only found in the Southern United States and the lower Midwest states. Thus, there is high uncertainty in the use of this TRV. It is unclear as to the source of the strontium in Coots Pond as it is not the result of emissions from the Darlington station; however, Coots Pond was constructed as a storm water management pond for the construction landfill at the Darlington station and thus the presence of strontium may be as a result of construction debris placed in the landfill. In addition, the Terrestrial Effects Assessment TSD provides a summary of site-specific field surveys on amphibians found in Coots Pond. The field surveys indicate that Coots Pond has been found to provide breeding grounds for six species of amphibians, including the Green frog, American toad, Northern Leopard frog, Wood frog, Western Chorus frog and Gray Tree frog. Therefore, based on the evidence from the site-specific field surveys it is unlikely that potential effects are occurring in populations of frogs present in Coots Pond.

Table 4.4-5 Summary of SI Values for Amphibians and Reptiles in Coots Pond

COPC	TRVs for Frog and Painted Turtle (mg/L)	Coots Pond – Polygon AB	
		Maximum Concentration (mg/L)	Screening Index Values
Boron	12.3	0.53	0.043
Cobalt	0.013	0.0036	0.28
Hydrazine	0.23	0.0025	0.011
Iron	4.41	1.31	0.30
Manganese	0.355	0.068	0.19
Strontium	0.01	0.73	**73.4**

Note: Values in bold and shade exceed an SI value of 1

Table 4.4-6 provides a summary of the Screening Index Values for amphibians and reptiles in Tree Frog Pond. Tree Frog Pond is a very small pond (approximately 20m by 40m) and will be in-filled for the NND Project. As seen from Table 4.4-6, manganese and strontium concentrations in Tree Frog Pond have SI values above 1. As discussed above the strontium TRV is highly uncertain, similarly the manganese TRV is from the same study on the Narrow Mouth toad eggs. In general, Tree Frog Pond has been found to provide breeding grounds for six species of amphibians, including the Green frog, American toad, Northern Leopard frog, Wood frog, Western Chorus frog and Gray Tree frog. In 2007, there was a drastic reduction in numbers of amphibians, but this was attributed to an exceptionally dry year that not only created suboptimal breeding conditions, but also caused Tree Frog pond to dry up completely. Given the small size of Tree Frog Pond, it is unlikely that populations of amphibians/reptiles will be adversely affected by the water quality in Tree Frog Pond.

Table 4.4-6 Summary of Screening Index Values for Amphibians and Reptiles in Polygon D – Tree Frog Pond

COPC	TRVs for Frog and Painted Turtle (mg/L)	Tree Frog Pond	
		Maximum Concentration (mg/L)	Screening Index Values
Boron	12.3	2.60	0.21
Cobalt	0.013	0.0050	0.39
Hydrazine	0.23	0.0025	0.011
Iron	4.41	3.85	0.87
Manganese	0.355	0.75	**2.1**
Strontium	0.01	0.26	**26.4**
Zirconium	1.226	0.023	0.02

Note: Values in bold and shade exceed an SI value of 1

4.4.1.4 Evaluation of Potential Risks for Terrestrial Ecological Receptors

The following tables (Tables 4.4-7 and 4.4-8) present the results for the terrestrial receptors in Polygon AB. There are two different types of terrestrial receptors considered in Polygon AB – receptors with a terrestrial based diet and receptors with an aquatic based diet. Terrestrial birds were not evaluated for exposure to strontium and zirconium since there were no TRV for avian species for these COPC. This adds some uncertainty to the assessment and is discussed in the Uncertainty Section (Section 6.1). Screening index values for ecological receptors with a terrestrial based diet are summarized in Table 4.4-7 and screening index values for terrestrial receptors with an aquatic based diet (i.e., waterfowl) are presented in Table 4.4-8. As discussed previously only strontium and zirconium were identified as COPC in the terrestrial environment. As seen from Table 4.4-7, no screening index values are above a value of 1 and thus exposure to strontium and zirconium in the terrestrial environment does not represent a risk to terrestrial based ecological receptors. Table 4.4-8 presents the results for the waterfowl present on Coots Pond. The COPC identified in the sediment screening process were evaluated for the assessment of waterfowl since the waterfowl are dabbling ducks and feed from the sediment. The SI values for the waterfowl are all below a value of 0.5. A value of 0.5 was selected since waterfowl are only expected to be in the study area for about 6 months of the year. Thus, there are no potential risks identified for waterfowl in Coots Pond.

Table 4.4-7 Summary of Screening Index Values for Terrestrial Ecological Receptors in Polygon AB

COPC	Eastern Cottontail	Deer Mouse	Meadow Vole	Muskrat	Raccoon	Red Fox	Short-tailed Weasel	White-tailed Deer
Strontium	0.04	0.06	0.06	0.23	0.04	<0.01	<0.01	0.02
Zirconium	0.21	0.25	0.14	0.05	0.23	0.03	0.19	0.04
SI Benchmark	1	1	1	1	1	1	1	1

Note: The SI values are based on the No Observable Adverse Effects Level (NOAEL)

Table 4.4-8 Summary of Screening Index Values for Waterfowl in Polygon AB – Coots Pond

Copper	Bufflehead	Pied-billed Grebe	Mallard
NOAEL	<0.01	0.01	<0.01
ENEV	0.02	0.03	<0.01
SI Benchmark	0.5	0.5	0.5

Note: The SI values are based on the No Observable Adverse Effects Level (NOAEL)

Table 4.4-9 presents the results for the terrestrial receptors in Polygon C. As seen from the table, no screening index values are above a value of 1 and thus exposure to strontium and zirconium in the terrestrial environment does not represent a risk to terrestrial based ecological receptors in this area.

Table 4.4-9 Summary of Screening Index Values for Terrestrial Ecological Receptors in Polygon C

COPC	Eastern Cottontail	Deer Mouse	Meadow Vole	Raccoon	Red Fox	Short-tailed Weasel	White-tailed Deer
Strontium	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01
Zirconium	0.18	0.11	0.10	0.20	0.02	0.19	0.03
SI Benchmark	1	1	1	1	1	1	1

Note: The SI values are based on the No Observable Adverse Effects Level (NOAEL)

Table 4.4-10 presents the results for the terrestrial receptors in Polygon D. Terrestrial receptors are assumed to drink water from Tree Frog Pond in Polygon D. As seen from the table, no screening index values are above a value of 1 and thus exposure to strontium and zirconium in the terrestrial environment does not represent a risk to terrestrial based ecological receptors in this area.

Table 4.4-10 Summary of Screening Index Values for Terrestrial Ecological Receptors in Polygon D

COPC	Eastern Cottontail	Deer Mouse	Meadow Vole	Raccoon	Red Fox	Short-tailed Weasel	White-tailed Deer
Strontium	0.03	0.03	0.03	0.02	<0.01	<0.01	0.01
Zirconium	0.20	0.97	0.12	0.41	0.03	0.20	0.03
SI Benchmark	1	1	1	1	1	1	1

Note: The SI values are based on the No Observable Adverse Effects Level (NOAEL)

Table 4.4-11 presents the results for the waterfowl present on Lake Ontario. As discussed above, the COPC identified in the sediment screen were evaluated for the assessment of waterfowl since the waterfowl are dabbling ducks and feed from the sediment. The SI values for the waterfowl are below a value of 0.5. A value of 0.5 was selected since waterfowl are only expected to be in the study area for about 6 months of the year. Thus, there are no potential risks identified for waterfowl in Lake Ontario.

Table 4.4-11 Summary of Screening Index Values for Waterfowl in Lake Ontario

COPC	Bufflehead	Pied-billed Grebe	Mallard
Cadmium	0.03	0.03	0.01
Copper	0.01	0.01	<0.01
Lead	0.26	0.14	0.09
Selenium	0.22	0.41	0.11
SI Benchmark	0.5	0.5	0.5

Note: The SI values are based on the No Observable Adverse Effects Level (NOAEL)

4.4.2 Evaluation of Risks for Radiological COPC

The Tier 2 analysis was based on maximum radiological concentrations measured within the air, soil, biota and water across the site as presented in Section 4.2.1. As indicated previously, the use of the measured concentrations tends to overestimate the doses associated with the existing conditions. Table 4.4-12 presents the results of the radiological doses and SI values for the maximum concentrations measured across the site. As shown in Table 4.4-12 all of the Screening Index Values for radioactive COPCs at maximum concentrations across the site are well below 1. Thus, for the radiological COPC, there are no ecological risks identified across the site for the existing conditions.

Table 4.4-12 Summary of Calculated Doses, in mGy/d for Ecological Receptors – Sitewide

Receptor Category	Indicator Species	Total Dose (all radionuclides & all pathways) (mGy/d)	Reference Dose Rate	SI
Summary of Calculated Doses, in mGy/d for Terrestrial Species				
Terrestrial Invertebrates	Earthworm (soil)	9.95×10^{-5}	1	<0.001
	Earthworm (gw)	3.02×10^{-5}	1	<0.001
Terrestrial Vegetation	Plants	2.12×10^{-4}	1	<0.001
Mammals	Red Fox	4.71×10^{-3}	1	0.0047
	Eastern Cottontail	4.26×10^{-4}	1	<0.001
	Meadow Vole	5.53×10^{-5}	1	<0.001
	Deer Mouse	4.53×10^{-5}	1	<0.001
	White-tailed Deer	1.80×10^{-3}	1	0.002
	Raccoon	1.59×10^{-3}	1	0.002
	Short-tailed Weasel	1.03×10^{-4}	1	<0.001
Birds	Yellow Warbler	1.64×10^{-5}	1	<0.001
	Song Sparrow	1.69×10^{-5}	1	<0.001
	Bank Swallow	1.69×10^{-5}	1	<0.001
	Red-eyed Vireo	1.70×10^{-5}	1	<0.001
	American Crow	2.76×10^{-5}	1	<0.001
	American Robin	2.49×10^{-5}	1	<0.001
Summary of Calculated Doses, in mGy/d for Aquatic Species – Coots Pond				
Fish	Forage Fish	6.28×10^{-4}	0.6	0.001
	Predator Fish	5.92×10^{-4}	0.6	<0.001
Benthic Invertebrates		5.42×10^{-4}	6	<0.001
Aquatic Vegetation		9.31×10^{-5}	3	<0.001
Amphibians	Midland Painted Turtle	1.10×10^{-4}	3	<0.001
	Frog	1.10×10^{-4}	3	<0.001
Aquatic Mammals	Muskrat	4.77×10^{-4}	1	<0.001
Aquatic Birds	Bufflehead	5.48×10^{-5}	1	<0.001
	Mallard	6.80×10^{-5}	1	<0.001
	Pied-Billed Grebe	7.08×10^{-5}	1	<0.001

Figure 4.4-1 provides a schematic representation of the Screening Index Values for the terrestrial ecological receptors with a terrestrial based diet across the site. As seen from the Figure, the Red

Fox has the highest SI value; however, the SI value is still well below a value of 1 (SI = 0.0047). Figure 4.4-2 provides a schematic representation of the contributions of the various radionuclides to the intake for the Red Fox. As seen from this figure, tritium followed by C-14 is responsible for the majority of the intakes for the Red Fox.

Figure 4.4-1 Screening Indices for Terrestrial Ecological Receptors – Sitewide

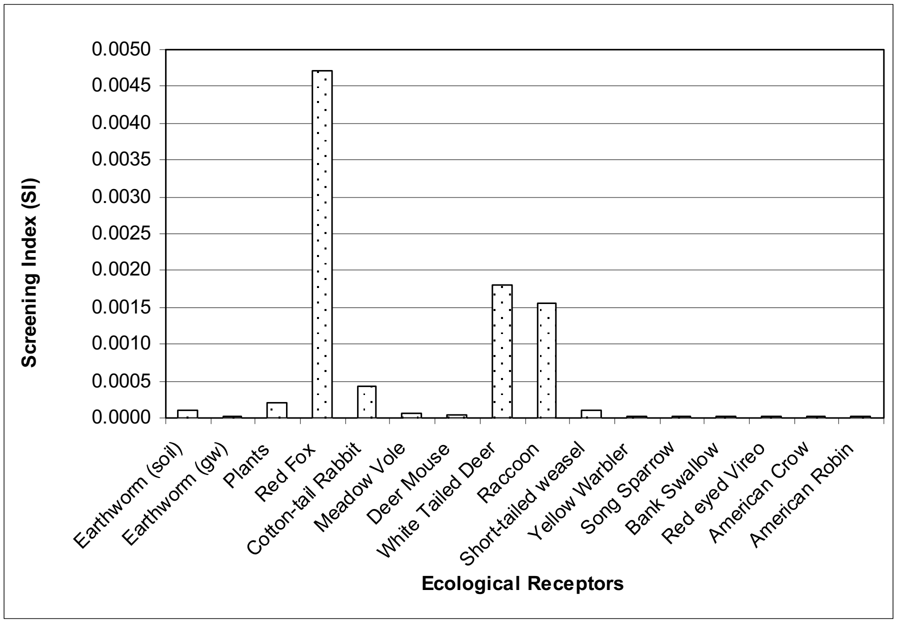


Figure 4.4-2 Schematic Representation of the Contribution to the Intake for the Red Fox – Total Intake (Bq/d)

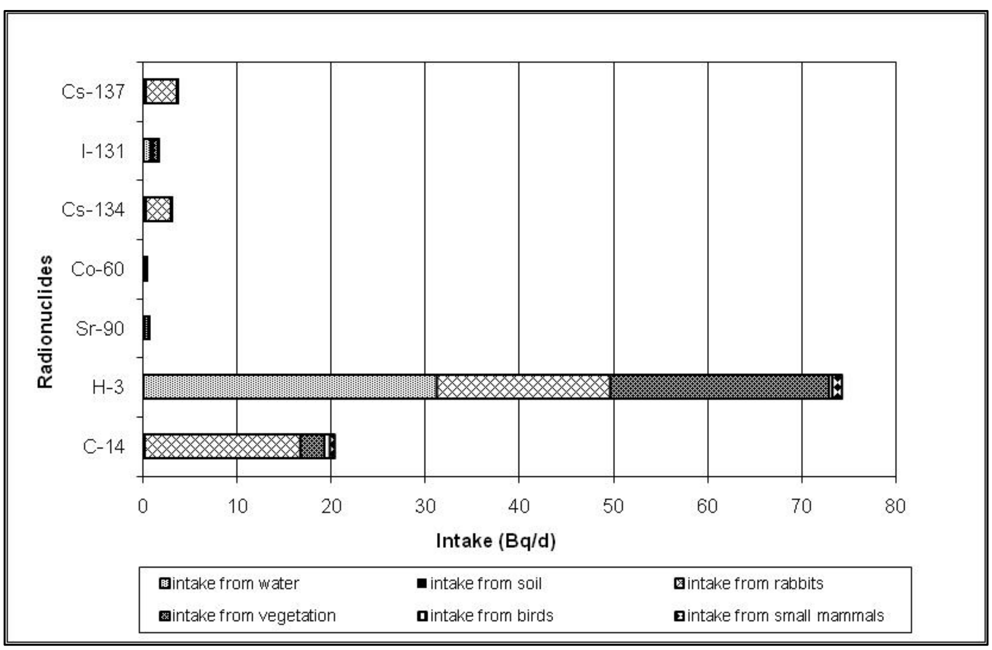


Figure 4.4-3 provides a schematic representation of the Screening Index Values for the aquatic receptors and the terrestrial ecological receptors with an aquatic based diet in Coots Pond. As seen from the figure, the SI values for forage fish are the highest (SI = 0.0011) for the aquatic receptors. It should be noted that this value is well below an SI value of 1. For the terrestrial receptors with an aquatic based diet, the muskrat has the highest SI value (SI = 0.0005), which is below the SI value for the forage fish. Figure 4.4-4 provides a schematic representation of the contributions of the various radionuclides to the total intake for the muskrat. As seen from this figure, tritium associated with the intake of aquatic plants and water is responsible for the majority of the intake for the muskrat.

In summary, given that the screening index values for the maximum radiological concentrations at the site are well below a value of 1, there are no ecological risk issues identified from radionuclides for existing conditions at the DN site.

Figure 4.4-3 Screening Indices for Aquatic Ecological Receptors and Terrestrial Receptors with an Aquatic Based Diet – Coots Pond

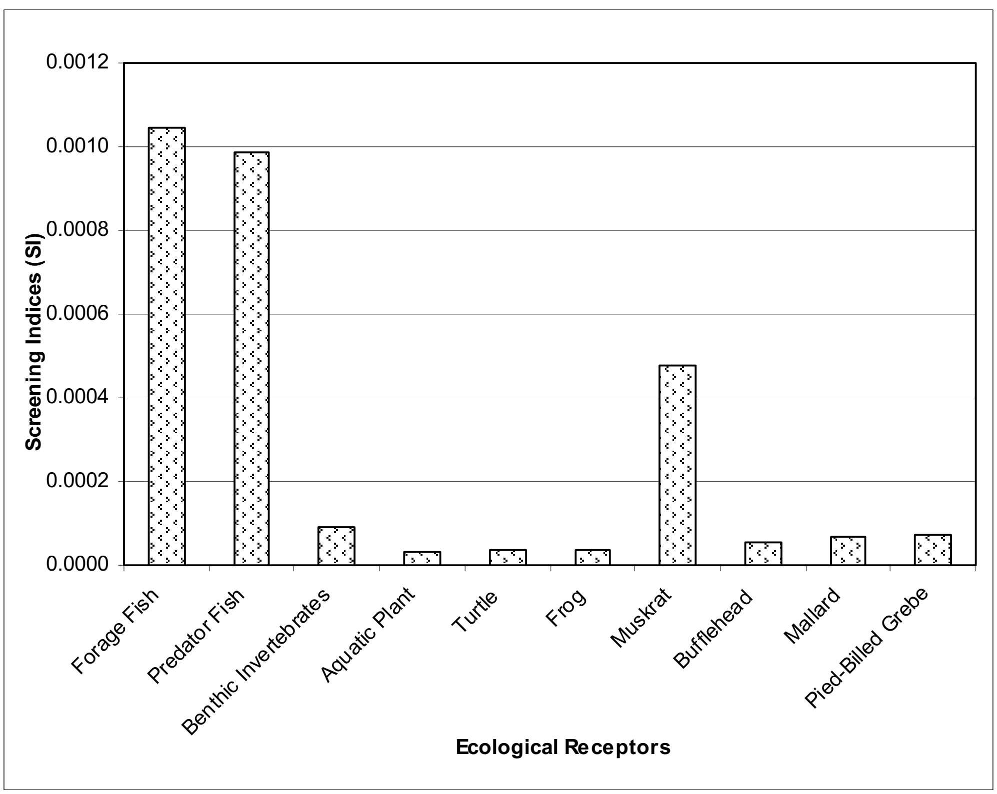


Figure 4.4-4 Schematic Representation of the Contribution to the Intake for the Muskrat – Coots Pond - Total Intake (Bq/d)

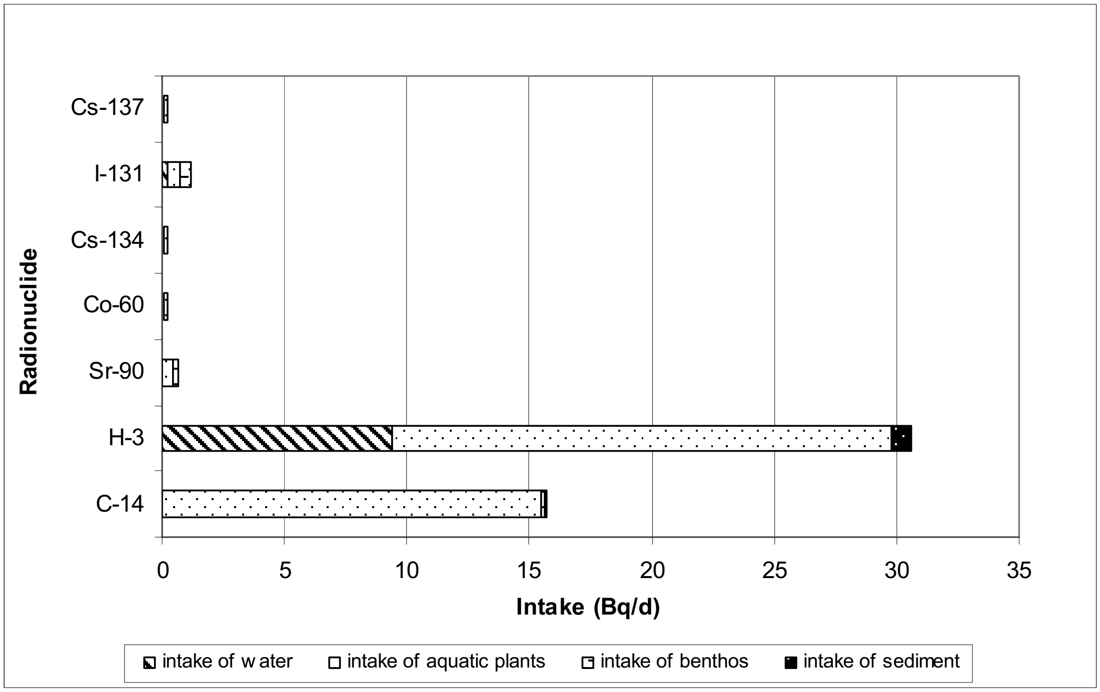


Table 4.4-13 provides a summary of the doses and SI values for ecological receptors in Lake Ontario. As seen from the table, all SI values are below a value of 1. Figure 4.4-5 provides a schematic representation of the Screening Index Values for the aquatic receptors and the terrestrial ecological receptors with an aquatic based diet in Lake Ontario. As seen from the Figure, the mallard has the highest SI values in Lake Ontario; however, the SI value is still well below a value of 1 (SI = 0.00007). Figure 4.4-6 provides a schematic representation of the contributions of the various radionuclides to the total intake for the mallard. As seen from this figure, I-131 associated with the consumption of benthic invertebrates, is responsible for the majority of the intake for the mallard in Lake Ontario. Carbon-14, tritium and Sr-90 also add to intake of mallard. In summary, there are no ecological risks to ecological receptors in Lake Ontario due to radionuclide COPC present in Lake Ontario.

Table 4.4-13 Summary of Calculated Doses, in mGy/d for Ecological Receptors – Lake Ontario

Ecological Receptor	Total Dose (mGy/d)	Reference Dose Rate (mGy/d)	SI
Forage Fish[1]	3.02×10^{-4}	0.6	<0.001
Predator Fish[1]	1.25×10^{-4}	0.6	<0.001
Benthic Invertebrates	5.47×10^{-4}	6	<0.001
Aquatic Plants	9.31×10^{-5}	3	<0.001
Mallard	6.82×10^{-5}	1	<0.001
Bufflehead	5.46×10^{-5}	1	<0.001
Pied-Billed Grebe[1]	4.95×10^{-5}	1	<0.001

[1] Values are based on maximum measured fish concentration in Site Study Area. One fish sample (Round Goby) recorded in the Regional Study Area had a tritium concentration of 52 Bq/kg. If this sample were used for the calculation, the doses would be:

a) Total dose to forage fish of 3.09×10^{-4} and 1.32×10^{-4} to predator fish;
b) Total dose to Pied-Billed Grebe of 4.98×10^{-5}

Figure 4.4-5 Screening Indices for Aquatic Ecological Receptors and Terrestrial Receptors with an Aquatic Based Diet – Lake Ontario

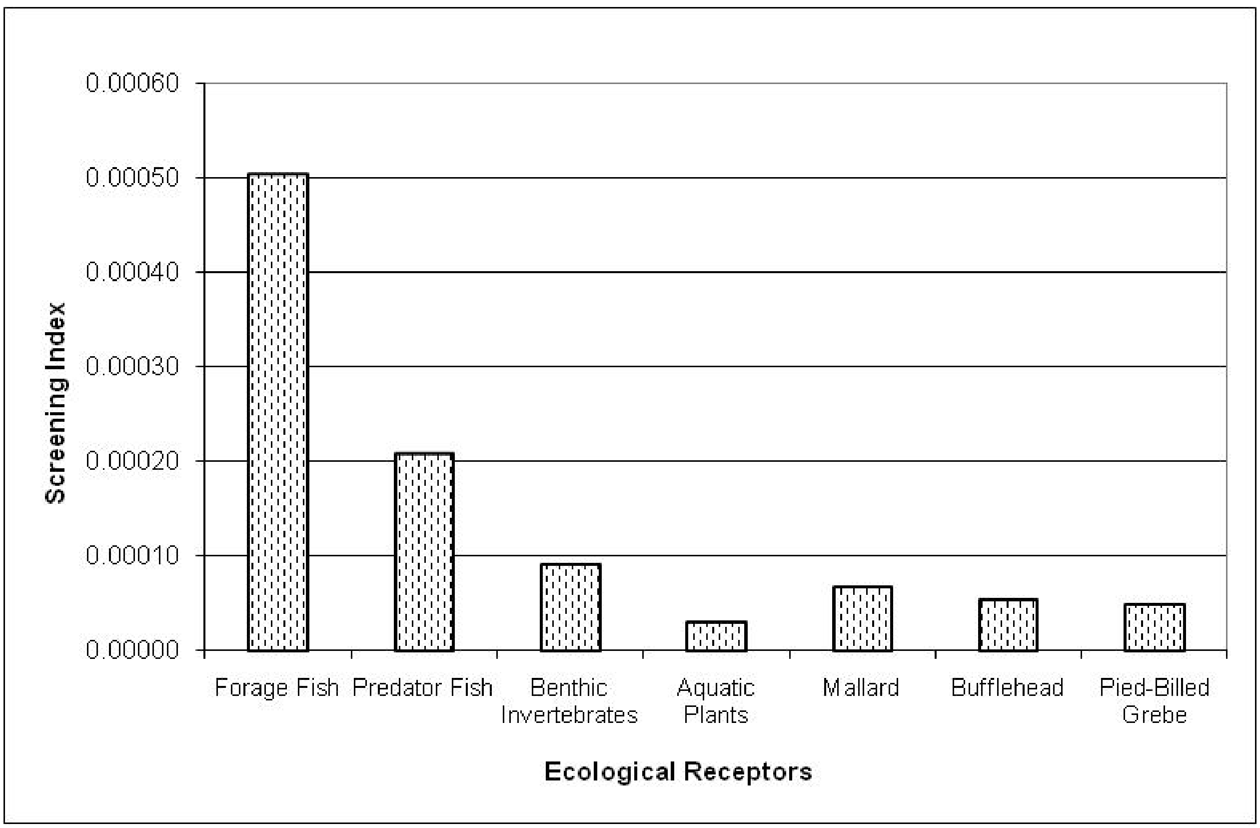
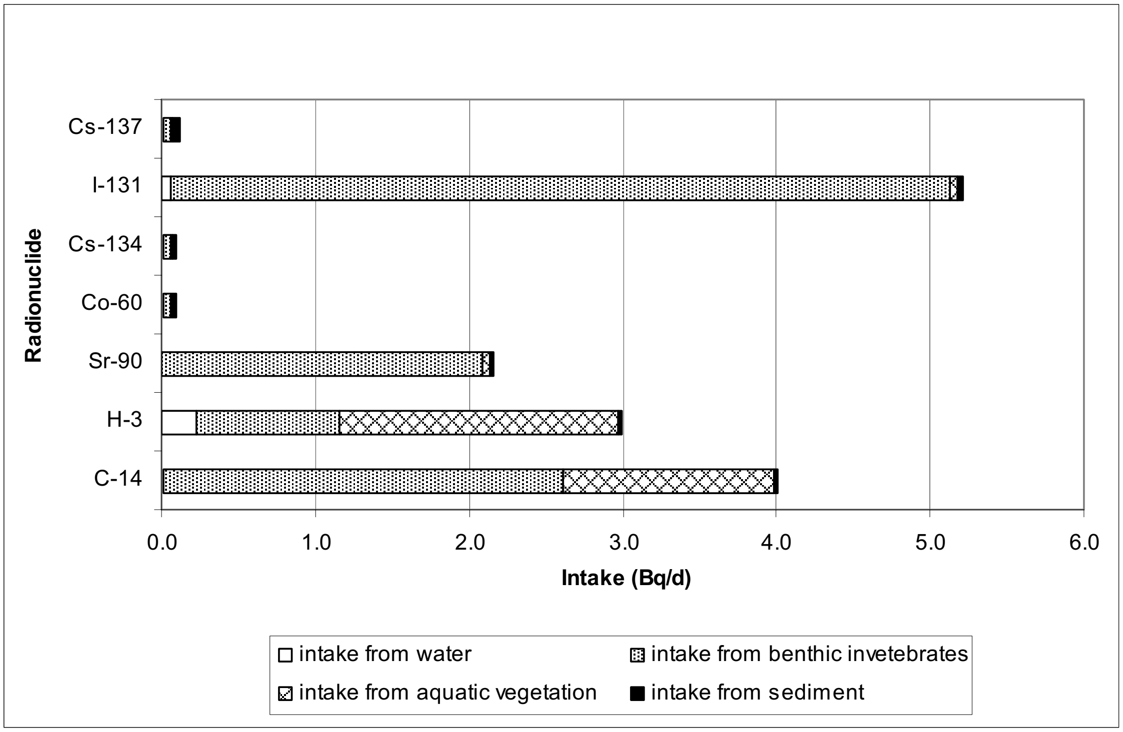


Figure 4.4-6 Schematic Representation of the Contribution to the Intake for the Mallard – Lake Ontario - Total Intake (Bq/d)



5.0 ASSESSMENT OF EFFECTS OF THE NND PROJECT ON NON-HUMAN BIOTA

This Section provides a qualitative evaluation for conventional COPC and a quantitative evaluation of radiological COPC of the potential effects of the proposed NND project on the environment with respect to the ecological effects on non-human biota.

5.1 Evaluation for Likely Measurable Changes to the Environment

The proposed Project may potentially have an effect on surface water, sediment, soil, groundwater (indirectly via deposition from air) and air environmental components. These environmental components may be impacted by increases in constituent concentrations as a result of the proposed Project (described in the Scope of Project TSD) and are considered potential pathways of exposure for aquatic and terrestrial biota. Effects related to the potential loss of habitat or disruption of wildlife and aquatic life is addressed in the Terrestrial Environment and Aquatic Environment Assessment of Environmental Effects TSDs. Potential Project-Environment Interactions are shown in Table 5.1-1.

Table 5.1-1 Potential Project-Environment Interactions in the Non-human Biota Environment

Project Works & Activities Darlington New Build	ERA	Rationale
	Non-Human Biota	
SITE PREPARATION AND CONSTRUCTION PHASE		
Mobilization and Preparatory Works	•	Mobilization and preparatory works is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from construction equipment.
Excavation and Grading	•	Excavation and Grading is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from construction equipment. This activity will alter groundwater flow patterns, but groundwater quality is not expected to be affected.
Marine and Shoreline Works	•	Marine and Shoreline Works is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from construction equipment.
Development of Administration and Physical Support Facilities	•	Development of Administration and Physical Support Facilities is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from construction equipment.
Construction of Power Block	•	Construction of Power Block is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from construction equipment. Also there will be minor chemical (conventional) releases to the air associated with welding and painting and minor releases due to the industrial radiography completed as part of this activity. Both the chemical and radiological releases are minor and captured within the

Project Works & Activities Darlington New Build	ERA	Rationale
	Non-Human Biota	
		bounding release scenarios assessed.
Construction of Intake and Discharge Channels and Structures	•	Construction of Intake and Discharge Channels and Structures is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from construction equipment.
Construction of Ancillary Facilities	•	Construction of Ancillary Facilities is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from construction equipment.
Construction of Radioactive Waste Storage Facilities	•	Construction of Radioactive Waste Storage Facilities is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from construction equipment.
Management of Stormwater	•	As noted in the Surface Water Environment Assessment of Environmental Effects TSD, during construction and operations and maintenance, the stormwater system may contain chemical and radiological constituents. Due to the possible redistribution of sub-surface soil contaminants.
Supply of Construction Material and Operating Equipment	•	Supply of Construction Material and Operating Equipment is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from delivery vehicles.
Management of Construction Waste, Hazardous Materials, Fuels and Lubricants	•	Management of Construction Waste, Hazardous Materials, Fuels and Lubricants is not expected to alter the radioactivity and chemical environment under normal operations with the exception of vehicle exhaust from delivery vehicles.
Workforce, Payroll and Purchasing	•	Workforce, Payroll and Purchasing is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from delivery vehicles.
OPERATION AND MAINTENANCE PHASE		
Operation of Reactor Core		Operation of the reactor core is not expected to result in radiological releases to the environment.
Operation of Primary Heat Transport System		No emission to air or water from the Operation of the Primary Heat Transport System is expected.
Operation of Active Ventilation and Radioactive Liquid Waste Management Systems	•	Operation of active ventilation and radioactive liquid waste management systems is expected to result in emissions of radiological releases to air and both radiological and conventional releases to water.
Operation of Safety and Related Systems		No emission to air or water from the Operation of the Safety and Related Systems.
Operation of Fuel and Fuel Handling Systems		No emission to air or water from the Operation of Fuel and Fuel Handling Systems.
Operation of Secondary Heat Transport System and Turbine Generators	•	Operation of secondary heat transport system and turbine generators is expected to result in discharge to the surface water and air environments from steam generator operation. Discharges to water, however are captured in the operation of Radioactive Liquid Waste Management System or Condenser Circulating Water, Service Water and Cooling Systems.
Operation of Condenser and Condenser Circulating Water, Service Water and Cooling Systems	•	Operation of the Condenser and Condenser Circulating Water, Service Water and Cooling Systems is expected to result in discharges of conventional constituents to both the air and water environments.

Project Works & Activities Darlington New Build	**ERA**	**Rationale**
	Non-Human Biota	
Operation of Electrical Power Systems	•	During normal operations, the operation of electrical power systems is not expected to alter the radioactivity and chemical environment with the exception of combustion exhausts from testing emergency and stand-by diesel power supply.
Operation of Site Services and Utilities	•	Operation of Site Services and Utilities may result in chemical releases to air from HVAC systems. Atmospheric emissions from ventilation sources at the NND are anticipated to be similar (i.e., negligible) to the DNGS and therefore do not have the potential to change the atmospheric environment. Discharges to water, however are captured in the operation of Radioactive Liquid Waste Management System or Condenser Circulating Water, Service Water and Cooling Systems.
Management of Operational Low and Intermediate-Level Waste	•	Management of operational low and intermediate-level waste is expected to result in airborne tritium emissions from the L&ILW building and increase the gamma radiation. No chemical discharges to air or water are expected with the exception of vehicle exhaust from transporting the waste.
Transportation of Operational Low and Intermediate-Level Waste to a Licensed Off-site Facility	•	Transportation of Operational Low and Intermediate-Level Waste to a Licensed Off-site Facility is expected to increase the gamma radiation and potentially increase radioactive exposure to biota. No chemical discharges to air or water are expected with the exception of vehicle exhaust from transporting the waste.
Dry Storage of Used Fuel	•	Dry storage of used fuel is expected to increase gamma radiation. This activity will also result in minor chemical (conventional) releases to air from processing (welding, painting) of the dry storage containers.
Management of Conventional Waste	•	Management of Conventional Waste will not result in any chemical or radiological discharges to air or water with the exception of vehicle exhaust from transporting the waste.
Replacement/ Maintenance of Major Components	•	Replacement/maintenance of major components and systems is expected result in air and water emissions of both radiological and conventional constituents.
Physical Presence of the Facility		No emission to air or water from the Operation of Fuel and Fuel Handling Systems.
Administration, Purchasing and Payroll	•	Administration, Purchasing and Payroll is not expected to alter the radioactivity and chemical environment with the exception of vehicle exhaust from worker vehicles.

5.1.1 Preliminary Screening of Project Works and Activities

Several of the project works and activities identified in Table 5.1-1 indicate a potential interaction with the air quality environment related to emissions from vehicle exhaust. The primary constituents associated with vehicle exhaust include nitrogen dioxide, sulphur dioxide, carbon monoxide and fine particles. The Atmospheric Environment Assessment of Environmental Effects TSD provides predicted air concentrations for these constituents across the DN site for the site preparation, construction and operation phases of the Project. All predicted concentrations of the constituents related to fuel combustion, at locations on-site (and off site), are below relevant annual air quality human health based criteria and toxic levels associated in plants (see Table 5.3-1). Therefore, no further evaluation of the project works and activities associated with fuel combustion is warranted.

For the remaining interactions, a qualitative screening of the potential chemical effects and a preliminary quantitative screening of radiological effects associated with the Project Works and Activities is provided in Table 5.1-2.

The possible extent and magnitude of potential effects in the Ecological Risk Assessment is a function of the characteristics of the sources and pathways. Each Project work and activity is a possible source of an effect; and each Project/Environment interaction is a potential pathway for an effect. These potential interactions are shown in Table 5.1-1. However, not all of these interactions are measurable. Those which are considered to have potentially measurable effects as determined in the Surface Water and Atmospheric Environment Assessment of Environmental Effects TSDs and which therefore required further analysis are shown in Table 5.1-2.

Table 5.1-2 Project Works and Activities with Likely Measurable Changes to Non-Human Biota

Project Works & Activities	Conventional		Radiological		Screening Rationale
	Terrestrial	Aquatic	Terrestrial	Aquatic	
SITE PREPARATION AND CONSTRUCTION PHASE					
Management of Stormwater	•	•			As noted in the Surface Water Environment Assessment of Environmental Effects TSD, during construction and operations, the stormwater system may contain chemical constituents. However, conventional discharges from the site will comply with applicable water quality criteria.
OPERATION AND MAINTENANCE PHASE					
Operation of Active Ventilation and Radioactive Liquid Waste Management Systems	•	•	•	•	Operation of active ventilation and radioactive liquid waste management systems is expected to result in radiological releases to air and both radiological and conventional releases to water. As noted in the Surface Water Environment Assessment of Environmental Effects TSD, conventional water discharges from the station will comply with applicable water quality criteria.
Operation of Secondary Heat Transport System and Turbine Generators	•				Operation of secondary heat transport system and turbine generators is expected to result in discharge of steam generator treatment chemicals to both air and water. Discharges to the aquatic environment, are captured in the operation of Radioactive Liquid Waste Management System or Condenser Circulating Water, Service Water and Cooling Systems.
Operation of Condenser and Condenser Circulating Water, Service Water and Cooling Systems	•	•			As noted in the Surface Water Environment Assessment of Environmental Effects TSD, conventional water discharges from the station will comply with applicable water quality criteria. The assessment considers the releases provided by the vendors and potential blowdown to cooling tower pond.
Operation of Electrical Power Systems	•				Testing of emergency and stand-by diesel power supply will result in combustion exhausts to air as described in the Atmospheric Environment Assessment of Environmental Effects TSD.
Management of Operational Low and Intermediate-Level Waste			•		Management of operational low and intermediate-level waste is expected to result in minor airborne tritium emissions from the L&ILW building. Also the storage of L&ILW is expected to increase the gamma radiation and potentially increase radioactive exposure to biota.
Transportation of Operational Low and Intermediate-Level Waste to a Licensed Off-site Facility			•		Transportation of Operational Low and Intermediate-Level Waste to a Licensed Off-site Facility is expected to increase the gamma radiation and potentially increase radioactive exposure to biota.
Dry Storage of Used Fuel			•		Dry storage of used fuel is expected to increase gamma radiation.

5.2 Assessment Methods

Section 3 provides a general overview of the ERA methodology used for both existing conditions and the Project effects assessment. With respect to the Project, each of the likely measurable changes identified in Table 5.1-2, are assessed in greater detail to determine whether changes to the environment may change the results of the ERA conducted for the existing conditions.

5.2.1 Assessment Criteria

The criteria used in the screening process to identify COPCs include:

- Standards provided by the MOE in the *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act* (MOE 2004).
- The Provincial Water Quality Objectives (PWQO) (MOEE, 1994).
- Provincial sediment quality guidelines (MOE 2008a).
- Guidelines contained in the Canadian Council of Ministers of the Environment (CCME) *Canadian Environmental Quality Guidelines* (CCME 2007).
- Sediment quality benchmarks developed by Canadian Nuclear Safety Commission (CNSC) for uranium mining and milling in Canada (Thompson *et al*. 2005).
- MOE and Environment Canada *Ambient Air Quality Criteria* (MOE 2008b,c,d; FPCAP 1976).
- Toxicity Reference Values (TRVs)

5.3 Assessment of Likely Effects on Biota – Conventional COPC

5.3.1 Management of Stormwater

During the site preparation activities, a large portion of soil will be relocated from the south east portion of the site to the North East and North West Landfill Areas. Measurements of soil quality were conducted on several of the boreholes within the area to be excavated, and at two locations north of the CN rail line. The data provided in the Geology and Hydrogeology Existing Environment TSD, indicate that the soil quality between these samples is similar, and all measured concentrations, with the exception of beryllium are below the soil criteria for industrial sites. Beryllium measured concentrations were only marginally above the criteria and as noted in the Geology and Hydrogeology Existing Conditions TSD, were consistent in all the samples, and therefore are considered representative of natural conditions with the overburden of the site. Consequently, relocation of soil within the DN site should not alter the on-land surface water or ground water chemistry at the DN site such that stormwater quality would be measurably affected.

During the site preparation, construction and operation and maintenance phases, there are no activities which will result in a release of conventional constituents that may affect soil or groundwater concentrations, such that stormwater would be measurably affected.

It should be noted that there may be an increase in Total Suspended Solids (TSS) in Coots Pond as a result of excavation and the placement of soil near Coots Pond. As indicated in the Terrestrial Environment Assessment of Environmental Effects TSD, all efforts will be made to reduce the TSS levels in Coots Pond and a Stormwater Management Pond may be added between the soil pile and Coots Pond to mitigate the increase of TSS in Coots Pond. The TSS criterion from the CCME (2003) document indicate that a maximum increase of 25 mg/L above background levels is allowable for any short term exposure (i.e., a 24 hour period) and a maximum average increase of 5 mg/L above background levels for longer term exposures (i.e. between 24 hours and 30 days).

With respect to Lake Ontario, it is anticipated that there will be increases in TSS in the nearshore area when the Coffer Dam is being built. However the near shore area of Lake Ontario is a high energy zone and is not highly productive. In addition, the effects will be in a localized area and will be short term; therefore aquatic populations will not be affected by short term increases in TSS.

5.3.2 Chemical Releases to Air and Water

The systems which may result in chemical releases to the environment are:

- Operation of active ventilation and radioactive liquid waste management system – potential discharges of liquid effluents (steam generator treatment chemicals, water treatment chemicals etc.) to receiving waters.
- Operation of secondary heat transport system and turbine generators – potential discharge of steam generator treatment chemicals to air.
- Operation of condenser and condenser circulating water, service water and cooling systems – water treatment chemicals and chemical constituents associated with cooling tower operation; once through cooling water is non-contact, and is therefore not expected to affect water quality.
- Operation of electrical power systems - testing of emergency and stand-by diesel power supply will result in the release of combustion products to air.

Releases to Air

The operation of the steam generators will result in a release of steam generator treatment chemicals to air. The only other source of these chemicals in the existing environment is the operation of DNGS; therefore with the operation of NND, the concentration of these chemicals in the air environment will increase. Testing of emergency and stand-by diesel power supply will result in the release of combustion gases to air and therefore increase the total release of these emissions from the DN site. DN site operations are only a small contribution to the local air quality given that there are numerous local sources of these emissions in the Local Study Area (e.g., Hwy. 401, St. Mary’s Cement).

The Atmospheric Environment Assessment of Environmental Effects TSD provides predicted concentrations of the steam generator chemicals (ammonia, hydrazine), and combustion products (nitrogen dioxide, sulphur dioxide) in air for both the contribution from NND and for the combined NND and DNGS. The existing condition (evaluated for COPCs in Appendix D) concentrations of hydrazine, ammonia, nitrogen dioxide and sulphur dioxide were predicted at several locations across the DN site at locations where biota may be exposed. The maximum predicted air concentrations across the site for both existing conditions and during the operation phase of the Project are provided in Table 5.3-1, along with available air quality criteria and the phytotoxic based benchmarks used in the ESG 2001 report. These phytotoxic based benchmarks are also considered to be protective of terrestrial mammals. In all cases, the predicted annual average concentrations in air across the site are below ambient air quality criteria (where available) and phytotoxic based benchmarks, and therefore would not result in any adverse effects in ecological receptors.

Table 5.3-1 Predicted Annual Average Concentrations in Air (μg/m^3)

Constituent	Annual Average Concentration – (μg/m^3) - DNGS	Annual Average Concentration (μg/m^3) – NND+DNGS	MOE AAQC (μg/m^3)	Other Criteria (μg/m^3)	Phytotoxic Air Based Benchmarks (ESG 2001)	
					Reference Benchmark (μg/m^3)	Reference
Ammonia	1.10	2.22		100[3]	5	Compensation point in plants (Sheppard, 1999)
Hydrazine	0.00057	0.0011		0.01[4]	1[5]	MOE level of concern
NO_2	28.4[1]	23.8[1]	100[6]		560	May reduce photosynthesis (Calow, 1998)
SO_2	3.3[2]	3.2[2]	55		380	Injury in grass

MOE – Ontario Ministry of the Environment; AAQC – Ambient Air Quality Criteria
1 Includes upwind background concentration of 20.9 μg/m^3 and contribution from local traffic (e.g. Hwy 401)
2 Includes upwind background concentration of 2.8 μg/m^3 and contribution from local source (e.g. St. Mary's)
3 IRIS database (U.S. EPA 2007)
4 Texas Commission on Environmental Quality, 2008
5 ½ hour average concentration
6 Federal Maximum Acceptable Level

Releases to Surface Water

The Surface Water Environment Existing Environment TSD provided water quality analysis for samples collected at the DNGS diffuser in Lake Ontario. The only COPC that was identified in the existing environment was hydrazine. As indicated in Section 4, the measured concentrations of steam generator chemicals (i.e. hydrazine) in water were less than the detection limit and concentrations of ammonia and hydrazine were similar to measurements in the Regional Study Area (Table 5.3-2 – see Appendix B for additional detail) and the quantitative evaluation indicated that there would be no adverse effects on aquatic receptors. The NND will have much lower releases of hydrazine to the surface water environment than DNGS, as the steam generator blowdown will be returned to the steam/feedwater cycle for reuse, unlike at DNGS, where the blowdown is discharged with the cooling water. Consequently, it is expected that the concentrations of hydrazine in the surface water environment will not be affected by the Project. No further analysis of these releases to water is warranted.

Table 5.3-2 Predicted Water Concentrations (mg/L) for Conventional Constituents

Constituent	Criteria[1]	Lake Ontario Background[2]			Site (Lake Ontario)[2]			Estimated Water Concentrations for Cooling Tower Option	
		Min	Mean	Max	Min	Mean	Max	Effluent	Edge of Turbulent Mixing Zone
Aluminum		0.004	0.08	2.77	0.004	0.09	3.52	0.146	0.091
Aluminum (filtered)	0.075	0.0014	0.0064	0.0188	0.0020	0.0064	0.0147	0.024	0.008
Ammonia		0.005	0.017	0.063	0.005	0.020	0.064	0.086	0.025
Ammonia (unionised)		0	0.0007	0.0063	0	0.00054	0.00270		
Antimony	0.02	0.0005	0.001	0.001	0.0005	0.00051	0.00179		
Arsenic	0.005	0.0005	0.0007	0.0020	0.0005	0.00061	0.00200		
Barium		0.017	0.034	0.298	0.017	0.040	0.644	0.092	0.042
Beryllium	1.1	0.0005	-	0.00050	0.0005	-	0.0005		
Boron	0.2	0.018	0.087	1.17	0.019	0.130	6.86	0.14	0.11
Cadmium	0.000017	0.00005	0.00005	0.00013	0.00005	0.00005	0.00005		
Calcium		28.3	36.0	44.4	30.6	35.3	41.1	143	46
Chromium	0.0089	0.00005	0.0010	0.0058	0.00005	0.0006	0.0017	0.0019	0.0009
Chromium (III)	0.0089	0.00005	0.00117	0.00575	0.00005	0.0004	0.0017		
Chromium(VI)	0.001	0.0025	-	0.0025	0.0025	-	0.0025		
Cobalt	0.0009	0.00005	0.0003	0.0016	0.00005	0.0004	0.0023	0.0021	0.0005
Copper	0.003	0.0006	0.001	0.041	0.0006	0.0011	0.0037	0.004	0.0015
Hydrazine		0.0025	0.0025	0.0025	0.0025	0.0025	0.0025		
Iron	0.3	0.0005	0.0240	0.0917	0.006	0.028	0.129	0.129	0.036
Lead	0.002	0.00005	0.0002	0.0023	0.00005	0.00014	0.00363	0.0003	0.0002
Lithium		0.0019	0.0028	0.0041	0.0018	0.0029	0.0045	0.0120	0.0037
Magnesium		7.7	9.5	11.2	7.6	9.58	11.05	38.9	12.3
Manganese		0.0001	0.0012	0.0030	0.0003	0.0014	0.0048	0.0059	0.0018
Mercury		0.000	-	0.000	0.00005	-	0.00005		
Molybdenum	0.04	0.001034	0.00134	0.00176	0.0011	0.0014	0.0020	0.0054	0.0017
Morpholine	4	0.0005	0.0005	0.0010	0.0005	0.0005	0.0020		
Nickel	0.025	0.00	0.00	0.00	0.00052	0.00072	0.00119	0.0027	0.0009
Potassium		1.33	1.73	2.18	1.38	1.79	3.54	7.0	2.2
Selenium	0.001	0.0005	0.0005	0.0013	0.0005	0.0005	0.0010		
Silver	0.0001	0.00005	-	0.00005	0.00005	-	0.00005		
Sodium		11.5	15.0	18.3	11.2	15.2	20.7	61	19
Strontium		0.16	0.19	0.24	0.17	0.20	0.22	0.77	0.25
Thallium	0.0003	0.00005	0.00005	0.00014	0.00005	-	0.00005		
Thorium		0.00005	-	0.00005	0.00005	0.00006	0.00062		
Tin		0.00005	0.00008	0.004423	0.00005	0.00007	0.00156		
Titanium		0.000181	0.0018	0.009585	0.00075	0.00222	0.01594	0.0095	0.0027
Tungsten		0.00005	0.00008	0.00025	0.00005	0.00008	0.00032		
Uranium	0.005	0.00026	0.00037	0.00052	0.00028	0.00038	0.00058	0.0015	0.0005
Vanadium	0.006	0.00005	0.00028	0.00119	0.00005	0.00032	0.00100		
Zinc	0.02	0.0004	0.0029	0.0269	0.00005	0.00245	0.01122	0.0086	0.0033
Zirconium	0.004	0.00005	0.00053	0.00974	0.00005	0.00095	0.05685		

Note: [1] Reference value or PWQO

Estimated concentrations for Cooling Tower Option from Surface Water Environment Assessment of Environmental Effects TSD.

[2] Lake concentrations from Appendix B.

There are two cooling options being considered for the NND, a cooling tower or a once-through cooling option. For the cooling tower option, the cooling tower blowdown, will possibly consist of some residual water treatment chemicals. Due to the concentrating effect of the cooling towers, the concentration of metals in the discharge will be approximately four times higher than the intake water. Prior to its release to the lake, discharges would be stored in a cooling tower pond where discharges could be tested and treated as required. It is possible that biota, such as individual waterfowl, may contact contaminated water in the cooling tower pond. No population level effects on non-human biota are expected due to the limited number of individuals that may contact the water. As noted in the Surface Water Environment Assessment of Effects TSD, any discharges to the surface water environment will be appropriately treated to meet applicable regulatory water quality criteria. In addition, the diffuser in Lake Ontario adds an additional dilution factor. The Surface Water Environment Assessment of Effects TSD indicates that there will be a factor of 10 dilution to the edge of the turbulent mixing zone.

Table 5.3-2 provides the predicted water concentrations in both the effluent and at the edge of the turbulent mixing zone of the diffuser associated with the cooling tower option. As seen from the table, all of the predicted water concentrations at the edge of the turbulent mixing zone, are within the PWQO or Interim PWQO (where available) and within the variability of background lake concentration. None of these constituents would result in adverse effects on aquatic biota. While aquatic biota may enter the turbulent mixing zone, it is unlikely they will reside in this zone for any length of time, so the minor increases in water concentrations due to cobalt and iron are unlikely to affect aquatic biota.

In the once-through cooling option, discharges will be similar to the existing DNGS. For the existing condition with the DNGS, the water quality analysis for samples collected at the DNGS diffuser were similar to measurements in the Lake Ontario background (see Table 5.3-2). It is expected that water concentrations for the NND with once-through cooling water option will be similar to DNGS, and thus will not result in adverse effects on aquatic biota.

Since the water quality in Lake Ontario is not predicted to measurably change, the sediment quality in Lake Ontario is also expected to remain unchanged.

5.3.3 Likely Effects on Ecological Receptors

Based on the above discussions, the NND will not result in measurable changes to the conventional COPC in the environment and therefore there will be no adverse effects on ecological receptors in the aquatic and terrestrial environment considering the mitigation measures identified for the Surface Water, Air Quality and Geology and Hydrogeology components of the environment.

5.4 Assessment of Likely Effects on Biota – Radiological

5.4.1 Releases of Radionuclides to Air and Water

The operation of the active ventilation and radioactive liquid waste management system will result in release of radioactivity to both air and water. Based on the emissions of radionuclides provided by the Vendors, concentrations of radionuclides in air, water and soil were determined using methods described in the Radiation and Radioactivity Assessment of Effects TSD. These concentrations are based on a bounding release scenario for the NND assuming 60 years of operation.

The predicted concentrations of radionuclides in air for the bounding release scenario (emissions described in the Radiation and Radioactivity Environment Assessment of Environmental Effects TSD) are shown in Table 5.4-1. The emissions for the bounding release scenario were applied to unit air dispersion factors for on-site receptors (described in the Atmospheric Environment Assessment of Environmental Effects TSD) to develop these predicted air concentrations. The maximum predicted tritium in air concentration across the site considering the operation of both DNGS (Table 4.2-11) and NND was used in the dose rate calculation.

Table 5.4-1 Predicted Air Concentrations of Radiological COPC Associated with the NND

Radionuclide	Predicted Air Quality Concentrations (Bq/m^3)			
	Polygon AB	Polygon C	Polygon D	Polygon E
C-14	7.35 x 10^{-3}	8.76 x 10^{-3}	6.90 x 10^{-3}	0.054
Tritium	3.19	3.81	3.00	23.6
Sr-90	1.19 x 10^{-6}	1.41 x 10^{-6}	1.11 x 10^{-6}	8.72 x 10^{-6}
Co-60	8.57 x 10^{-6}	1.02 x 10^{-5}	8.05 x 10^{-6}	6.32 x 10^{-5}
Cs-134	2.27 x 10^{-6}	2.70 x 10^{-6}	2.13 x 10^{-6}	1.67 x 10^{-5}
I-131	1.18 x 10^{-4}	1.41 x 10^{-4}	1.11 x 10^{-4}	8.72 x 10^{-4}
Cs-137	3.54 x 10^{-6}	4.22 x 10^{-6}	3.33 x 10^{-6}	2.61 x 10^{-5}

The predicted concentrations of radionuclides in water for the bounding release scenario (for cooling tower – described in the Radiation and Radioactivity Environment Assessment of Environmental Effects TSD) are shown in Table 5.4-2 for both the cooling tower and the once through cooling options. As shown in Table 5.4-2 the radiological releases associated with emissions to Lake Ontario for the NND for the two options are below the measured water concentrations in the existing environment with the exception of tritium (H-3). Section 5.4.4 presents the results for the radiological assessment related to the cooling tower option since this option results in higher concentrations of the radiological COPC. The dose calculations consider the maximum predicted incremental water quality concentrations (Table 5.4-2) plus the measured background concentrations (Table 4.2-6). The measured background concentrations are larger than the predicted concentrations with the exception of tritium. Consequently, for the cooling tower scenario, only tritium concentrations are affected. Measured values for all other constituents were used in the dose calculations.

Table 5.4-2 Predicted Water Concentrations of Radiological COPC Associated with the NND

Radionuclide	Measured Water Concentrations in Lake Ontario (Bq/L)	Maximum Predicted Lake Ontario Water Concentrations (Bq/L)	
		Once Through	Cooling Tower
C-14	0.25	0.0024	0.020
Tritium	7.5	8.4	68.3
Sr-90	0.05	8.8×10^{-9}	7.2×10^{-6}
Co-60	0.5	3.9×10^{-7}	3.2×10^{-6}
Cs-134	0.5	8.8×10^{-6}	7.2×10^{-5}
Cs-137	0.5	1.2×10^{-5}	9.6×10^{-5}
I-131	2	2.3×10^{-5}	1.9×10^{-4}

The predicted concentrations of radionuclides in soil from the bounding release scenario for the NND are shown in Table 5.4-3. As seen from the table, the predicted incremental soil concentrations associated with the radiological releases from the bounding scenario are below the measured soil concentrations in the existing environment for Sr-90, Cs-137 and I-131. Section 5.4.4 presents the results for the radiological assessment associated with the NND. In this evaluation, the maximum of the measured or the predicted (total) concentrations were used.

Table 5.4-3 Predicted Soil Concentrations of Radiological COPC Associated with the NND

Radionuclide	Soil Concentrations (Bq/kg)											
	Measured (Total)				Bounding Release (Predicted Incremental)				Bounding Release (Predicted Total (DNGS + NND)			
	Polygon				Polygon				Polygon			
	AB	C	D	E	AB	C	D	E	AB	C	D	E
C-14	14.1	11.4	8.35	15.1	-	-	-	-				
Tritium	N/A	N/A	N/A	N/A	-	-	-	-				
Sr-90	10	10	10	10	0.043	0.052	0.041	0.320	0.044	0.052	0.041	0.321
Co-60	0.56[1]	N/A	0.56[1]	0.56[1]	1.38	1.65	1.30	10.2	1.39	1.66	1.31	10.2
Cs-134	0.56[1]	N/A	0.56[1]	0.56[1]	0.21	0.25	0.20	1.56	0.21	0.25	0.20	1.57
Cs-137	8.4[1]	N/A	5.1[1]	9.2[1]	1.03	1.22	0.97	7.58	1.04	1.23	0.97	7.6
I-131	4.4[1]	N/A	2.8[1]	3.9[1]	0.070	0.083	0.066	0.516	0.070	0.084	0.066	0.517

Note: N/A – Not analyzed
[1] Converted from wet weight based on an average soil water content of 10% (Geological and Hydrogeological Environment Existing Environmental Conditions TSD) – See Table 4.2-6.
C-14 and Tritium soil concentrations are not predicted since exposure to these radionuclides is dominated by transfer from the atmosphere and other specific activity models are used to account for the contribution from soil of these radionuclides.

5.4.2 Gamma Exposure

The gamma radiation (from all sources associated with the NND) and atmospheric emissions (i.e., emissions to terrestrial vegetation, biota and soil) arising from future activities at the site is not expected to be significantly different from the existing conditions. Therefore, no incremental environmental effects associated with gamma radiation exposure for ecological receptors are expected.

5.4.3 Likely Effects on Ecological Receptors

Table 5.4-4 provides a summary of the predicted doses associated with the bounding release scenario for the NND. The predicted doses were based on the maximum predicted radiological concentrations within the air, soil, biota and water across the site. As seen from the table, all screening index values are well below a value of 1 indicating that there will be no adverse effects in ecological receptors exposed to radionuclide releases associated with the NND.

In summary, the Project will not result in measurable changes to the radiological COPC that will adversely affect ecological receptors considering the mitigation measures identified for the Surface Water, Air Quality and Geology and Hydrogeology components of the environment.

5.5 Other Considerations Related to Development of the Site

As noted in Section 3.1.2.2, the site preparation activities in Polygon D will result in the removal of Polliwog, Treefrog and Dragonfly Ponds. The Terrestrial Environment Effects Assessment TSD has identified mitigations to address this loss, including the possible creation of new wetland ponds in appropriate locations on the DN Site. Since there are no predicted measurable changes to air quality and no water discharges to naturalized ponds, it is expected that the water and sediment quality of conventional COPC in the new naturalized ponds would be similar to or better than the existing ponds. Air concentrations of the radiological COPC are predicted to increase particularly in close proximity to the NND; therefore, any new naturalized ponds in close proximity to the NND will likely have radiological COPC concentrations that are higher than those currently in the naturalized ponds such as Polliwog, Treefrog and Dragonfly Ponds. However, given that the predicted dose rates for aquatic receptors are very much lower than the reference dose rates there will be no adverse effects on ecological populations related to the development of new naturalized ponds.

Table 5.4-4 Summary of Maximum Radiological Doses Associated with the NND

Receptor Category	Indicator Species	Total Dose (all radionuclides & all pathways) (mGy/d)	Benchmark	SI
Summary of Calculated Doses, in mGy/d for Terrestrial Species				
Terrestrial Invertebrates	Earthworm (soil)	1.46×10^{-4}	1	<0.001
	Earthworm (gw)	3.02×10^{-5}	1	<0.001
Terrestrial Vegetation	Plants	2.47×10^{-4}	1	<0.001
Mammals	Red Fox	9.27×10^{-3}	1	0.0093
	Eastern Cottontail	7.57×10^{-4}	1	<0.001
	Meadow Vole	1.17×10^{-4}	1	<0.001
	Deer Mouse	9.93×10^{-5}	1	<0.001
	White-tailed Deer	1.86×10^{-3}	1	0.002
	Raccoon	2.62×10^{-3}	1	0.003
	Short-tailed Weasel	2.20×10^{-4}	1	<0.001
Birds	Yellow Warbler	2.93×10^{-5}	1	<0.001
	Song Sparrow	2.97×10^{-5}	1	<0.001
	Bank Swallow	2.99×10^{-5}	1	<0.001
	Red-eyed Vireo	3.00×10^{-5}	1	<0.001
	American Crow	4.23×10^{-5}	1	<0.001
	American Robin	3.48×10^{-5}	1	<0.001
Summary of Calculated Doses, in mGy/d for Near Shore Lake Ontario (Cooling Tower Scenario)				
Fish	Forage Fish	3.15×10^{-4}	0.6	<0.001
	Predator Fish	1.37×10^{-4}	0.6	<0.001
Benthic Invertebrates		5.63×10^{-4}	6	<0.001
Aquatic Vegetation		9.74×10^{-5}	3	<0.001
Aquatic Birds	Bufflehead	7.03×10^{-5}	1	<0.001
	Mallard	5.63×10^{-5}	1	<0.001
	Pied-Billed Grebe	5.10×10^{-5}	1	<0.001

Note: The doses provided in this table are due to the bounding release scenario (highest emissions from each reactor type for each radionuclide).

6.0 UNCERTAINTY AND QUALITY ASSURANCE

6.1 Uncertainty Assessment

Many areas of uncertainty are involved in a risk assessment. This is due to the fact that assumptions have been made throughout the assessment either due to data gaps, environmental fate complexities, or in the generalization of receptor characteristics. To be able to place a level of confidence in the results, an accounting of the uncertainty, the magnitude and type of which are important in determining the significance of the results, must be completed. In recognition of these uncertainties, some cautious assumptions are used throughout the assessment to ensure that the potential for an adverse effect would not be underestimated. Several of the major assumptions are outlined below.

The primary uncertainties in this assessment are associated with prediction of environmental concentrations using transfer factors, as well as the toxicity data used to define the toxicity reference value concentrations for each ecological receptor. Both contribute to uncertainties in the screening index values. Transfer factors and toxicity data are both highly dependent on the form (e.g., dissolved in water, bound in an inorganic complex, etc.) of a COPC. The conditions at the DN site differ from those studied for the derivation of transfer factors and toxicity data from field or laboratory studies; therefore, there is uncertainty in the applicability of data from the literature to this specific site.

There is some uncertainty with the analytical data collected for evaluating current conditions at the DN site. For example, in the case of small terrestrial mammals and insects the sample size was too small for the lab to analyze. Therefore transfer factors were used to calculate concentrations of radionuclides and conventional COPC in small mammals and data from caterpillars were used as surrogates for insect concentrations. In general these assumptions would tend to overestimate exposure. For some biota, the detection limits for the radionuclides were too high and thus many samples had concentrations below the detection limit. In these cases, transfer factors were used to calculate radionuclide concentrations; this tends to result in an over-estimate of exposure. Some concentrations of radionuclides and conventional COPC were measured below the method detection limit. In these cases the concentrations were assumed to be ½ of the method detection limit. In many cases, this assumption will tend to overestimate exposure but in some cases the exposure may be underestimated.

For the surface water ponds (Coots Pond and Tree Frog Pond) on site, background water concentrations in Lake Ontario were used as there were no background data for these ponds. This likely results in the identification of more COPC since background Lake Ontario concentrations would generally be lower than concentrations in surface water ponds.

Toxicity reference values for COPC were obtained from reputable sources; however, some assumptions were made in the absence of available data. For example, for aquatic species, the lowest available toxicity data for species that were similar to the indicator receptor species were used. For amphibians and reptiles, the available toxicity information come from old studies related to narrow mouth toad eggs. Narrow mouth toads are not found in Ontario and thus the use of this data is highly uncertain and may overestimate potential effects. Given that no complete toxicological database is available that determines the concentrations of COPCs that impact all of the terrestrial indicator species, toxicity data from laboratory species such as rats and mice were used to represent the appropriate terrestrial receptor. This assumes that rats and mice would be affected in the same way as other terrestrial receptors. Additionally, for terrestrial mammals and birds, toxicity information for a chemical was used regardless of its form in the test procedure, even though this may not be the same form as exists at the DN site (e.g., an oxide or sulphide mineral form compared to a more soluble form). Where possible COPC forms and species were selected that are most representative of those anticipated to be present at the site. No toxicity information is available for avian species exposed to zirconium and selenium and therefore no evaluation for avian species was carried out. It is difficult to determine the effects of these assumptions; however, it is unlikely that the overall conclusions of the assessment would change.

The bioavailability/bioaccessibility of all COPC in all environmental media was assumed to be 1, or 100% bioavailable. This assumption generally tends to overestimate the exposure from all exposure pathways as typically not all of the COPC content in soils for example are 100% bioavailable.

The dietary characteristics (food, water and soil or sediment consumption) of ecological receptors were obtained from the literature. These values are sometimes obtained from studies using relatively sedentary animals held in captivity and may not be fully representative of the receptor characteristics (e.g., activity levels) of free-range animals in the wild. An underestimate of exposure might result from this, but there are other conservative assumptions that tend to compensate for the use of these receptor characteristics (e.g., receptors were assumed to be always exposed to maximum or 95% UCLM concentrations measured at the site).

For gamma radiation exposure, it was assumed that terrestrial receptors are exposed to background levels and thus doses due to gamma exposure were not calculated. As indicated previously, storage facilities will be designed such that the external gamma dose rate at the fence line will not exceed 0.5 µSv/h. Moreover, this design objective is independent of reactor type. Gamma radiation exposure rates over most of the Darlington site are at background levels and thus there is no incremental gamma radiation exposure. The only area where there would be any exposure to gamma radiation would be a limited area directly at the fence line. An ecological receptor (for example a plant or animal) with a small home range exposed at the fence line would be exposed at most to a dose rate of 0.5 µGy/h (0.012 mGy/d). If this dose was added to the maximum total dose rates presented in Table 4.4-12, the total dose rates would be 0.012 mGy/d which is well below the reference dose rate of 1 mGy/d and thus the conclusions of the radiological assessment will be unchanged.

Another area of uncertainty in the risk assessment is the potential effect of multiple COPC. When dealing with multiple toxic COPCs, there is potential interaction with other COPCs that may be found at the same location. It is well established that synergism, potentiation, antagonism or additivity of toxic effects occurs in the environment. A quantitative assessment of these interactions is outside the scope of this study and, in any event, would be constrained, as there is not an adequate base of toxicological evidence to quantify these interactions. This may result in an under- or over-estimation of the risk for some COPC.

In terms of the concentrations associated with the NND, no data are available since a Vendor has not yet been selected, therefore a bounding or worst case scenario was used to determine the radionuclide concentrations in the various media, this assumption tends to result in an overestimate of exposure. For the conventional COPC, no data were available and thus only a qualitative evaluation was carried out. It is not expected that this would underestimate exposure since it is unlikely that conventional COPC will be released from the facility.

In summary, although uncertainties exist in the calculations for the DN site and NND, it is highly likely that the overall assessment results in the overestimate of exposure and risk.

6.2 Use of Statistics in this assessment

Data has been collected during the baseline sampling program as described in Section 2 and summarized for use in this TSD. The data for this TSD was summarized as statistics as seen in Appendix B. These summary statistics used depend on a number of factors including but not limited to:

- regulatory requirements;
- precedence;
- professional judgment;
- the creation of bounding scenarios or conservatism;
- use by and consistency with another environmental component; and/or
- use in ongoing baseline monitoring.

Statistics were processed with Microsoft Access using the Total Access Statistics Package. Considerations specific to this TSD may limit the amount of data used for the summary statistics, depending on the factors discussed above. All collected data were used and no outliers were removed.

Within this TSD, the method for handling data reported as below the MDL was to substitute with a numeric value related to the MDL, that is, substitution with ½ of the MDL, resulting in a representative value for the statistic without overestimating.

Given the above discussion, it is possible that a summary statistic reported in another TSD may have a different value than that reported in this TSD. The Ecological Risk Assessment and Assessment of Non-Human Biota TSD was designed and completed with professional judgment to provide sufficient precision for the statistics used in this report.

6.3 Quality Assurance

This section provides an overview of the quality assurance measures that were undertaken for the ERA calculations for both the existing scenario and the bounding release scenario for the NND.

6.3.1 Model Parameter Values

The preparation and quality assurance of the model parameter values followed a clear and traceable process.

For the preparation process, the parameter table (within a spreadsheet) were prepared as follows:

- Enter the corresponding parameter values;
- Provide a reference for every parameter value (i.e., the reference/assumption for every parameter value was included in the spreadsheet); and
- Enter their name and date beside the “Prepared By” cell.

Once the input parameter table had been completed, the table underwent review and quality assurance. The quality assurance process was a collaborative team effort, with both the format and content of each input parameter table discussed amongst appropriate team members. Any revisions to the input parameter values were based on a consideration of alternative data sources (e.g., local data, published databases or other references), professional judgement or relevant project experience.

Once all of the input parameter values were agreed upon by the team, a designated individual (different than the person who created the tables) reviewed each and every parameter value in the input parameter table with the value provided in the given reference. For this quality assurance check, the designated individual performed the following tasks:

- Compare each and every parameter value against the value reported in the reference or confirm the assumption with the team;
- Enter their name and date beside the “Reviewed By” cell; and
- Document in the spreadsheet any revisions made to any of the input parameter values.

Revisions were made to input parameter values based on quality assurance checks, disposition comments from OPG or the peer reviewer, or discussions with OPG.

6.3.2 Sample Calculations

Sample calculations have been completed and are provided in Appendix E for the Conventional COPC and Appendix F for the radionuclide COPC. The sample calculations were performed as an independent quality assurance, once all of the input parameter values had been agreed upon by the team. For this quality assurance check, the designated individual compared the spreadsheet dose calculations with those from the database, with any discrepancies identified, discussed and resolved.

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APPENDIX A

BASIS FOR THE EA

[*For additional information on the items in this Appendix, refer to the 'Scope of the Project for EA Purposes – Technical Support Document']*

Project Phase / Works and Activities	Description
Site Preparation Phase	
Mobilization and Preparatory Works	**Mobilization (construction workforce and equipment):** will involve mobilization of equipment and the construction workforce to the site. The physical aspects of mobilization will involve the establishment of parking areas for staff and equipment, service areas for construction offices, construction phase fencing for security and safety and equipment storage; security/guardhouse and reception facilities. **Clearing and Grubbing:** Vegetation within areas of future construction will be removed. A variety of methods including the removal of trees by truck, chipping of smaller vegetation and grubbing with a dozer or excavator will be used to remove vegetation. Environmental effects management measures will be applied throughout the activity such as minimizing the area to be cleared to the extent feasible and complying with seasonal constraints and regulatory requirements for clearing operations. **Installation of Services and Utilities:** includes temporary services and utilities required during construction and permanent services and utilities required to support operations. Wherever possible, utilities and services will be installed to accommodate the needs of both construction and operation phases. Utilities and services will include: i) potable water; ii) sanitary sewage collection discharging to a municipal water pollution control plant; iii) electrical and telephone service; iv) P.A. system; v) fencing. Excavation to install services is captured by other earthmoving activities. **Development of Roads and Related Infrastructure:** includes improvements to access into the site and features to provide for temporary (i.e., during construction) and permanent (during operations) access, egress and parking. Onsite roads and infrastructure will include local access roads and parking facilities within the site to accommodate workforce-related and other traffic during both construction and operation phases. For EA purposes, it is assumed that off-site parking facilities may be used with workers transferred to the NND via shuttle bus.
Excavation and Grading	Excavation and grading will comprise all earth and rock-moving activities including earthmoving and grading, drilling and blasting. Excavation activities will be conducted in-the-dry with dewatering where required. Collected water will be managed and discharged as described in Management of Stormwater. **On-Land Earthmoving and Grading:** During site preparation activities, effectively all land area east of Holt Road will be disturbed to a large extent. Topsoil stripping will be by means of suitable earthmoving equipment (e.g., scrapers, excavators and trucks). Excavated soils transferred to the Northeast and Northwest Landfill Areas and lake infill will be placed using good management practices that address surface erosion, dust control and related aspects including noise and vehicle emissions. **Transport of Surplus Soil to Off-site Disposal:** Should it be necessary to do so, surplus soil will be transported to disposal at an off-site location(s). The destinations for this material have not been determined, however, it is intended that the material be used to rehabilitate extraction pits and quarries or other development sites, or similar beneficial use. **Rock Excavation and Grading (Drilling, Blasting, Boring):** will involve the excavation and grading of rock and like material, and associated activities such as drilling or blasting to facilitate its excavation and transfer to rock fill areas (i.e. lake infill) or disposal areas. **Development of Construction Laydown Areas:** will include specific areas identified for, and developed as, staging areas for contractor operations and storage areas for construction equipment and materials. Laydown areas will be graded, temporarily fenced, and surfaced, depending on function, with granular or asphalt.

Project Phase / Works and Activities	Description
Marine and Shoreline Works	Marine and Shoreline Works includes all works and activities conducted within or adjacent to Lake Ontario such that they are likely to interact with the marine and aquatic environment. Marine and shoreline-related works and activities will include the following: **Lake Infilling and Shoreline Protection:** will occur throughout an area of Lake Ontario and will extend from the easterly limit of the DN site to approximately the DNGS intake channel; and about 100 m into the lake on its westerly limit to approximately 450 m on its easterly limit. Lake infilling will create a new landform of up to approximately 40 ha. The lake infill operation will begin with the construction of a low-permeability coffer dam on its outer perimeter to contain the deposit lake infill materials and isolate the area from lake water intrusion. The core would typically consist of low-permeability soils or compacted granular materials, driven or vibrated steel sheeting, or drilled caissons. The lake-facing surface of the dam will be covered with armour stone placed by crane on the lake side of the dam. Any fish within the area to be dammed will be directed out of the work area by progressive seining and other appropriate means as the dam is placed. Once the cofferdam is complete, the water contained within it will be pumped out and discharged to Lake Ontario. The material placed within the cofferdam to create the new landform will originate on-site and be placed as part of the Excavation and Grading activity. **Construction of Wharf:** a wharf will be developed in a portion of the lake infilled area generally in front of the Power Block. The wharf will be used during construction for off-loading oversize and over-weight components and its construction will be appropriate for this purpose. **Lake Bottom Dredging:** dredging activities are expected to be minimal, but may be required at the point where the cooling water intake tunnel daylights to the lake bottom. Any such minor dredging will involve conventional equipment designed and operated for the purpose (suction and/or mechanical). All dredged sediment will be placed into barges and subsequently off-loaded and disposed of in the Northeast Landfill Area or existing onsite construction landfill.
Development of Administration and Physical Support Facilities	Administration and Support Facilities comprise various buildings housing staff, equipment and operations necessary to provide ongoing support to the NND. These will include offices, workshops, maintenance, storage and perimeter security buildings, and utilities operating centres. All such buildings will consist of conventional steel and masonry structures.
Construction Phase	
For assessment purposes, it is assumed that the entire site will be prepared for construction at the outset. Construction of the nuclear power plant elements (i.e., construction phase) will begin as soon as possible into the site preparation activities and accordingly, the site preparation and construction phases will overlap in time. This is a bounding assumption since it represents the greatest amount of related work in the shortest period of time.	
Construction of Power Block	The **Power Block** includes the reactor building, the turbine-generator building/turbine hall (powerhouse) and related structural features that are physically associated with them. Development of the Power Block includes the installation of all power generation equipment within it, including the reactors, primary and secondary heat transport components, and all powerhouse components including turbines, generators and heat exchangers and pumps and standby power systems. Supply of construction materials and operating equipment to the site is included in the Construction Material and Operating Equipment Supply. Foundations will extend into bedrock and may require drilling and blasting. Some elements of construction will be further supported on steel piles. Above-grade construction will involve techniques typical of heavy industrial development. Placement will involve extensive use of heavy equipment, including heavy-lift fixed and mobile cranes. Installation of operating equipment will involve movement and placement of large and specialty components using various standard and extraordinary procedures, depending on the size and weight of the component.

Project Phase / Works and Activities	Description
Construction of Intake and Discharge Structures	**Intake and Discharge Tunnels and Structures for Once-Through Lake Water Cooling:** For EA purposes, the once-through cooling water intake and diffuser structures at NND are assumed to be similar to the existing structures at DNGS, although appropriately sized to accommodate the required water flow rates at NND. The tunnels at DNGS were constructed using typical underground mining techniques involving blasting and excavation. Tunnels for once through cooling water at NND may alternatively be constructed by boring using a purpose-built tunnel boring machine (TBM). **Intake and Discharge Structures for Cooling Tower Water Makeup and Service Water:** Although the water from both mechanical draft and natural draft cooling towers is recirculated, some make-up water is required to replace tower blowdown and other losses (e.g.,evaporation) and for plant service water needs. This water will be drawn from Lake Ontario via intake and discharge pipelines. The open-cut drill-and-blast method is likely to be used to excavate a trench to place the intake or outfall pipe. Pipes will be placed in trenches and backfilled with a granular material, and armour surface protection. Screens may be used to prevent debris from entering the intake structure. Both the intake and discharge structures for makeup water and service water will be substantially smaller than those required for once-through lakewater cooling due to the smaller associated water volumes.
Construction of Ancillary Facilities	Ancillary facilities include all features necessary to support operations of the reactors and generation of electricity, although not physically associated with the power block. Clearing and grubbing and major earthmoving and grading to accommodate development of the ancillary features are included in the Mobilization and Preparatory Works, and the Earthmoving and Grading activities, respectively. **Expansion of Existing Switchyard:** will involve the physical enlargement of the footprint of the existing DNGS switchyard, an increase to the electrical capacity to accommodate its use for NND, and its connection to the existing electrical grid. The switchyard expansion will effectively be as an easterly extension to the existing switchyard. **Cooling Towers – Mechanical Draft:** includes the towers and the associated infrastructure to support their operation. Mechanical draft cooling towers are typically shorter in height and larger in footprint than natural draft cooling towers. Construction of the towers will involve conventional techniques and materials, primarily steel framing, concrete and masonry, and mechanical and electrical components. **Cooling Towers – Natural Draft:** includes the towers and associated infrastructure to support their operations. Up to two natural draft towers may be constructed for each unit (depending on the design). The towers will have a hyperbolic shape. The towers will be constructed of steel reinforced concrete with structural, mechanical and electrical components and will be erected by means of traditional construction methods (e.g., slip forming, crane lifts), and conventional construction materials. **Cooling Towers – Fan Assisted Natural Draft:** are not included in any of the three model plant layout scenarios considered in the EA. Because they are a variation of the two cooling tower types that are considered, their potential interfaces with the environment during construction are considered to be bounded by the cooling tower options that are addressed in the EA. Fan assisted natural draft cooling towers have a slightly larger base dimension than the natural draft cooling tower, and have fans placed around the base of the tower to increase the air flow rate. These towers have a similar hyperbolic shape as a traditional natural draft tower, but approximately ⅓ the height. **Cooling Tower Blowdown Ponds:** For each of the cooling tower options one or more blowdown ponds may be required to receive and treat blowdown from the towers. Blowdown is the portion of the circulating water flow that is removed in order to maintain the amount of dissolved solids and other impurities at acceptable levels. The ponds would be excavated into the ground surface and lined (e.g., with clay or synthetic materials) to ensure proper containment. The ponds will be sized to accommodate the required volume for the system, and the water would be appropriately treated to comply with discharge water quality criteria, prior to discharge.

Project Phase / Works and Activities	Description
Construction of Radioactive Waste Storage Facilities	Radioactive Waste Storage Facilities comprise used fuel dry storage facility to house containerized used fuel bundles following their removal from wet storage in the used fuel bays. Low and Intermediate Level Waste Storage building(s) may also be required. For EA purposes, it is assumed that a used fuel dry storage building for NND will not be required until approximately 2025, though a storage building for Low and Intermediate Level Waste will likely be required starting in 2017.
Common to Site Preparation and Construction – Works and Activities	
Management of Stormwater	As the site is developed, ditches and swales will be constructed to collect and convey surface water to stormwater management ponds and ultimately to discharge to an existing drainage course or Lake Ontario. Stormwater management features will be developed to address the requirements for runoff control both during site preparation and construction (temporary) and during operations (permanent). Wherever possible, stormwater management features will consider the needs of both construction and operation phases.
Supply of Construction Equipment, Material and Operating Plant Components	Supply of construction materials and operating equipment includes the delivery to the site, of all necessary materials and components for construction of NND. While much of the material that will be delivered to the site will be via the road network, large components may be delivered by rail (to an existing rail siding on a neighbouring property and then transported overland to the site or to a new rail siding on the DN site), or by barge to the new wharf. **Rock Delivery for Cofferdam:** delivery of imported rock for cofferdam construction is estimated to be up to 200 trucks per day. **Construction Equipment:** comprises all mechanized and related equipment required to support construction. Heavy earthmoving equipment will be typical of large-scale construction projects (e.g., trucks, dozers, loaders, excavators, scrappers, graders, compactors). **Aggregate and Concrete:** For EA purposes, it is assumed that ready-mixed concrete will be provided by an offsite supplier operating on a nearby property, or is mixed on site in a concrete batch plant. Approximately 750,000 to 1,000,000 m^3 of concrete will be required for 4 units. **Manufactured Construction Materials:** will include items associated with site preparation (e.g., precast concrete structures, culverts and utility piping, fence), structural components for buildings and other facilities (e.g., fabricated steel products, masonry), mechanical and electrical components for buildings and facilities, and various sundry items (e.g., interior finish components). All manufactured construction materials will be delivered to the site via highway-licensed trucks travelling on provincial and municipal roads, by rail, or by barge. Aside from concrete, the largest single quantity of material that will be delivered to the site will be structural steel (rebar etc). Approximately 150,000-200,000 tonnes of structural steel would be required for 4 units. **Plant Operating Components:** are fixtures and components associated with an operating nuclear plant. These will include conventional items (e.g., pumps, turbines, electrical power systems) as well as those that are unique to nuclear plants (e.g., calandria). Most operating components will be delivered to the site via highway-licensed trucks travelling on provincial and municipal roads. Some oversize items will require special permits and transport provisions, and others are likely to be transported to the site by rail or via barge and off-loaded at the purpose built wharf.

Project Phase / Works and Activities	Description
Management of Construction Waste, Hazardous Materials, Fuels and Lubricants	**Construction waste:** will be transferred from the site to disposal or recycling at appropriately-licensed waste management facilities. This activity does not include disposal of excavated spoil (see Excavation and Grading). The existing on-site DNGS construction landfill may also be reopened for the disposal of construction waste. **Hazardous Materials:** (e.g., solvents, chemicals, compressed gases) associated with site preparation and construction will be managed, including storage, use and disposal, in compliance with applicable legislation, codes and practices. These materials will include expired chemicals, cleaners, paint, aerosol cans and electrical components. Non-radioactive oil and chemical wastes will be removed from the site for disposal. **Fuels, Lubricants and Chemicals:** those required for mechanical construction equipment will be delivered to the site in appropriately-qualified vehicles and/or containers, stored in purpose-built facilities, and dispensed and used, all in compliance with applicable legislation, codes and practices. Contingency plans for a detailed response system in the event of a spill will be developed.
Work Force, Payroll and Purchasing	Site preparation and construction will require a contractor labour force that will vary in size throughout the work based on the scope and nature of the activities underway at any given time. This activity will represent the daily transportation-related aspects of workforce commute as well as the economic aspects associated with payroll and construction-related capital purchases. The labour force will peak, in the early years of the Project, at approximately 3,800. In later years of the site preparation and construction phase, the workforce involved in the construction of units 3 and 4 will overlap with staff operating units 1 and 2 and will peak at approximately 5,200.
Operation and Maintenance Phase	
Prior to the start of the Operation and Maintenance Phase, commissioning activities will be undertaken including the testing of systems and components. Nuclear fission reactions in the reactor core will be increased in a controlled manner until criticality is achieved. Reactor power will then be increased in a controlled manner. Steam will be admitted into the turbine and the steam and feedwater system will be placed into service. The unit's electrical generator will be connected, or synchronized, to the electrical grid. Maintenance, both routine and major, is included in this phase of the Project. Three general areas of maintenance are performed: preventative maintenance, corrective maintenance, and improvement or upgrade activities (including during planned shutdowns and outages).	
Operation of Reactor Core	The reactor consists of the reactor assembly and reactivity control devices. The reactor core is the starting point for the generation of radioactivity. All other systems in the nuclear power plant (NPP) work to support the reactor core. This activity includes operation, startup, shutdown, and maintenance, testing and modification of the reactor core components, including the maintenance required for refurbishment. Nuclear malfunction and accident considerations will originate here. In an **ACR-1000 reactor** the horizontal calandria vessel is axially penetrated by calandria tubes. The calandria tubes provide access through the calandria vessel to the fuel channel assemblies containing nuclear fuel bundles of varying fuel enrichments. In the **EPR and AP1000 reactors,** a pressure vessel contains vertically oriented assemblies of fuel rods called fuel assemblies. The assemblies, containing various fuel enrichments, are configured into the core arrangement located and supported by the reactor internals. The reactor internals also direct the flow of the coolant past the fuel rods.

Project Phase / Works and Activities	Description
Operation of Primary Heat Transport System	The function of the primary heat transport system is to move heat from the reactor core into the primary side of the steam generator. This system will generate L&ILW (such as filters and ion exchange resins). This is captured in the Waste Management work activity. Maintenance of this system includes periodic chemical cleaning of the steam generators and replacement of parts during refurbishment and is included in the Major Maintenance work activity. Water losses are captured under the ventilation and drainage project works and activities. For all of the technologies, the chemistry of the reactor coolant is controlled by filtering, ion exchange, and chemical addition. In an **EPR reactor**, core cooling and moderation are provided by light water (H_20) at high pressure. There is no separate moderator system, only a reactor coolant system. The coolant is circulated through 4 cooling loops, each containing a steam generator. A pressurizer and a chemical and volume control system are used to maintain inventory and chemical composition in the reactor coolant system. The coolant used in this system contains boron, which acts as a neutron absorber and can also result in a reaction that forms tritium in the heat transport system fluid. Unique to the **AP1000 reactor** is the use of 2 cooling loops instead of 4, and therefore the use of only two steam generators. The remainder of the system is similar to that of the **EPR reactor**. In an **ACR-1000 reactor**, the heat transport system circulates light water through the reactor fuel channels to remove the heat produced by the fission of uranium fuel within the fuel bundles. Coolant from the fuel channels passes to the four steam generators where the heat is transferred to the secondary side to generate steam. The **ACR-1000** reactor has a calandria filled with a heavy water (D_2O) moderator. The moderator slows down neutrons from fission reactions in the fuel, increasing the opportunity for these neutrons to trigger additional fissions. The heavy water moderator is circulated and cooled. This system is separate from the primary heat transport system, and is a low pressure, low temperature closed circuit. This activity includes routine maintenance of the moderator systems and their auxiliaries. **Heavy water management** is only applicable to the **ACR-1000.** Heavy water is managed during maintenance activities and those activities connected to the movement of heavy water inventories into and out of the moderator system. Heavy water is managed in the **ACR-1000** by the D_2O Supply System, the D_2O Vapour Recovery System and the D_2O Cleanup System. Measures are taken to minimize the loss and downgrading of the heavy water, which escapes from the moderator systems. Heavy water may be transported offsite to a licensed facility for the removal of tritium. Losses from the heavy water management system are addressed under the active ventilation systems and radioactive liquid waste management activities.

Project Phase / Works and Activities	Description
Operation of Active Ventilation and Radioactive Liquid Waste Management Systems	**Radioactive Liquid Waste Management:** The active drainage system segregates liquid waste by the degree of contamination and directs it to the receiving tanks of the radioactive liquid waste management system. The system discharges treated wastes at a controlled rate to Lake Ontario after stringent testing and treatment to maintain acceptable activity levels for release. Tritium can be found in heavy water after contact with the reactor core, and this may be present in waterborne and airborne emissions from water losses. There are cleanup (ion exchange columns and filters) and upgrading facilities for recovered heavy water that will be used if heavy water is present in the liquid waste stream. There are also heavy water vapour recovery circuits in each reactor building to dry the atmosphere in areas that are subject to heavy water leakage during operation or servicing of equipment. Tritium can also be produced through neutron capture by B-10 in the **EPR** and **AP1000** reactors. This tritium can be found in liquid and airborne effluents due to water losses. **Radioactive Gaseous Waste Management:** Gaseous wastes from potentially active areas, such as reactor buildings, will be monitored for activity before release to the atmosphere. The gases from the active ventilation stacks are filtered through absolute and charcoal filters before being released, to minimize the release of radioactivity. In some cases, the release of active gaseous waste is delayed to allow for decay of short-lived radioisotopes.
Operation of Safety and Related Systems	A multiple barrier approach has been built into the design of all of the reactors to control releases of radioactivity to the environment. The **ACR-1000** reactor has five safety systems: Shutdown System 1 (SDS1) and Shutdown System 2 (SDS2), which provide emergency safe shutdown capability for the reactors, the Emergency Core Cooling System (ECCS), the Emergency Feedwater System (EFW) and the Containment System. The **EPR** reactor design includes four safety systems: the Safety Injection System (SIS) which provides emergency cooling, the Rod Cluster Control Assembly (RCCA) shutdown system which provides rapid reactor shutdown, the Emergency Feedwater System (EFWS), as well as the Containment System. The **AP1000** reactor includes four safety systems: the Passive Core Cooling System (PXS) which is designed to provide emergency core cooling; the Passive Containment Cooling System (PCS) which provides for the removal of heat from the containment vessel using water and airflow; the Containment System which is a steel vessel surrounded by a concrete shielding structure; and the Reactor Trip System, which acts to keep the reactor operating away from any safety limit.
Operation of Fuel and Fuel Handling Systems	**Fuel and Fuel Handling** includes receipt, handling and storage of fresh fuel and used fuel. **Fuel:** The reactor may be fuelled with low enriched uranium (LEU) or more highly enriched uranium, with a maximum enrichment of approximately 5% U-235. The enrichment level and configuration of the fuel differs based on the reactor class. Fuel will be delivered to the NND site in protective flame retardant containers and stored in these containers until required. Criticality safety is a concern due to the enrichment of the fuel and a criticality program will be put in place to mitigate this. **Fuel Storage and Handling**: The fuel handling system comprises equipment required for fuel changing, for the storage of fresh fuel, and for on-site storage of used fuel. **New fuel storage:** New fuel is stored in a high density rack which includes integral neutron absorbing material to maintain the required degree of subcriticality. The rack is designed to store fuel of the maximum design basis enrichment.

Project Phase / Works and Activities	Description
	Fuelling system: In the **ACR-1000** reactor, fuelling of the reactor is completed online. Fresh fuel bundles are pushed into one end of the fuel channel by a remotely operated fuelling machine. Irradiated fuel bundles are simultaneously discharged at the other end of the channel into another fuelling machine. For the **EPR and AP1000** reactors, fuelling must be completed during a refuelling outage. The refuelling operation is divided into four major phases: preparation, reactor disassembly, fuel handling, and reactor assembly. Prior to refuelling, the reactor pressure vessel (RPV) cavity is flooded with borated water and the reactor internals are placed in an internals storage pool separated from the reactor cavity by a removable gate. Fuel assemblies are remotely removed from the RPV and sent to the Spent Fuel Pool (SFP) through the fuel transfer tube. Some new fuel assemblies may be stored in the SFP, from where they will move through the fuel transfer tube and be placed into the RPV by the refuelling machine. When the refuelling is complete, the RPV internals are replaced into the RPV, instrumentation, and control/shutdown rods are reconnected, and the reactor vessel head is placed and fastened back onto the RPV. The borated water is then drained from the refuelling work areas and can be reused in the IRWST. **Used Fuel Handling:** In every reactor technology, the used fuel storage facility will be composed of transfer systems that carry the used fuel from the reactor to a used fuel storage pool in which the fuel is stored and cooled. The used fuel will be stored in a used fuel storage bay until it has cooled sufficiently for storage using an alternative means. **Used Fuel Bay and Auxiliaries:** The design specifications and location of the used fuel storage pool will be determined based on the reactor technology selected and the level of enrichment of the fuel to be used. Neutron absorbing material and spacers will be used to maintain the desired degree of subcriticality. A fuel bay cooling and purification system is used to maintain chemical composition, volume, activity level and temperature of the water in the fuel bay at desired levels. Filters, ion exchange columns and heat exchangers may be used depending on the specific reactor design selected.
Operation of Secondary Heat Transport System and Turbine Generators	**Turbine/Generator and Auxiliaries** comprise the turbine/generator, steam supply, main condenser, feedwater heating system and auxiliary systems. These systems are similar for the **EPR, AP1000** and **ACR-1000** reactors. This system also includes the generator oil supply and the associated fire suppression systems. This activity also includes maintenance of the system components. Interactions with the environment resulting from this activity are from oil leaks and water usage. **Turbine/Generator System:** Each unit has one turbine/generator unit and its auxiliary systems. The **EPR** and **ACR-1000** reactors have four steam generators, and the **AP1000** has two. **Steam Supply:** Steam is produced in steam generators in the reactor building, and transported by pipes to each turbine/generator. The specific configuration may vary by reactor design. **Main Condenser:** Steam from the turbines exhausts into the condenser shells where it is condensed using Condenser Circulating Water and collected in the hotwells. The condensate feedwater system collects the condensed steam from the turbine and supplies it to the steam generators. External makeup to the closed loop steam and feedwater system is from the demineralized water storage tank. This configuration is independent of reactor technology selected. **Feedwater Heating System:** The feedwater heating system supplies feedwater to the steam generators where applicable, preheats the water to achieve a good heat rate, and performs several other functions. This is generally true for all reactor technologies.

Project Phase / Works and Activities	Description
	Auxiliary Systems: The major turbine/generator auxiliary systems are: the sampling system, which permits sampling steam and feedwater for chemical analysis; and the chemical control system, which eliminates the residual oxygen from the deaerated feedwater and controls its pH. These systems have different names depending on which reactor is being discussed but perform the same functions.
Operation of Condenser and Condenser Circulating Water, Service Water and Cooling Systems	The **condenser circulating water system (CCW)** supplies cold water to the condenser tubes to condense the steam from the turbine exhaust. Four options are being assessed for the CCW system. These options are: once through cooling water, natural or mechanical draft cooling towers, or fan assisted natural draft cooling towers. Dependent on climate and land considerations, a combination of these technologies may be used to provide condenser circulating water at NND. The once-through CCW system draws water from Lake Ontario, pumps the water through the condenser tubes, and discharges the water back to Lake Ontario. Water will be brought into the plant through a lake bottom intake tunnel. The configuration of the intake tunnel and structure will be similar to that currently being used at DNGS, but sized to the necessary water volumes. Natural draft cooling towers are taller and have a smaller footprint than mechanical draft cooling towers, and up to two towers will be required for each reactor unit. A natural draft tower uses convection and evaporation forces to cool the condenser circulating water. Mechanical draft cooling towers use power driven fan motors to force or draw air through the tower. They are typically shorter and have a larger footprint than natural draft cooling towers. For both cooling tower technologies, makeup condenser cooling water is drawn from Lake Ontario at significantly lower rates than with once through cooling, however, a portion of the water is lost to evaporation. The blowdown flow is directed to blowdown ponds, where mineral and particulate impurities may be removed. Discharge will comply with appropriate criteria for surface water discharge to Lake Ontario. **Service Water Systems:** Water will be drawn from Lake Ontario and distributed to the various systems. For the once-through cooling option, service water will be combined with the CCW systems intake. For the cooling tower option, service water is drawn from the CCW closed loop circuit. **Demineralized Water**: NND will include two demineralized water plants to remove minerals removed from lake water prior to use in plant cooling systems. **Inactive Drainage Systems:** The inactive drainage system collects wastewater in various buildings (turbine building, waste treatment building, pumphouses etc.). The wastewater is collected and treated as required to comply with discharge criteria prior to discharge.
Operation of Electrical Power Systems	**Electrical Power Systems** deliver power to and from the grid, generate emergency power and distribute power throughout the station. The Electrical Power Systems will be similar for all reactor technologies as their operation is independent of the reactor itself. Possible environmental interactions may include noise, spills or leaks from storage tanks, and air emissions from the generators. **Switchyard and Main Transformers:** A switchyard is located near the station to connect the station to the grid transmission lines. The main transformers and associated service transformers are oil cooled. **On-Site Power System:** Power used internally at DNGS is supplied both from the unit itself and from the grid. Several buildings largely used for administration or general support functions are supplied with electricity from the grid. **Generation of Emergency and Standby Power:** On-site standby diesel generators (DGs) provide back-up power sources to specific station loads. The configuration of the diesel generators is similar for all reactor technologies.

Project Phase / Works and Activities	Description
Operation of Site Services and Utilities	**Domestic Water:** The domestic water system will be supplied from Durham Region water mains. **Sewage System:** The sewage system collects waste throughout the complex and discharges it into the Regional Municipality of Durham sewage mains. **Stormwater Management:** Stormwater management features will be developed to address the requirements for runoff control. Stormwater runoff ponds will be sufficient in number and size to provide adequate retention times following rainfall events. The pond design will incorporate an emergency overflow bypass for flows in excess of the design storage capacity. **Compressed Air:** The compressed air systems consist of instrument air, service air, high pressure air and breathing air. **Heating and Ventilation:** The heating and ventilation systems are required to provide comfort to people working inside the plant and prevent equipment and line freezing during plant shutdown in the winter. Steam, electricity, and hot water are used for heating. **On-Site Transportation:** There is an extensive existing road network at the DN site including the roadways and parking lots necessary to service DNGS. Further infrastructure will be developed to service NND. The roads are used by employees, contractors and visitors to drive to and from the site, as well as for the transfer of materials. **Other Auxiliary Systems:** Other auxiliary systems will include: communication systems; lighting systems, site security facilities, auxiliary and service buildings, and fencing. NND will also have a dedicated onsite laundry facility.
Management of Operational Low and Intermediate-Level Waste	Management of Low and Intermediate-Level Waste (L&ILW) will be similar regardless of reactor design selected. Two options for management of L&ILW include storage in a modular building on the DN site, and transport to an appropriately licensed facility off-site. Low Level Storage Buildings (LLSB), constructed as required, could accommodate both Low and Intermediate Level Waste. Eventually, the waste would be transported to an appropriate facility off-site for long-term management. The first LLSB will be required by approximately 2017.
Transportation of Operational Low and Intermediate-Level Waste to a Licensed Off-site Facility	Transportation of L&ILW to the WWMF or another licensed facility and transportation of other radioactive materials, such as tritiated heavy water, will be carried out in accordance with the *NSCA* and its Regulations and other applicable regulations (e.g., as made under the *Transportation of Dangerous Goods Act)*.
Dry Storage of Used Fuel	Used fuel from NND will be stored in used fuel bays for approximately ten years following removal from the reactor. After this cooling period, the fuel is moved to dry storage containers which are processed and stored in a Used Fuel Dry Storage (UFDS) Building. Storage containers differ between the ACR and the two PWR reactors due to differences in fuel characteristics. UFDS buildings will be constructed as required, and will be either an independent facility of an expansion to the existing DWMF.
Management of Conventional Waste	The generation of non-radioactive wastes will be minimized to the extent practicable through re-use and recycling programs. All residual waste will be collected regularly by licensed contractors and transferred to appropriately licensed off-site disposal facilities. Hazardous wastes will be handled in accordance with applicable regulations.

Project Phase / Works and Activities	Description
Replacement / Maintenance of Major Components and Systems	**Major Maintenance:** Some systems and components will require maintenance, replacement or upgrading. A maintenance program for the plant will be developed to address issues related to ageing, wear and degradation. A portion of this work will require the unit to be offline for these maintenance activities to be completed. Typically, this work is done during a maintenance or refuelling outage that occurs once every one to three years (1-2 months duration), depending on station protocols and an assessment of needs. The periodic chemical cleaning of systems and components (e.g. steam generators) is also included in this activity. Many maintenance activities do not require a unit shutdown, and will be performed with the unit in an operating state. **Refurbishment:** During the 60 year life of the station, specific reactor components and the steam generators, will likely require replacement. In addition to the steam generators, refurbishment of the **ACR-1000** would require replacement of fuel channel assemblies, calandria tubes and feeder pipes; and the **EPR** and **AP1000** would require replacement of the reactor pressure vessel head. Each of these activities will require the reactors being removed from service for a period of time (one to three years). The reactor will be defuelled, systems will be drained and access ways through containment created. The components will be removed by cutting or disconnecting piping and equipment. The Low and Intermediate Level Waste from refurbishment will be transported either to a purpose built facility on-site or transported a licensed facility is in accordance with CNSC transportation regulations in place at the time of refurbishment. **Safe Storage:** Preparation for, and safe storage of a reactor are the first two of the three-stage decommissioning program (the final stage is dismantling, disposal and site restoration). Safe storage involves removing the reactors from service for a period of time to allow for decay of radionuclides. In preparation for safe storage, the reactors will be defueled, and dewatered. During the safe storage period resident maintenance staff will perform routine inspections and carry out preventative and corrective maintenance.
Physical Presence of the Station	When complete, NND will exist as a functioning nuclear power plant comprised of up to four individual reactors. The greatest potential difference, in an environmental context, between the new facility and the existing station are the cooling towers that may be included as an alternative to the once-through cooling. From a physical presence perspective, natural draft cooling towers would be the more dominant of the cooling tower options, with several towers likely, each extending to a height of as much as 152.4 m above finished grade. A visible steam plume would routinely be associated with cooling tower operation. During operations, used reactor fuel will be stored onsite in water-filled bays for a period of several years, following which it will be removed from the bays, repackaged into dry storage containers and placed into on-land storage, also onsite, for a period of up to several decades.
Administration, Purchasing and Payroll	Upon completion of the Construction Phase of the project, the maximum estimated staff required for the operation of NND is expected to be 1,400 for the first two units in approximately 2016, and 2,800 for four units in about 2025. During the period 2018-2024, the workforce involved in the operation of units 1 and 2 will overlap with the workforce staff associated with the construction of units 3 and 4. During these years the Project-related workforce will total approximately 5,200. The Project-related workforce will increase from the normal complement of 2,800 by a further 2,000 during NND refurbishment (approximately 2050-2055).

APPENDIX B:

BASELINE CHARACTERIZATION PROGRAM AND COLLECTED DATA

LIST OF FIGURES

Page No.

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B.1 SAMPLING PROGRAM

The ERA Baseline Sampling Program was designed using the methodology outlined in Sections 2.1.2 and 3.2 of this TSD.

The program summarized in Table B.1-1 includes the collection of data on radionuclide and non-radionuclide concentrations in abiotic and biotic components that was required to conduct an ERA of baseline conditions. These concentrations are required to estimate the radiological and non-radiological exposures which are used to calculate the dose and Screening Index (SI) for each indicator species for ERA purposes.

The sampling locations, frequency and program duration for the baseline sampling program are shown in Table B.1-1. References for the figures showing the locations of the identified sampling locations in the Site, Local and Regional Study Areas can be found in Section B.2 of this Appendix.

The protocols, equipment and methodologies for abiotic components are the same as those described in the air, groundwater, soil, sediment and surface water work packages. The protocols, equipment and methodologies for biotic components are the same as those in the aquatic and terrestrial work packages.

Table B.1-1: Baseline Characterization Sampling Program Plan for ERA

Environmental Sub-component	Constituent	Number of Locations	Number of Samples per Location / Frequency	No. of Sample s/ERA	Sampling Locations
Soil	Metals, Arsenic, TOC, PHC fractions, boron, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan	4 Locations, 2 Depths	5	40	- Same borehole locations as G&H (~20 locations) Specific for ERA: - Include boreholes in: meadow, woodlot, ditch near landfill and ditch near Hydro switching yard - Include boreholes in site study area Depth: 20 cm and 1 or 2 cm
Groundwater	Total hardness, bicarbonate, TSS, carbonate, metals, arsenic, TPH plus rads as per G&H	Same as G&H	Same as G&H	-	Same locations as Soil – see (1) above. Need to document whether each sampling location is covered (e.g., by asphalt, concrete, etc)
Surface Water	Total hardness, bicarbonate, TSS, carbonate, metals, arsenic, TOC, PHC fractions, ammonia, hydrazine, morpholine, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, plus Sr-90 and gross beta in first campaign	16 Lake locations 4 Non-Lake locations	5 X (quarterly) 5 X (quarterly)	320 80	1. Nearshore existing discharge diffuser zone (Site Study Area): near-bottom and near-surface. 2. Offshore existing discharge diffuser zone (Site Study Area): near-bottom. 3. Offshore existing intake zone (over intake cap) (Site Study Area): near-bottom. 4. Nearshore DNS Provincial Park (Local Study Area): near-bottom and near-surface. 5. Offshore DNS Provincial Park (Local Study Area): near-bottom. 6. Nearshore Port DNS (Local Study Area): near-bottom and near-surface. 7. Offshore Port DNS (Local Study Area): near-bottom. 8. Nearshore Cobourg (Regional Study Area): near-bottom and near-surface. 9. Offshore Cobourg (Regional Study Area): near-bottom. 10. Nearshore New Build discharge diffuser zone (Site Study Area): near-bottom and near-surface. 11. Offshore New Build discharge diffuser zone (Site Study Area): near-bottom. Creeks: - Wilmot Creek Ponds: - Coots - Tree Frog - Stormwater settling pond

Table B.1-1: Baseline Characterization Sampling Program Plan for ERA

Environmental Sub-component	Constituent	Number of Locations	Number of Samples per Location / Frequency	No. of Sample s/ERA	Sampling Locations
Sediment	Metals, arsenic, TOC, PHC fractions, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, plus Sr-90 in first campaign	11 Lake locations, 4 Non-Lake locations (same as surface water)	5 5	55 (lake locations) 20 Ponds and stream)	Lake Sampling Locations (see Surface Water above): SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9, SW10, SW11. Non-Lake Sampling Locations: Creeks: - Wilmot Creek Ponds: - Coots - Tree Frog - Stormwater Management Pond
Air	Conventional analytes as per Atmospheric WP, H-3, C-14, gross beta, gamma scan, gross gamma	5 Passive samplers - H-3 only (Plus: 3 Locations, 1 Monitor per location; done for R&R and Atm)	1 X (quarterly) -	20 (passive only) -	5 passive samples for tritium: (1) meadow (2) woodlot (3) ditch near landfill (4) ditch near Hydro switching yard (5) at active sampler location (for calibration)
Terrestrial Vegetation	Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, OBT	4 Locations	3	12	Select from soil sampling locations: (1) Meadow (2) Woodlot (3) Ditch near landfill (4) Ditch near Hydro switching yard
Apples/ Fruit	Metals tissue analysis, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, OBT	4 Locations	1	4	Same locations as terrestrial vegetation, if possible Other fruit at 100g if possible
Insects	Metals tissue analysis, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, OBT	4 Locations	3	12	Similar to soil sampling locations (for surficial geology) to the extent that is practical (5-10 envisaged)

Table B.1-1: Baseline Characterization Sampling Program Plan for ERA

Environmental Sub-component	Constituent	Number of Locations	Number of Samples per Location / Frequency	No. of Samples/ERA	Sampling Locations
Attached Algae (Lake) Aquatic plants (non-Lake)	Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, OBT plus Sr-90 in first campaign	8 Lake locations 3 Pond locations	5 5	40 15	Lake Sampling Locations (see Surface Water above): (1) SW1 (2) SW2 (3) SW3 (4) SW4 and SW5 (5) SW6 and SW7 (6) SW8 and SW9 (7) SW10 (8) SW11 Non-Lake Sampling Locations: Ponds: - Coots - Tree Frog - Stormwater Management Pond
Zebra Mussels / Quagga Mussels	Metals tissue analysis, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, Sr-90, alpha scan, OBT	8 Lake locations	3 Shell 3 No-shell	24 24	Lake Sampling Locations (see Surface Water above): (1) SW1 (2) SW2 (3) SW3 (4) SW4 and SW5 (5) SW6 and SW7 (6) SW8 and SW9 (7) SW10 (8) SW11
Round Goby	Metals tissue analysis, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, Sr-90, OBT	8 Locations	3 (June/July 2008 depending on mussel results in 2007)	24	Same locations as quagga / zebra mussel.
Lake Trout (predatory fish)	Metals tissue analysis, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, Sr-90, OBT	6 Lake Locations	5	30	Lake Sampling Locations (see Surface Water above): (1) SW1 and SW2 (2) SW3 (3) SW4 and SW5 (4) SW6 and SW7

Table B.1-1: Baseline Characterization Sampling Program Plan for ERA

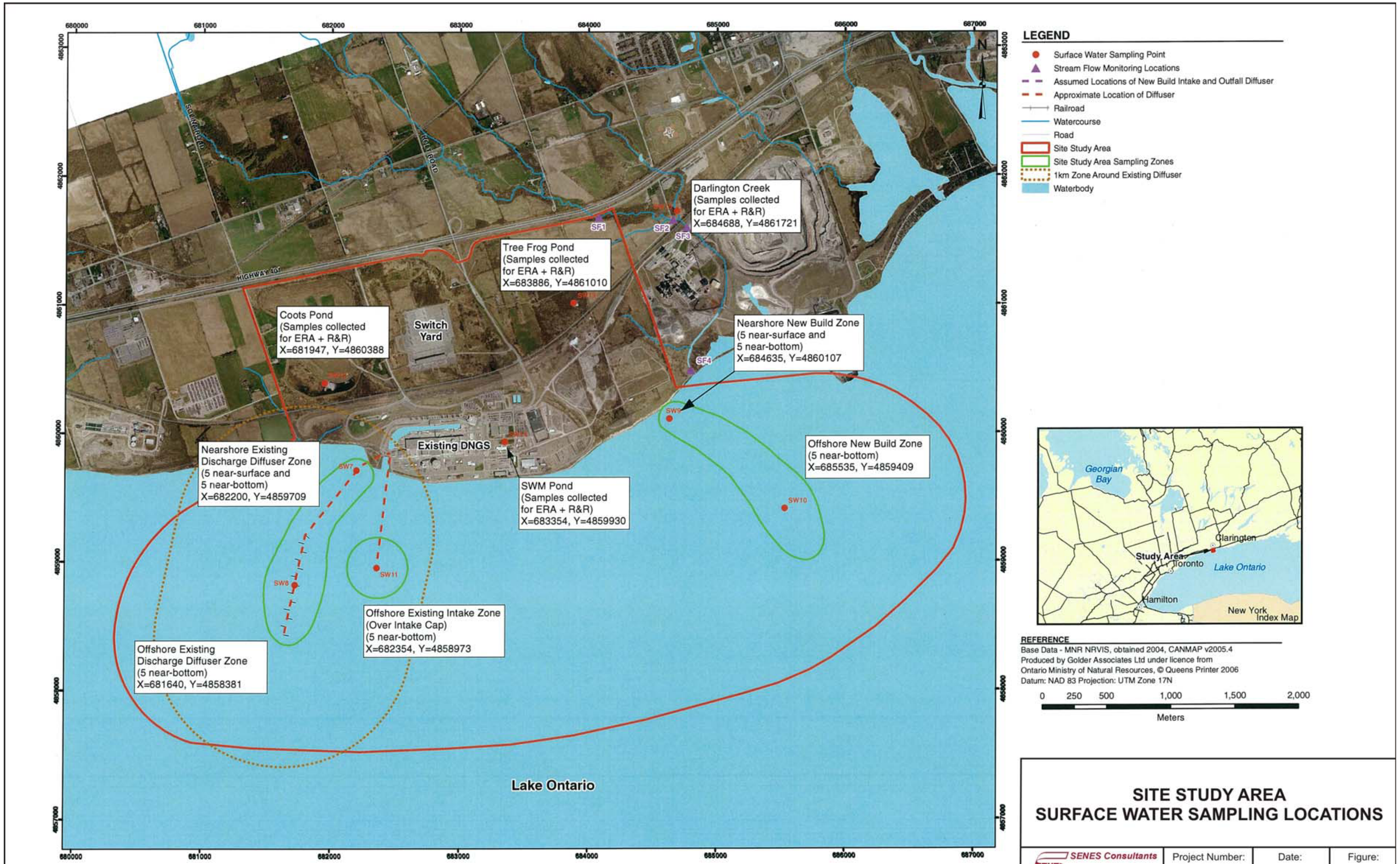
Environmental Sub-component	Constituent	Number of Locations	Number of Samples per Location / Frequency	No. of Samples/ERA	Sampling Locations
					(5) SW8 and SW9 (6) SW10 and SW11
Alewife	Metals tissue analysis, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, Sr-90, OBT	6 Lake Locations	5	30	Lake Sampling Locations (see Surface Water above): (1) SW1 and SW2 (2) SW3 (3) SW4 and SW5 (4) SW6 and SW7 (5) SW8 and SW9 (6) SW10 and SW11
Forage Fish	Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, Sr-90, OBT	1 pond location	3	3	One inland pond location (where found)
Other Fish	As per R&R White sucker Round whitefish Pan fish	As per R&R	3 per species	As per R&R	These will be used from R&R data to supplement ERA data. No specific locations are suggested.
Green Frog	Metals tissue analysis, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, OBT	3 Locations	3 (2008 spring)	9	Ponds: - Coots - Treefrog - Lagoon 1 location per pond
Earthworm	Metals tissue analysis, TPH, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, OBT	4 Locations	3 X (twice/yr)	36	Same locations as terrestrial vegetation and soil
Small Mammals (meadow voles)	Non-radiological tissues analysis, Cs-134, Cs-137, Co-60, K-40, C-14, H-3, gross gamma, gamma scan, OBT	4 Locations	1	4	4 locations, preferably covering Meadow, Woodlot, Ditch near landfill and Ditch near Hydro switching yard

B.2 FIGURES OF SAMPLING LOCATIONS

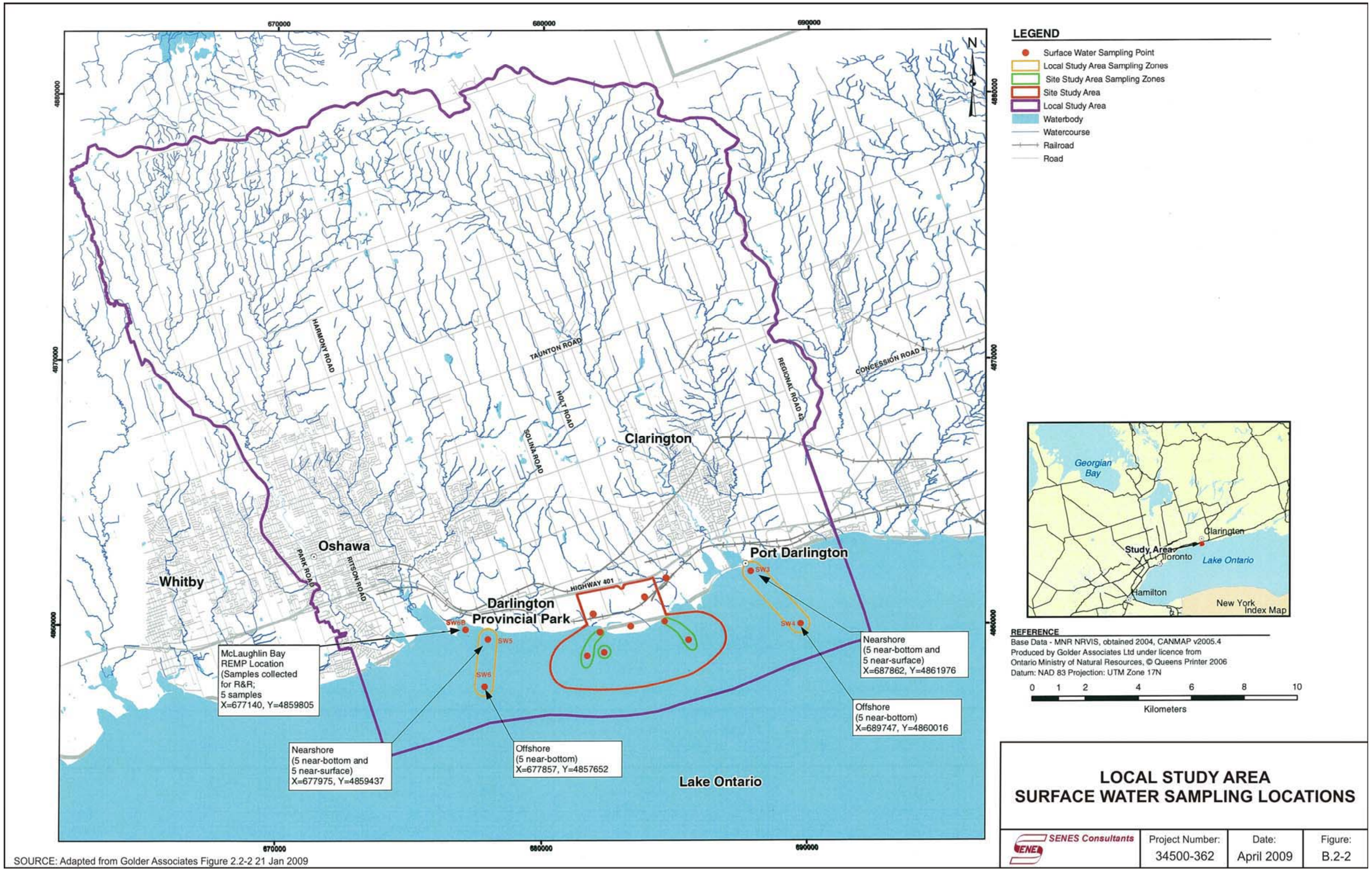
This section (specifically Table B.2-1) provides the references for figures available in the Surface Water and Geology and Hydrogeology Existing Environment TSDs for the purposes of illustrating the geographic of the sampling locations referred to in the sampling plan above and the data tables in Section B.3. It should be noted that the sampling locations used for the Aquatic and Surface Water sampling programs (identified as SW locations) are the same, therefore no figures are given for the aquatic sampling locations.

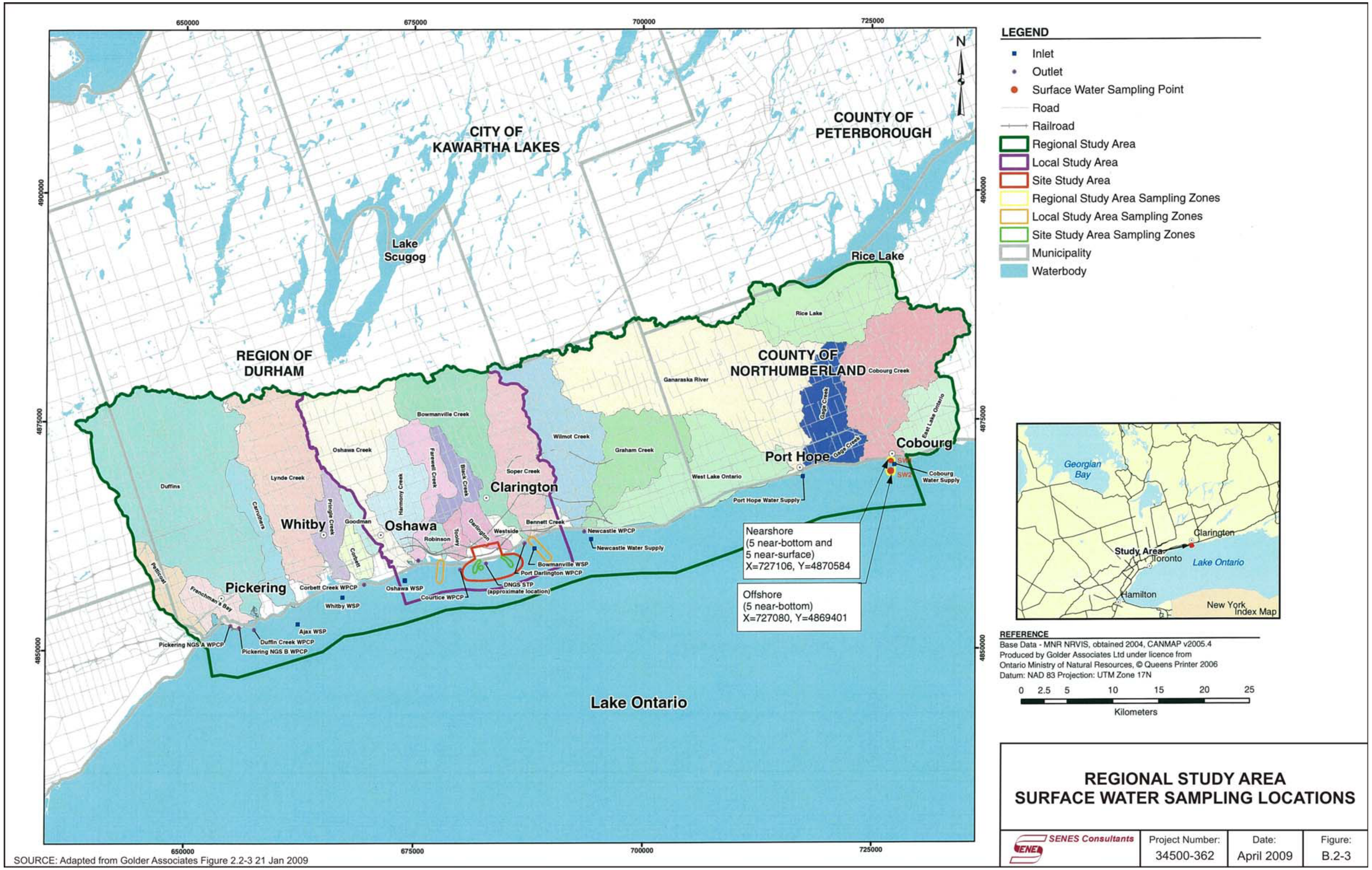
Table B.2-1: Reference Figures for the ERA Sampling Program

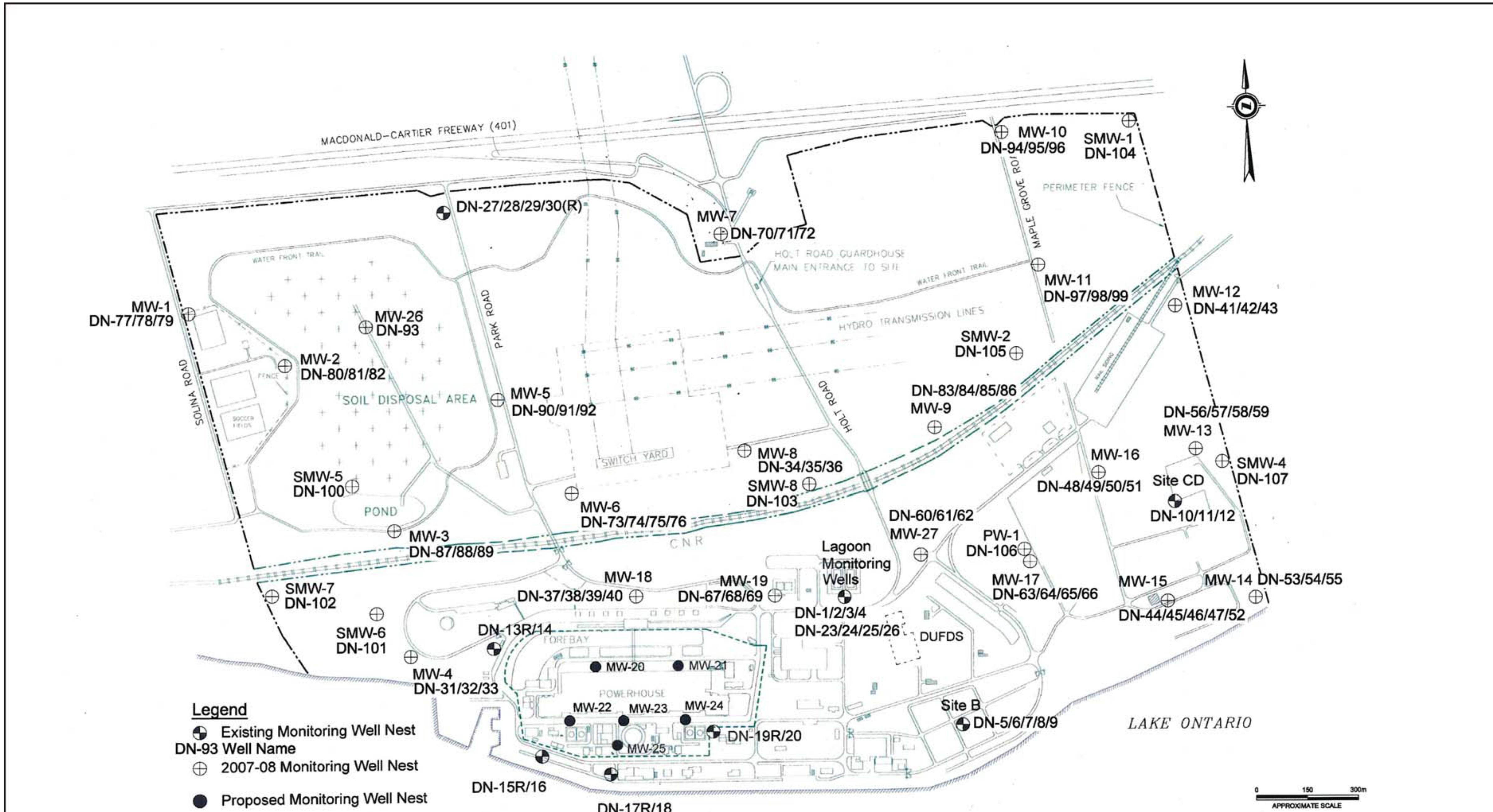
Figure Name	Reference in the ERA Program	TSD of Origin (Reference TSD)	Figure Number
Site Study Area Surface Water Sampling Locations	SW7 – SW15	Surface Water Environment	B.2-1
Local Study Area Surface Water Sampling Locations	SW3 – SW6, SW6B	Surface Water Environment	B.2-2
Regional Study Area Surface Water Sampling Locations	SW1, SW2	Surface Water Environment	B.2-3
Groundwater and Soil Sampling Locations	▪ Borehole and monitoring well locations for soil and groundwater. ▪ Only groundwater depths within 2 m of surface considered in ERA (DN-78, 79, 82, 100, 92, 75, 72, 86, 95, 96, 99, 12, 107). ▪ Surficial soils collected at 2 depths (shallow: 1-2 cm; and deep: 20 cm) in the vicinity of MW-2; MW-5; MW-8; MW-11; MW-15.	Geology and Hydrogeology	B.2-4
Monitoring Locations for the Air Quality Program	Passive tritium samples	Atmospheric Environment	B.2-5



SOURCE: Adapted from Golder Associates Figure 2.2-1 21 Jan 2009


LEGEND
Surface Water Sampling Point
Local Study Area Sampling Zones
Site Study Area Sampling Zones
Site Study Area
Local Study Area
Waterbody
Watercourse
Railroad
Road
Whitby
Oshawa
Clarington
Port Darlington
Darlington Provincial Park
Lake Ontario
HIGHWAY 401
TAUNTON ROAD
HARMONY ROAD
HOLT ROAD
SOLINA ROAD
REGIONAL ROAD 42
CONCESSION ROAD 4
PARK ROAD
RITSON ROAD
SW3
SW4
SW5
SW6
SW6B
McLaughlin Bay REMP Location (Samples collected for R&R; 5 samples X=677140, Y=4859805
Nearshore (5 near-bottom and 5 near-surface) X=677975, Y=4859437
Offshore (5 near-bottom) X=677857, Y=4857652
Nearshore (5 near-bottom and 5 near-surface) X=687862, Y=4861976
Offshore (5 near-bottom) X=689747, Y=4860016
Georgian Bay
Study Area
Toronto
Clarington
Lake Ontario
Hamilton
New York
Index Map
REFERENCE
Base Data - MNR NRVIS, obtained 2004, CANMAP v2005.4
Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2006
Datum: NAD 83 Projection: UTM Zone 17N
0 1 2 4 6 8 10
Kilometers
LOCAL STUDY AREA
SURFACE WATER SAMPLING LOCATIONS
SENES Consultants
Project Number: 34500-362
Date: April 2009
Figure: B.2-2
SOURCE: Adapted from Golder Associates Figure 2.2-2 21 Jan 2009

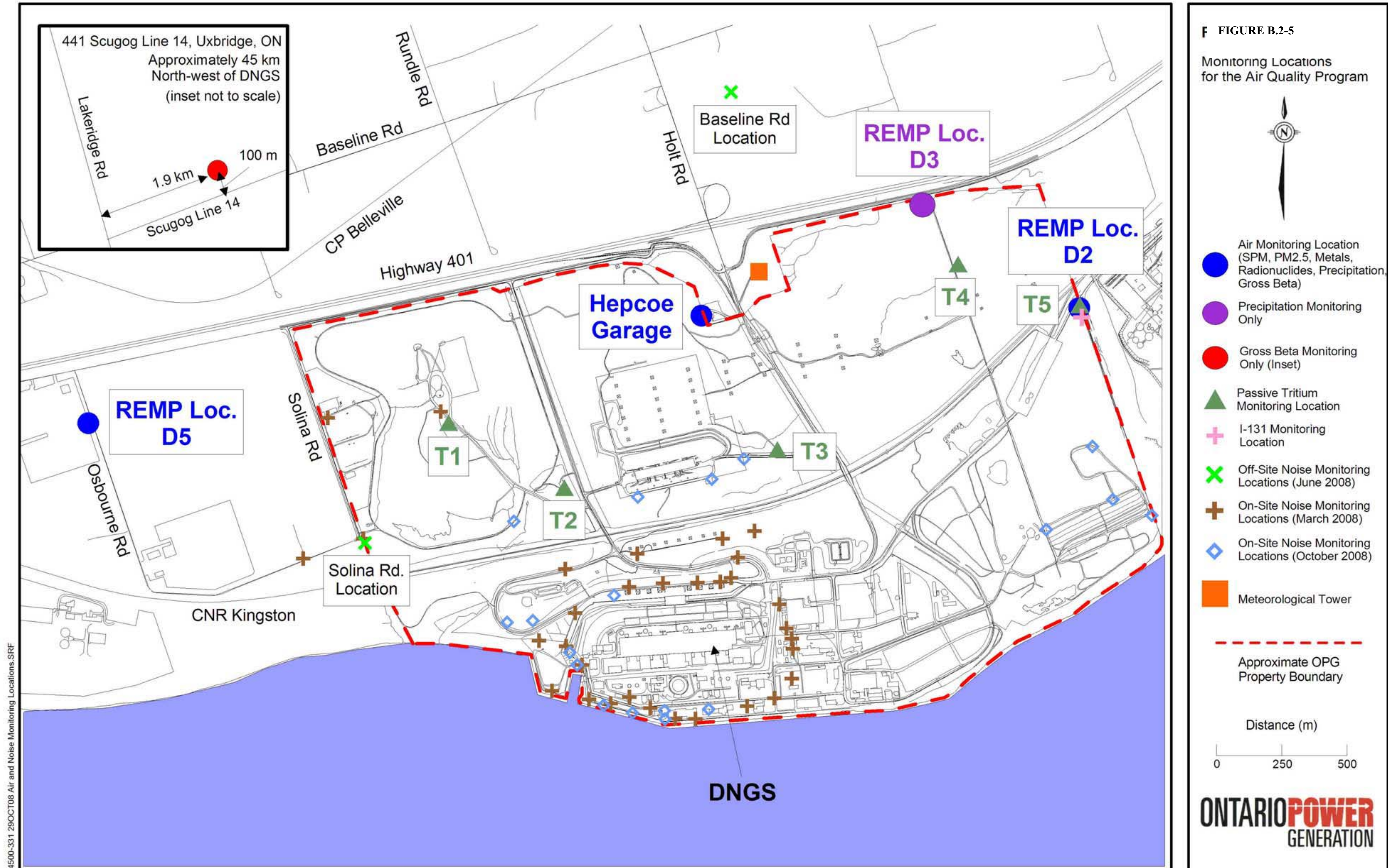

LEGEND
Inlet
Outlet
Surface Water Sampling Point
Road
Railroad
Regional Study Area
Local Study Area
Site Study Area
Regional Study Area Sampling Zones
Local Study Area Sampling Zones
Site Study Area Sampling Zones
Municipality
Waterbody
CITY OF KAWARTHA LAKES
COUNTY OF PETERBOROUGH
REGION OF DURHAM
COUNTY OF NORTHUMBERLAND
Lake Scugog
Rice Lake
Lake Ontario
Pickering
Whitby
Oshawa
Clarington
Port Hope
Cobourg
Nearshore
(5 near-bottom and
5 near-surface)
X=727106, Y=4870584
Offshore
(5 near-bottom)
X=727080, Y=4869401
REFERENCE
Base Data - MNR NRVIS, obtained 2004, CANMAP v2005.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2006
Datum: NAD 83 Projection: UTM Zone 17N
0 2.5 5 10 15 20 25
Kilometers
Georgian Bay
Study Area
Toronto
Clarington
Lake Ontario
Hamilton
New York
Index Map
REGIONAL STUDY AREA
SURFACE WATER SAMPLING LOCATIONS
SENES Consultants
Project Number: 34500-362
Date: April 2009
Figure: B.2-3
SOURCE: Adapted from Golder Associates Figure 2.2-3 21 Jan 2009



GROUNDWATER AND SOIL MONITORING LOCATIONS

SENES Consultants	Project Number:	Date:	Figure:
	34500-362	April 2009	B.2-4

SOURCE: Adapted from CH2MHILL Figure 3.2-1 25 Nov 2008


441 Scugog Line 14, Uxbridge, ON
Approximately 45 km
North-west of DNGS
(inset not to scale)
Lakeridge Rd
1.9 km
100 m
Scugog Line 14
Rundle Rd
Baseline Rd
CP Belleville
Highway 401
Holt Rd
Baseline Rd Location
REMP Loc. D3
REMP Loc. D2
Hepcoe Garage
T1
T2
T3
T4
T5
REMP Loc. D5
Solina Rd
Osbourne Rd
Solina Rd. Location
CNR Kingston
DNGS
34500-331 29OCT08 Air and Noise Monitoring Locations.SRF
FIGURE B.2-5
Monitoring Locations for the Air Quality Program
N
Air Monitoring Location (SPM, PM2.5, Metals, Radionuclides, Precipitation, Gross Beta)
Precipitation Monitoring Only
Gross Beta Monitoring Only (Inset)
Passive Tritium Monitoring Location
I-131 Monitoring Location
Off-Site Noise Monitoring Locations (June 2008)
On-Site Noise Monitoring Locations (March 2008)
On-Site Noise Monitoring Locations (October 2008)
Meteorological Tower
Approximate OPG Property Boundary
Distance (m)
0
250
500
ONTARIO POWER GENERATION

B.3 DATA TABLES

The tables in this section give summaries of the data that was collected for the sampling program outlined in Section B.1. For all of the data tables, an MDL formatted as 0.001 (130); 0.004 (10) indicates that for 130 of the samples, the MDL was 0.001, and for 10 of the samples the MDL was 0.004. In this case, the MDL was changed to reflect preliminary sampling results in order to enhance the sampling program. In the case of samples that were measured as below the MDL, ½ of the MDL was used, this is accepted by regulatory agencies such as Health Canada and the Ontario Ministry of the Environment. If there are only three or fewer samples, no statistics are presented.

Note that for some samples, the reported MDL is higher than some of the sample results. This may be due to improved detection limits beyond the generic method detection limit due to sample size or less dilution, for example.

B.3.1 Surface Water Data Tables

The tables in Section B.3.1 are of data collected at the surface water (SW) and pond sampling locations identified in Table B.2-1.

B.3.1.1 Conventional Constituents

Table B.3.1-1: Site (Lake Ontario) Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Alkalinity	General Chemistry	ppm CaCO3	140	5	100%	-	40	92	5	92	97	102
Aluminum	Metals	ppm	140	0.0001	100%	0.1	0.004	0.088	0.33	0.02	0.5	3.5
Aluminum (filtered)	Metals	ppm	140	0.0001	100%	0.075	0.002	0.006	0.003	0.006	0.01	0.01
Ammonia	Nutrients	ppm	140	0.01	79%	-	0.005	0.02	0.013	0.016	0.04	0.06
Ammonia (unionised)	Nutrients	ppm	140	NA	NA	0.02	0.00018	0.00067	0.00050	0.0006	0.00158	0.00270
Antimony	Metals	ppm	140	0.001	1%	0.02	0.0005	0.0005	0.0001	0.0005	0.0005	0.0018
Arsenic	Metals	ppm	140	0.001 (130); 0.004 (10)	1%	0.005	0.0005	0.0006	0.0004	0.0006	0.002	0.002
Barium	Metals	ppm	140	0.0001	100%	1000	0.02	0.040	0.08	0.03	0.15	0.6
Benzene	PetroHydrocarbon	ppb	35	0.1	0%	100	0.05	-	-	-	-	0.05
Beryllium	Metals	ppm	140	0.001	0%	1.1	0.0005	-	-	-	-	0.0005
Bicarbonate	General Chemistry	ppm $CaCO_3$	140	5	100%	-	40	92	5	92	97	102
Bismuth	Metals	ppm	140	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	Metals	ppm	140	0.0001	100%	0.2	0.02	0.13	0.6	0.04	0.65	6.9
Bromodichloromethane	THMs	ppb	14	0.1	0%	200	0.05	-	-	-	-	0.05
Bromoform	THMs	ppb	14	0.1	0%	60	0.05	-	-	-	-	0.05
Cadmium	Metals	ppm	140	0.0001	0%	0.000017	0.00005	-	-	-	-	0.00005
Calcium	Metals	ppm	140	0.0001	100%	-	31	35	3	35	40	41
Carbonate	General Chemistry	ppm $CaCO_3$	140	5	0%	-	2.5	-	-	-	-	2.5
Cesium	Metals	ppm	140	0.0001	1%	-	0.00005	0.00005	0.00001	0.00005	0.00005	0.0002
Chemical Oxygen Demand	Nutrients	ppm	35	1	83%	-	0.5	3.1	2.1	2.3	6.0	8.0
Chloroform	THMs	ppb	14	0.1	0%	1.8	0.05	-	-	-	-	0.05
Chromium	Metals	ppm	140	0.0001	61%	0.05	0.00005	0.0006	0.0005	0.0003	0.0013	0.0017
Chromium (III)	Metals	ppm	35	0.0001	43%	0.0089	0.00005	0.0004	0.0005	0.00017	0.0014	0.0017
Chromium(VI)	Metals	ppm	35	0.005	0%	0.001	0.0025	-	-	-	-	0.0025
Cobalt	Metals	ppm	140	0.0001	62%	0.0009	0.00005	0.0004	0.0007	0.00016	0.0019	0.0023
Conductivity	General Chemistry	mS/m	140	0.1	100%	-	29	30	0.5	30	31	32.5
Copper	Metals	ppm	140	0.0001	100%	0.003	0.0006	0.001	0.0004	0.0012	0.002	0.004
Dibromochloromethane	THMs	ppb	14	0.1	0%	-	0.05	-	-	-	-	0.05
E.coli	Bacteria	/100mL	140	1	50%	-	0.5	59	230	2.3	200	1640
Ethylbenzene	PetroHydrocarbon	ppb	35	0.1	0%	8	0.05	-	-	-	-	0.05
F1 Petroleum Hydrocarbons C6-10	PetroHydrocarbon	ppb	56	100	0%	-	50	-	-	-	-	50

Table B.3.1-1: Site (Lake Ontario) Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
F2 Petroleum Hydrocarbons C10-16	PetroHydrocarbon	ppb	56	100	0%	-	50	-	-	-	-	50
F3 Petroleum Hydrocarbons C16-34	PetroHydrocarbon	ppb	56	100	0%	-	50	-	-	-	-	50
F4 Petroleum Hydrocarbons C34-50	PetroHydrocarbon	ppb	56	100	0%	-	50	-	-	-	-	50
Field pH	General Chemistry	units	30	-	100%	-	7.8	8.1	0.3	8.1	8.7	8.7
Field Temperature	General Chemistry	Deg C	31	-	100%	-	5.4	13.5	6	12	23	24
Field Tot. Res. Chlorine	General Chemistry	mg/L	9	0.002	0%	-	0.001	-	-	-	-	0.001
Field Tot. Res. Chlorine	General Chemistry	ppm	12	0.002	0%	-	0.001	-	-	-	-	0.001
Hydrazine	Special	ppm	56	0.005	0%	-	0.0025	-	-	-	-	0.0025
Hydroxide	General Chemistry	ppm $CaCO_3$	140	5	0%	-	2.5	-	-	-	-	2.5
Iron	Metals	ppm	140	0.001	100%	0.3	0.006	0.03	0.02	0.02	0.08	0.13
Lead	Metals	ppm	140	0.0001	34%	0.004	0.00005	0.0001	0.0003	0.00008	0.00045	0.003
Lithium	Metals	ppm	140	0.0001	100%	-	0.002	0.003	0.0005	0.003	0.004	0.0045
m/p-Xylene	PetroHydrocarbon	ppb	35	0.1	0%	-	0.05	-	-	-	-	0.05
Magnesium	Metals	ppm	140	0.0001	100%	-	7.6	9.6	1.1	9.5	10.8	11.1
Manganese	Metals	ppm	140	0.0001	100%	-	0.0003	0.0014	0.0008	0.0012	0.003	0.005
Mercury	Metals-Special	ppm	56	0.0001	0%	0.000026	0.00005	-	-	-	-	0.00005
Molybdenum	Metals	ppm	140	0.0001	100%	0.04	0.001	0.0014	0.00009	0.0014	0.0014	0.002
Morpholine	Special	ppm	84	0.001	2%	0.004	0.0005	0.0005	0.0002	0.0005	0.0005	0.002
Nickel	Metals	ppm	140	0.0001	100%	0.025	0.0005	0.0007	0.0001	0.0007	0.001	0.001
Nitrate	Nutrients	ppm	140	0.01	100%	-	1.1	2.8	9.3	1.7	2.1	89.7
Nitrite	Nutrients	ppm	140	0.01	27%	-	0.005	0.007	0.004	0.006	0.02	0.02
o-Xylene	PetroHydrocarbon	ppb	35	0.1	0%	-	0.05	-	-	-	-	0.05
PCB in Water	PCB	ppb	56	0.05	0%	0.001	0.025	-	-	-	-	0.025
pH	General Chemistry	units	140	-	100%	-	6.6	8.2	0.3	8.1	8.6	8.6
Phosphorus	Nutrients	ppm	140	0.002 (105); 0.01 (35)	89%	-	0.0029	0.01	0.01	0.008	0.04	0.05
Potassium	Metals	ppm	140	0.001	100%	-	1.4	1.8	0.3	1.8	2.1	3.5
Selenium	Metals	ppm	140	0.001	1%	0.001	0.0005	0.0005	0.00005	0.0005	0.0005	0.001
Silver	Metals	ppm	140	0.0001	0%	0.0001	0.00005	-	-	-	-	0.00005

Table B.3.1-1: Site (Lake Ontario) Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Sodium	Metals	ppm	140	0.0001	100%	200	11	15.2	2.09	15.01	17.4	21
Strontium	Metals	ppm	140	0.0001	100%	-	0.17	0.20	0.01	0.19	0.21	0.22
Thallium	Metals	ppm	140	0.0001	0%	0.0003	0.00005	-	-	-	-	0.00005
Thorium	Metals	ppm	140	0.0001	4%	-	0.00005	0.00006	0.00005	0.00005	0.00005	0.0006
Tin	Metals	ppm	140	0.0001	8%	-	0.00005	0.00007	0.0001	0.00006	0.0001	0.0016
Titanium	Metals	ppm	140	0.0001	100%	-	0.00075	0.002	0.002	0.0017	0.0057	0.016
Toluene	PetroHydrocarbon	ppb	35	0.1	3%	0.8	0.05	0.05	0.008	0.05	0.05	0.1
Total Coliforms	Bacteria	/100mL	140	1	91%	-	0.5	407	806	45	2070	5310
Total Dissolved Solids(105 C)	General Chemistry	ppm	140	2	100%	-	131	180	26	178	203	324
Total Hardness	General Chemistry	ppm $CaCO_3$	140	1	100%	-	108	128	10.5	127	144	147
Total Kjeldahl Nitrogen	Nutrients	ppm	140	0.5	1%	-	0.25	0.3	0.06	0.25	0.25	0.9
Total Organic Carbon	Nutrients	ppm	56	0.2	100%	-	2.0	2.4	0.3	2.3	2.7	4.1
Total Suspended Solids (105 C)	General Chemistry	ppm	140	2	29%	-	1.0	2.2	2.6	1.5	8	16
Tungsten	Metals	ppm	140	0.0001	34%	0.03	0.00005	0.00008	0.00004	0.00007	0.0001	0.0003
Turbidity	General Chemistry	NTU	140	0.1	100%	-	0.14	0.9	0.6	0.76	1.9	5
Uranium	Metals	ppm	140	0.0001	100%	0.005	0.0003	0.0004	0.00004	0.0004	0.0004	0.0006
Vanadium	Metals	ppm	140	0.0001	56%	0.006	0.00005	0.0003	0.0003	0.0002	0.0008	0.001
Zinc	Metals	ppm	140	0.0001	99%	0.02	0.00005	0.00245	0.0022	0.0017	0.007	0.01
Zirconium	Metals	ppm	140	0.0001	15%	0.004	0.00005	0.00095	0.0052	0.00008	0.006	0.057

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 ppm, and 10 samples analyzed at 0.004 ppm) 0.001 (130); '0.004 (10).

Table B.3.1-2: Local (Lake Ontario) Background Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Alkalinity	General Chemistry	ppm $CaCO_3$	120	5	100%	-	85	93	3	93	98	107
Aluminum	Metals	ppm	120	0.0001	100%	0.1	0.005	0.067	0.16	0.022	0.6	0.73
Aluminum (filtered)	Metals	ppm	120	0.0001	100%	0.075	0.002	0.006	0.004	0.005	0.0125	0.019
Ammonia	Nutrients	ppm	120	0.01	73%	-	0.005	0.018	0.013	0.014	0.04	0.06
Ammonia (unionised)	Nutrients	ppm	120	NA	NA	0.02	0.00003	0.00072	0.00065	0.00060	0.00230	0.00295
Antimony	Metals	ppm	120	0.001	0%	0.02	0.0005	-	-	-	-	0.0005
Arsenic	Metals	ppm	120	0.001 (110); 0.004 (10)	8%	0.005	0.0005	0.0007	0.0004	0.0006	0.002	0.002
Barium	Metals	ppm	120	0.0001	100%	1000	0.017	0.038	0.054	0.027	0.17	0.3
Benzene	PetroHydrocarbon	ppb	30	0.1	0%	100	0.05	-	-	-	-	0.05
Beryllium	Metals	ppm	120	0.001	0%	1.1	0.0005	-	-	-	-	0.0005
Bicarbonate	General Chemistry	ppm $CaCO_3$	120	5	100%	-	85	93	3	93	98	107
Bismuth	Metals	ppm	120	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	Metals	ppm	120	0.0001	100%	0.2	0.02	0.1	0.25	0.04	0.9	1.2
Bromodichloromethane	THMs	ppb	12	0.1	0%	200	0.05	-	-	-	-	0.05
Bromoform	THMs	ppb	12	0.1	0%	60	0.05	-	-	-	-	0.05
Cadmium	Metals	ppm	120	0.0001	1%	0.000017	0.00005	0.00005	0.00001	0.00005	0.00005	0.0001
Calcium	Metals	ppm	120	0.0001	100%	-	28	36	4	36	42.5	44
Carbonate	General Chemistry	ppm $CaCO_3$	120	5	0%	-	2.5	-	-	-	-	2.5
Cesium	Metals	ppm	120	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Chemical Oxygen Demand	Nutrients	ppm	30	1	77%	-	0.5	3	2	2	6	8
Chloroform	THMs	ppb	12	0.1	0%	1.8	0.05	-	-	-	-	0.05
Chromium	Metals	ppm	120	0.0001	91%	0.05	0.00005	0.001	0.0007	0.0008	0.002	0.006
Chromium (III)	Metals	ppm	30	0.0001	63%	0.0089	0.00005	0.001	0.001	0.0004	0.003	0.006
Chromium(VI)	Metals	ppm	30	0.005	0%	0.001	0.0025	-	-	-	-	0.0025
Cobalt	Metals	ppm	120	0.0001	68%	0.0009	0.00005	0.0004	0.0006	0.0002	0.0015	0.0016
Conductivity	General Chemistry	mS/m	120	0.1	100%	-	29.3	30.1	0.4	30.1	30.8	31.2
Copper	Metals	ppm	120	0.0001	100%	0.003	0.0006	0.0015	0.004	0.001	0.002	0.041
Dibromochloromethane	THMs	ppb	12	0.1	0%	-	0.05	-	-	-	-	0.05
E.coli	Bacteria	/100mL	120	1	55%	-	0.5	15.8	37.3	2.4	102.5	200

Table B.3.1-2: Local (Lake Ontario) Background Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ethylbenzene	PetroHydrocarbon	ppb	30	0.1	0%	8	0.05	-	-	-	-	0.05
F1 Petroleum Hydrocarbons C6-10	PetroHydrocarbon	ppb	48	100	0%	-	50	-	-	-	-	50
F2 Petroleum Hydrocarbons C10-16	PetroHydrocarbon	ppb	48	100	0%	-	50	-	-	-	-	50
F3 Petroleum Hydrocarbons C16-34	PetroHydrocarbon	ppb	48	100	0%	-	50	-	-	-	-	50
F4 Petroleum Hydrocarbons C34-50	PetroHydrocarbon	ppb	48	100	0%	-	50	-	-	-	-	50
Field pH	General Chemistry	Units	29	-	100%	-	6.1	8.1	0.5	8.1	8.6	8.8
Field Temperature	General Chemistry	Deg C	29	-	100%	-	4.9	12.8	5.2	11.8	20.8	21.0
Field Tot. Res. Chlorine	General Chemistry	mg/L	8	0.002	0%	-	0.001	-	-	-	-	0.001
Field Tot. Res. Chlorine	General Chemistry	ppm	10	0.002	0%	-	0.001	-	-	-	-	0.001
Hydrazine	Special	ppm	48	0.005	0%	-	0.0025	-	-	-	-	0.0025
Hydroxide	General Chemistry	ppm $CaCO_3$	120	5	0%	-	2.5	-	-	-	-	2.5
Iron	Metals	ppm	120	0.001	99%	0.3	0.0005	0.024	0.017	0.02	0.05	0.084
Lead	Metals	ppm	120	0.0001	54%	0.004	0.00005	0.0002	0.0002	0.0001	0.0005	0.002
Lithium	Metals	ppm	120	0.0001	100%	-	0.002	0.0027	0.0003	0.0027	0.0033	0.0036
m/p-Xylene	PetroHydrocarbon	ppb	30	0.1	17%	-	0.05	0.06	0.02	0.06	0.12	0.13
Magnesium	Metals	ppm	120	0.0001	100%	-	7.7	9.5	1.2	9.5	10.8	11.2
Manganese	Metals	ppm	120	0.0001	100%	-	0.0003	0.0012	0.0006	0.0011	0.002	0.003
Mercury	Metals-Special	ppm	48	0.0001	0%	0.000026	0.00005	-	-	-	-	0.00005
Molybdenum	Metals	ppm	120	0.0001	100%	0.04	0.0010	0.0013	0.0001	0.0013	0.0015	0.0018
Morpholine	Special	ppm	72	0.001	1%	0.004	0.0005	0.0005	0.0001	0.0005	0.0005	0.001
Nickel	Metals	ppm	120	0.0001	100%	0.025	0.0003	0.0007	0.0002	0.0007	0.0011	0.0012
Nitrate	Nutrients	ppm	120	0.01	100%	-	1.1	1.7	0.4	1.7	2.2	4.8
Nitrite	Nutrients	ppm	120	0.01	25%	-	0.005	0.008	0.009	0.007	0.02	0.05
o-Xylene	PetroHydrocarbon	ppb	30	0.1	0%	-	0.05	-	-	-	-	0.05
PCB in Water	PCB	ppb	48	0.05	0%	0.001	0.025	-	-	-	-	0.025
pH	General Chemistry	units	120	-	100%	-	7.5	8.1	0.2	8.1	8.6	8.7
Phosphorus	Nutrients	ppm	120	0.002	83%	-	0.003	0.007	0.0045	0.006	0.016	0.03

Table B.3.1-2: Local (Lake Ontario) Background Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
				(90); 0.01 (30)								
Potassium	Metals	ppm	120	0.001	100%	-	1.3	1.7	0.2	1.7	2.0	2.2
Selenium	Metals	ppm	120	0.001	3%	0.001	0.0005	0.0005	0.0001	0.0005	0.0005	0.0013
Silver	Metals	ppm	120	0.0001	0%	0.0001	0.00005	-	-	-	-	0.00005
Sodium	Metals	ppm	120	0.0001	100%	200	11.5	15	2.1	14.8	17.6	18.3
Strontium	Metals	ppm	120	0.0001	100%	-	0.17	0.19	0.01	0.19	0.21	0.21
Thallium	Metals	ppm	120	0.0001	0%	0.0003	0.00005	-	-	-	-	0.00005
Thorium	Metals	ppm	120	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Tin	Metals	ppm	120	0.0001	5%	-	0.00005	0.0001	0.0004	0.00005	0.00005	0.004
Titanium	Metals	ppm	120	0.0001	100%	-	0.0002	0.002	0.0019	0.0016	0.0075	0.0096
Toluene	PetroHydrocarbon	ppb	30	0.1	17%	0.8	0.05	0.06	0.03	0.06	0.13	0.15
Total Coliforms	Bacteria	/100mL	120	1	91%	-	0.5	289.5	495	58.5	1370	2710
Total Dissolved Solids(105 C)	General Chemistry	ppm	120	2	100%	-	121	176.5	21	175	207	228
Total Hardness	General Chemistry	ppm $CaCO_3$	120	1	100%	-	104	130	14	129	151	157
Total Kjeldahl Nitrogen	Nutrients	ppm	120	0.5	0%	-	0.25	-	-	-	-	0.25
Total Organic Carbon	Nutrients	ppm	48	0.2	100%	-	2.0	2.3	0.2	2.3	2.6	3.1
Total Suspended Solids (105 C)	General Chemistry	ppm	120	2	26%	-	1.0	1.6	1.3	1.4	4.3	10.5
Tungsten	Metals	ppm	120	0.0001	41%	-	0.00005	0.00008	0.00004	0.00007	0.00014	0.00016
Turbidity	General Chemistry	NTU	120	0.1	100%	-	0.1	0.9	0.5	0.7	1.6	3
Uranium	Metals	ppm	120	0.0001	100%	0.005	0.0003	0.0004	0	0.0004	0.0004	0.0004
Vanadium	Metals	ppm	120	0.0001	58%	0.006	0.00005	0.0003	0.0003	0.0002	0.0008	0.001
Zinc	Metals	ppm	120	0.0001	100%	0.02	0.0004	0.003	0.004	0.002	0.007	0.03
Zirconium	Metals	ppm	120	0.0001	16%	0.004	0.00005	0.0007	0.002	0.00008	0.008	0.01

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 ppm, and 10 samples analyzed at 0.004 ppm) 0.001 (130); '0.004 (10).

Table B.3.1-3: Regional (Lake Ontario) Background Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Alkalinity	General Chemistry	ppm $CaCO_3$	45	5	100%	-	78	92	3.6	92	97.5	99
Aluminum	Metals	ppm	45	1E-04	100%	0.1	0.0046	0.1	0.5	0.02	0.45	2.8
Aluminum (filtered)	Metals	ppm	45	1E-04	100%	0.075	0.001	0.007	0.004	0.005	0.013	0.017
Ammonia	Nutrients	ppm	45	0.01	64%	-	0.005	0.015	0.01	0.01	0.03	0.06
Ammonia (unionised)	Nutrients	ppm	45	-	100%	0.02	0.0001	0.0009	0.001	0.0005	0.002	0.006
Antimony	Metals	ppm	45	0.001	0%	0.02	0.0005	-	-	-	-	0.0005
Arsenic	Metals	ppm	45	0.001	7%	0.005	0.0005	0.0006	0.0002	0.0005	0.001	0.0015
Barium	Metals	ppm	45	1E-04	100%	1000	0.02	0.02	0.001	0.025	0.03	0.03
Beryllium	Metals	ppm	45	0.001	0%	1.1	0.0005	-	-	-	-	0.0005
Bicarbonate	General Chemistry	ppm $CaCO_3$	45	5	100%	-	77.9	90.4	5.0	90.3	97.5	98.7
Bismuth	Metals	ppm	45	0.001	2%	-	0.0005	0.0005	0.0002	0.0005	0.0005	0.0018
Boron	Metals	ppm	45	1E-04	100%	0.2	0.025	0.043	0.040	0.037	0.07	0.26
Bromodichloromethane	THMs	ppb	6	0.1	0%	200	0.05	-	-	-	-	0.05
Bromoform	THMs	ppb	6	0.1	0%	60	0.05	-	-	-	-	0.05
Cadmium	Metals	ppm	45	1E-04	0%	0.000017	0.00005	-	-	-	-	0.00005
Calcium	Metals	ppm	45	1E-04	100%	-	31.8	35.7	3.5	35.5	41.5	42
Carbonate	General Chemistry	ppm $CaCO_3$	45	5	22%	-	2.5	3.5	2.1	3.2	8.3	9
Cesium	Metals	ppm	45	1E-04	2%	-	0.00005	0.00005	0.00001	0.00005	0.00005	0.0001
Chloroform	THMs	ppb	6	0.1	0%	1.8	0.05	-	-	-	-	0.05
Chromium	Metals	ppm	45	1E-04	67%	0.05	0.00005	0.0009	0.0007	0.0004	0.002	0.003
Cobalt	Metals	ppm	45	1E-04	71%	0.0009	0.00005	0.0001	0.00007	0.00009	0.0002	0.00047
Conductivity	General Chemistry	mS/m	45	0.1	100%	-	29	30	0	30	30	31
Copper	Metals	ppm	45	1E-04	100%	0.003	0.0009	0.001	0.0001	0.001	0.0013	0.0015
Dibromochloromethane	THMs	ppb	6	0.1	0%	-	0.05	-	-	-	-	0.05
E.coli	Bacteria	/100mL	45	1	64%	-	0.5	10	15	2	43	48
F1 Petroleum Hydrocarbons C6-10	PetroHydrocarbon	ppb	21	100	0%	-	50	-	-	-	-	50
F2 Petroleum Hydrocarbons C10-16	PetroHydrocarbon	ppb	21	100	0%	-	50	-	-	-	-	50
F3 Petroleum Hydrocarbons C16-34	PetroHydrocarbon	ppb	21	100	5%	-	50.0	52	11	52	50	100

Table B.3.1-3: Regional (Lake Ontario) Background Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
F4 Petroleum Hydrocarbons C34-50	PetroHydrocarbon	ppb	21	100	0%	-	50	-	-	-	-	50
Field pH	General Chemistry	Units	11	-	100%	-	7.9	8	0.2	8	8.5	8.5
Field Temperature	General Chemistry	Deg C	11	-	100%	-	7.3	15	5	14	21.5	21.5
Field Tot. Res. Chlorine	General Chemistry	mg/L	4	0.002	0%	-	0.001	-	-	-	-	0.001
Field Tot. Res. Chlorine	General Chemistry	ppm	2	0.002	0%	-	0.001	-	-	-	-	0.001
Hydrazine	Special	ppm	21	0.005	0%	-	0.0025	-	-	-	-	0.0025
Hydroxide	General Chemistry	ppm $CaCO_3$	45	5	0%	-	2.5	-	-	-	-	2.5
Iron	Metals	ppm	45	0.001	100%	0.3	0.003	0.02	0.02	0.02	0.04	0.09
Lead	Metals	ppm	45	1E-04	38%	0.004	0.00005	0.0002	0.0004	0.00009	0.0005	0.002
Lithium	Metals	ppm	45	1E-04	100%	-	0.002	0.003	0.0006	0.0031	0.004	0.004
Magnesium	Metals	ppm	45	1E-04	100%	-	8	9.5	0.8	9.5	10	11
Manganese	Metals	ppm	45	1E-04	100%	-	0.0005	0.001	0.0006	0.0012	0.0024	0.003
Mercury	Metals-Special	ppm	21	1E-04	0%	0.000026	0.00005	-	-	-	-	0.00005
Molybdenum	Metals	ppm	45	1E-04	100%	0.04	0.0012	0.0013	0.0001	0.0013	0.0014	0.0016
Morpholine	Special	ppm	21	0.001	0%	0.004	0.0005	-	-	-	-	0.0005
Nickel	Metals	ppm	45	1E-04	100%	0.025	0.0006	0.0007	0.0001	0.0007	0.0009	0.001
Nitrate	Nutrients	ppm	45	0.01	100%	-	1.0	1.7	0.7	1.6	1.9	5.9
Nitrite	Nutrients	ppm	45	0.01	33%	-	0.005	0.009	0.007	0.008	0.02	0.02
PCB in Water	PCB	ppb	21	0.05	0%	0.001	0.025					0.025
pH	General Chemistry	units	45	-	100%	-	7.2	8.2	0.4	8.2	8.8	8.8
Phosphorus	Nutrients	ppm	45	0.002	100%	-	0.0037	0.0058	0.0016	0.0056	0.0084	0.0087
Potassium	Metals	ppm	45	0.001	100%	-	1.5	1.7	0.1	1.7	1.9	1.9
Selenium	Metals	ppm	45	0.001	0%	0.001	0.0005	-	-	-	-	0.0005
Silver	Metals	ppm	45	1E-04	0%	0.0001	0.00005	-	-	-	-	0.00005
Sodium	Metals	ppm	45	1E-04	100%	200	12	15	1.7	15	17	17
Strontium	Metals	ppm	45	1E-04	100%	-	0.17	0.2	0.01	0.19	0.21	0.22
Thallium	Metals	ppm	45	1E-04	0%	0.0003	0.00005	-	-	-	-	0.00005
Thorium	Metals	ppm	45	1E-04	0%	-	0.00005	-	-	-	-	0.00005
Tin	Metals	ppm	45	1E-04	2%	-	0.00005	0.00006	0.00005	0.00005	0.00005	0.0004

Table B.3.1-3: Regional (Lake Ontario) Background Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Titanium	Metals	ppm	45	1E-04	100%	-	0.0008	0.0012	0.0002	0.0012	0.0016	0.0017
Total Coliforms	Bacteria	/100mL	45	1	100%	-	6	660	812	261	1780	4290
Total Dissolved Solids(105 C)	General Chemistry	ppm	45	2	100%	-	133	165.5	14	164.8	185	188
Total Hardness	General Chemistry	ppm $CaCO_3$	45	1	100%	-	118	128.5	9.5	128.2	145	150
Total Kjeldahl Nitrogen	Nutrients	ppm	45	0.5	0%	-	0.25	-	-	-	-	0.25
Total Organic Carbon	Nutrients	ppm	21	0.2	100%	-	2.1	2.4	0.1	2.4	2.6	2.7
Total Suspended Solids (105 C)	General Chemistry	ppm	45	2	27%	-	1.0	1.7	1.3	1.4	4.4	6.3
Tungsten	Metals	ppm	45	1E-04	40%	0.03	0.00005	0.00009	0.00005	0.00008	0.00015	0.00025
Turbidity	General Chemistry	NTU	45	0.1	100%	-	0.2	0.8	0.5	0.7	1.6	1.8
Uranium	Metals	ppm	45	1E-04	100%	0.005	0.0003	0.0004	0.0001	0.0004	0.0005	0.0005
Vanadium	Metals	ppm	45	1E-04	47%	0.006	0.00005	0.00028	0.00029	0.00015	0.0007	0.001
Zinc	Metals	ppm	45	1E-04	100%	0.02	0.0006	0.002	0.001	0.002	0.0047	0.0049
Zirconium	Metals	ppm	45	1E-04	2%	0.004	0.00005	0.00005	0.00001	0.00005	0.00005	0.0001

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 ppm, and 10 samples analyzed at 0.004 ppm) 0.001 (130); '0.004 (10).

Table B.3.1-4: Coots Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Alkalinity	General Chemistry	ppm $CaCO_3$	20	5	100%	-	94	185	68	172	269	281
Aluminum	Metals	ppm	20	0.0001	100%	0.1	0.01	0.7	1.1	0.17	2.74	2.94
Aluminum (filtered)	Metals	ppm	20	0.0001	100%	0.075	0.007	0.04	0.06	0.02	0.18	0.19
Ammonia	Nutrients	ppm	20	0.01	90%	-	0.005	0.3	0.5	0.04	1.2	1.2
Ammonia (unionised)	Nutrients	ppm	20	-	100%	0.02	0.0008	0.01	0.02	0.004	0.05	0.05
Antimony	Metals	ppm	20	0.001	5%	0.02	0.0005	0.0005	0.0001	0.0005	0.0005	0.001
Arsenic	Metals	ppm	20	0.001 (15); 0.004 (5)	0%	0.005	0.0005	-	-	-	-	0.002
Barium	Metals	ppm	20	0.0001	100%	1000	0.01	0.05	0.03	0.04	0.1	0.1
Benzene	PetroHydrocarbon	ppb	5	0.1	0%	100	0.05	-	-	-	-	0.05
Beryllium	Metals	ppm	20	0.001	0%	1.1	0.0005	-	-	-	-	0.0005
Bicarbonate	General Chemistry	ppm $CaCO_3$	20	5	100%	-	52	175	83	150	269	281
Bismuth	Metals	ppm	20	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	Metals	ppm	20	0.0001	100%	0.2	0.2	0.35	0.1	0.34	0.52	0.53
Bromodichloromethane	THMs	ppb	2	0.1	0%	200	0.05	-	-	-	-	0.05
Bromoform	THMs	ppb	2	0.1	0%	60	0.05	-	-	-	-	0.05
Cadmium	Metals	ppm	20	0.0001	0%	0.000017	0.00005	-	-	-	-	0.00005
Calcium	Metals	ppm	20	0.0001	100%	-	19	49	25	43	83	86
Carbonate	General Chemistry	ppm $CaCO_3$	20	5	25%	-	2.5	12	17	5	42	42
Cesium	Metals	ppm	20	0.0001	25%	-	0.00005	0.00008	0.00005	0.00007	0.00016	0.00016
Chemical Oxygen Demand	Nutrients	ppm	5	1	100%	-	24	27	1.6	27	28	28
Chloroform	THMs	ppb	2	0.1	50%	1.8	0.05	-	-	-	-	0.1
Chromium	Metals	ppm	20	0.0001	75%	0.05	0.00005	0.0014	0.001	0.0006	0.002	0.004
Chromium (III)	Metals	ppm	5	0.0001	100%	0.0089	0.00012	0.0017	0.0016	0.001	0.0039	0.004
Chromium(VI)	Metals	ppm	5	0.005	0%	0.001	0.0025	-	-	-	-	0.0025
Cobalt	Metals	ppm	20	0.0001	100%	0.0009	0.00015	0.001	0.0015	0.0007	0.004	0.004
Conductivity	General Chemistry	mS/m	20	0.1	100%	-	44	60	15	59	76	77
Copper	Metals	ppm	20	0.0001	100%	0.003	0.0005	0.001	0.0004	0.001	0.0015	0.0015
Dibromochloromethane	THMs	ppb	2	0.1	0%	-	0.05	-	-	-	-	0.05
E.coli	Bacteria	/100mL	20	1	100%	-	5.0	32	30	22	84	101

Table B.3.1-4: Coots Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ethylbenzene	PetroHydrocarbon	ppb	5	0.1	0%	8	0.05	-	-	-	-	0.05
F1 Petroleum Hydrocarbons C6-10	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F2 Petroleum Hydrocarbons C10-16	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F3 Petroleum Hydrocarbons C16-34	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F4 Petroleum Hydrocarbons C34-50	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
Field pH	General Chemistry	Units	4	-	100%	-	8.3	8.6	0.5	8.6	9.2	9.3
Field Temperature	General Chemistry	Deg C	4	-	100%	-	5.7	16.6	7.5	14.7	22.2	22.5
Hydrazine	Special	ppm	8	0.005	0%	-	0.0025	-	-	-	-	0.0025
Hydroxide	General Chemistry	ppm $CaCO_3$	20	5	0%	-	2.5	-	-	-	-	2.5
Iron	Metals	ppm	20	0.001	100%	0.3	0.02	0.4	0.5	0.15	1.2	1.3
Lead	Metals	ppm	20	0.0001	80%	0.004	0.00005	0.0003	0.0003	0.0002	0.001	0.001
Lithium	Metals	ppm	20	0.0001	100%	-	0.005	0.009	0.002	0.008	0.01	0.01
m/p-Xylene	PetroHydrocarbon	ppb	5	0.1	0%	-	0.05	-	-	-	-	0.05
Magnesium	Metals	ppm	20	0.0001	100%	-	25	32	4	32	38	38
Manganese	Metals	ppm	20	0.0001	100%	-	0.015	0.04	0.02	0.036	0.065	0.07
Mercury	Metals-Special	ppm	8	0.0001	0%	0.000026	0.00005	-	-	-	-	0.00005
Molybdenum	Metals	ppm	20	0.0001	100%	0.04	0.00017	0.0007	0.0005	0.0005	0.0015	0.0015
Morpholine	Special	ppm	12	0.001	0%	0.004	0.0005					0.0005
Nickel	Metals	ppm	20	0.0001	100%	0.025	0.0005	0.001	0.0005	0.001	0.0019	0.0019
Nitrate	Nutrients	ppm	20	0.01	75%	-	0.005	0.08	0.07	0.04	0.16	0.2
Nitrite	Nutrients	ppm	20	0.01	25%	-	0.005	0.02	0.03	0.01	0.08	0.08
o-Xylene	PetroHydrocarbon	ppb	5	0.1	0%	-	0.05	-	-	-	-	0.05
PCB in Water	PCB	ppb	8	0.05	0%	0.001	0.025	-	-	-	-	0.025
pH	General Chemistry	units	20	-	100%	-	8	8.5	0.5	8.5	9.4	9.4
Phosphorus	Nutrients	ppm	20	0.002 (15); 0.01 (5)	100%	-	0.005	0.044	0.041	0.03	0.15	0.12
Potassium	Metals	ppm	20	0.001	100%	-	4.9	7.7	2.8	7.2	11.8	12.0
Selenium	Metals	ppm	20	0.001	0%	0.001	0.0005	-	-	-	-	0.0005
Silver	Metals	ppm	20	0.0001	0%	0.0001	0.00005	-	-	-	-	0.00005

Table B.3.1-4: Coots Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Sodium	Metals	ppm	20	0.0001	100%	200	27.4	38.0	6.0	37.5	43.4	43.8
Strontium	Metals	ppm	20	0.0001	100%	-	0.27	0.51	0.18	0.47	0.72	0.73
Thallium	Metals	ppm	20	0.0001	0%	0.0003	0.00005	-	-	-	-	0.00005
Thorium	Metals	ppm	20	0.0001	25%	-	0.00005	0.00012	0.00012	0.00008	0.00034	0.00037
Tin	Metals	ppm	20	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Titanium	Metals	ppm	20	0.0001	100%	-	0.003	0.03	0.033	0.01	0.085	0.092
Toluene	PetroHydrocarbon	ppb	5	0.1	0%	0.8	0.05	-	-	-	-	0.05
Total Coliforms	Bacteria	/100mL	20	1	100%	-	165	3269	6187	642	16697	20050
Total Dissolved Solids(105 C)	General Chemistry	ppm	20	2	100%	-	274	379	82	370	469	474
Total Hardness	General Chemistry	ppm $CaCO_3$	20	1	100%	-	183	256	73	247	364	374
Total Kjeldahl Nitrogen	Nutrients	ppm	20	0.06 (5); 0.5 (15)	60%	-	0.25	1.07	1.2	0.6	3.1	3.2
Total Organic Carbon	Nutrients	ppm	8	0.2	100%	-	8.2	9.8	1.2	9.7	10.9	10.9
Total Suspended Solids (105 C)	General Chemistry	ppm	20	2	80%	-	1	19	24	7.4	60	62.5
Tungsten	Metals	ppm	20	0.0001	25%	0.03	0.00005	0.00007	0.00003	0.00006	0.00012	0.00013
Turbidity	General Chemistry	NTU	20	0.1	100%	-	0.9	8.8	7.6	5.3	21.4	21.5
Uranium	Metals	ppm	20	0.0001	100%	0.005	0.0003	0.0009	0.0006	0.0007	0.002	0.002
Vanadium	Metals	ppm	20	0.0001	75%	0.006	0.00005	0.0007	0.0006	0.0004	0.0016	0.0017
Zinc	Metals	ppm	20	0.0001	100%	0.02	0.0007	0.004	0.004	0.003	0.011	0.014
Zirconium	Metals	ppm	20	0.0001	65%	0.004	0.00005	0.0006	0.0008	0.0002	0.002	0.002

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 ppm, and 10 samples analyzed at 0.004 ppm) 0.001 (130); '0.004 (10).

Table B.3.1-5: Darlington Creek Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Alkalinity	General Chemistry	ppm $CaCO_3$	20	5	100%	-	111	230	76	216	325	328
Aluminum	Metals	ppm	20	0.0001	100%	0.1	0.07	0.27	0.25	0.19	0.71	0.73
Aluminum (filtered)	Metals	ppm	20	0.0001	100%	0.075	0.002	0.007	0.004	0.006	0.014	0.014
Ammonia	Nutrients	ppm	20	0.01	100%	-	0.03	0.13	0.15	0.07	0.45	0.48
Ammonia (unionised)	Nutrients	ppm	20	-	100%	0.02	0.0005	0.0015	0.001	0.0013	0.004	0.004
Antimony	Metals	ppm	20	0.001	0%	0.02	0.0005	-	-	-	-	0.0005
Arsenic	Metals	ppm	20	0.001 (15); 0.004 (5)	10%	0.005	0.0005	0.0009	0.00065	0.0007	0.002	0.002
Barium	Metals	ppm	20	0.0001	100%	1000	0.05	0.13	0.135	0.085	0.39	0.4
Benzene	PetroHydrocarbon	ppb	5	0.1	0%	100	0.05	-	-	-	-	0.05
Beryllium	Metals	ppm	20	0.001	0%	1.1	0.0005	-	-	-	-	0.0005
Bicarbonate	General Chemistry	ppm $CaCO_3$	20	5	100%	-	111.0	230	76	216	325	328
Bismuth	Metals	ppm	20	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	Metals	ppm	20	0.0001	100%	0.2	0.035	0.2	0.3	0.1	0.9	0.9
Bromodichloromethane	THMs	ppb	2	0.1	0%	200	0.05	-	-	-	-	0.05
Bromoform	THMs	ppb	2	0.1	0%	60	0.05	-	-	-	-	0.05
Cadmium	Metals	ppm	20	0.0001	0%	0.000017	0.00005	-	-	-	-	0.00005
Calcium	Metals	ppm	20	0.0001	100%	-	86.5	117.7	30.6	114.2	172.2	176.9
Carbonate	General Chemistry	ppm $CaCO_3$	20	5	0%	-	2.5	-	-	-	-	2.5
Cesium	Metals	ppm	20	0.0001	25%	-	0.00005	0.00007	0.00004	0.00006	0.00014	0.00015
Chemical Oxygen Demand	Nutrients	ppm	5	1	100%	-	6.0	9.4	3.8	8.8	13.8	14.0
Chloroform	THMs	ppb	2	0.1	0%	1.8	0.05	-	-	-	-	0.05
Chromium	Metals	ppm	20	0.0001	100%	0.05	0.0007	0.002	0.001	0.002	0.003	0.003
Chromium (III)	Metals	ppm	5	0.0001	100%	0.009	0.0007	0.001	0.0002	0.001	0.001	0.001
Chromium(VI)	Metals	ppm	5	0.005	0%	0.001	0.0025	-	-	-	-	0.0025
Cobalt	Metals	ppm	20	0.0001	100%	0.0009	0.0004	0.0025	0.004	0.001	0.009	0.009
Conductivity	General Chemistry	mS/m	20	0.1	100%	-	61	118	79	100	260	272
Copper	Metals	ppm	20	0.0001	100%	0.003	0.001	0.002	0.0005	0.002	0.003	0.003
Dibromochloromethane	THMs	ppb	2	0.1	0%	-	0.05	-	-	-	-	0.05
E.coli	Bacteria	/100mL	19	1	100%	-	9.0	192	217	96	564	870

Table B.3.1-5: Darlington Creek Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ethylbenzene	PetroHydrocarbon	ppb	5	0.1	0%	8	0.05	-	-	-	-	0.05
F1 Petroleum Hydrocarbons C6-10	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F2 Petroleum Hydrocarbons C10-16	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F3 Petroleum Hydrocarbons C16-34	PetroHydrocarbon	ppb	8	100	13%	-	50	57	20.5	55	88	108
F4 Petroleum Hydrocarbons C34-50	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50.0
Field pH	General Chemistry	units	4	-	100%	-	7.6	7.8	0.2	7.8	8.1	8.1
Field Temperature	General Chemistry	Deg C	4	-	100%	-	11.3	14.3	2.9	14.1	17.6	18.0
Field Tot. Res. Chlorine	General Chemistry	ppm	1	0.002	0%	-	0.001	-	-	-	-	0.001
Hydrazine	Special	ppm	8	0.005	0%	-	0.0025	-	-	-	-	0.0025
Hydroxide	General Chemistry	ppm $CaCO_3$	20	5	0%	-	2.5	-	-	-	-	2.5
Iron	Metals	ppm	20	0.001	100%	0.3	0.17	0.29	0.13	0.27	0.5	0.67
Lead	Metals	ppm	20	0.0001	100%	0.004	0.0002	0.0005	0.0003	0.0005	0.001	0.001
Lithium	Metals	ppm	20	0.0001	100%	-	0.0015	0.02	0.026	0.0045	0.06	0.07
m/p-Xylene	PetroHydrocarbon	ppb	5	0.1	0%	-	0.05	-	-	-	-	0.05
Magnesium	Metals	ppm	20	0.0001	100%	-	10	15	5.5	14	24.7	25.4
Manganese	Metals	ppm	20	0.0001	100%	-	0.04	0.14	0.13	0.10	0.38	0.47
Mercury	Metals-Special	ppm	8	0.0001	0%	0.000026	0.00005	-	-	-	-	0.00005
Molybdenum	Metals	ppm	20	0.0001	100%	0.04	0.0011	0.0013	0.0002	0.0013	0.0018	0.0018
Morpholine	Special	ppm	12	0.001	25%	0.004	0.0005	0.003	0.007	0.0009	0.01	0.02
Nickel	Metals	ppm	20	0.0001	100%	0.025	0.0009	0.0024	0.002	0.002	0.006	0.007
Nitrate	Nutrients	ppm	20	0.01	100%	-	0.25	4.6	5.8	2.0	14.0	14.4
Nitrite	Nutrients	ppm	20	0.01	35%	-	0.005	0.04	0.06	0.012	0.14	0.14
o-Xylene	PetroHydrocarbon	ppb	5	0.1	0%	-	0.05	-	-	-	-	0.05
PCB in Water	PCB	ppb	8	0.05	0%	0.001	0.025	-	-	-	-	0.025
pH	General Chemistry	units	20	-	100%	-	7.7	7.9	0.1	7.9	8.1	8.1
Phosphorus	Nutrients	ppm	20	0.002 (15); 0.01 (5)	75%	-	0.005	0.034	0.028	0.022	0.078	0.085
Potassium	Metals	ppm	20	0.001	100%	-	2.6	4.6	2.4	4.1	8.8	9.2
Selenium	Metals	ppm	20	0.001	30%	0.001	0.0005	0.01	0.02	0.0015	0.04	0.05
Silver	Metals	ppm	20	0.0001	0%	0.0001	0.00005	-	-	-	-	0.00005
Sodium	Metals	ppm	20	0.0001	100%	200	40	79	46	69	163	165

Table B.3.1-5: Darlington Creek Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Strontium	Metals	ppm	20	0.0001	100%	-	0.28	1.44	1.98	0.65	4.97	5.3
Thallium	Metals	ppm	20	0.0001	0%	0.0003	0.00005	-	-	-	-	0.00005
Thorium	Metals	ppm	20	0.0001	25%	-	0.00005	0.00007	0.00003	0.00006	0.00013	0.00014
Tin	Metals	ppm	20	0.0001	5%	-	0.00005	0.00005	0.00002	0.00005	0.00005	0.00013
Titanium	Metals	ppm	20	0.0001	100%	-	0.004	0.01	0.005	0.009	0.016	0.018
Toluene	PetroHydrocarbon	ppb	5	0.1	0%	0.8	0.05	-	-	-	-	0.05
Total Coliforms	Bacteria	/100mL	19	1	100%	-	3060	17613	20654	11369	65100	75000
Total Dissolved Solids(105 C)	General Chemistry	ppm	19	2	100%	-	388	686	486	579	1632	1650
Total Hardness	General Chemistry	ppm $CaCO_3$	20	1	100%	-	258	355	97	344	526	531
Total Kjeldahl Nitrogen	Nutrients	ppm	20	0.5	30%	-	0.25	0.36	0.18	0.33	0.70	0.70
Total Organic Carbon	Nutrients	ppm	8	0.2	100%	-	2.3	4.2	2.5	3.7	8.0	8.4
Total Suspended Solids (105 C)	General Chemistry	ppm	20	2	95%	-	1.0	10.2	7.7	7.7	28.6	30.7
Tungsten	Metals	ppm	20	0.0001	45%	0.03	0.00005	0.0001	0.0001	0.0001	0.0004	0.0004
Turbidity	General Chemistry	NTU	20	0.1	100%	-	1.6	6.0	3.3	5.1	10.9	13.1
Uranium	Metals	ppm	20	0.0001	100%	0.005	0.0004	0.001	0.0004	0.001	0.001	0.001
Vanadium	Metals	ppm	20	0.0001	100%	0.006	0.0002	0.001	0.001	0.0008	0.003	0.003
Zinc	Metals	ppm	20	0.0001	100%	0.02	0.001	0.005	0.005	0.003	0.02	0.02
Zirconium	Metals	ppm	20	0.0001	75%	0.004	0.00005	0.002	0.004	0.0004	0.01	0.01

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 ppm, and 10 samples analyzed at 0.004 ppm) 0.001 (130); '0.004 (10).
Sample point is at an offsite location in a tributary that has no interaction with the Darlington site (see Surface Water Existing Condition TSD). Water quality is similar to Coot's pond and reflects water quality within the general area creeks and ponds.

Table B.3.1-6: Stormwater Management Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Alkalinity	General Chemistry	ppm $CaCO_3$	20	5	100%	-	74	116	26	113	138	139
Aluminum	Metals	ppm	20	0.0001	100%	0.1	0.13	0.5	0.7	0.3	1.64	2.7
Aluminum (filtered)	Metals	ppm	20	0.0001	100%	0.075	0.013	0.035	0.02	0.03	0.07	0.07
Ammonia	Nutrients	ppm	20	0.01	90%	-	0.005	0.035	0.03	0.025	0.09	0.095
Ammonia (unionised)	Nutrients	ppm	20	-	100%	0.02	0.0011	0.003	0.002	0.0025	0.005	0.007
Antimony	Metals	ppm	20	0.001	0%	0.02	0.0005	-	-	-	-	0.0005
Arsenic	Metals	ppm	20	0.001 (15); 0.004 (5)	25%	0.005	0.0005	0.001	0.0007	0.0009	0.002	0.002
Barium	Metals	ppm	20	0.0001	100%	1000	0.04	0.19	0.2	0.1	0.5	0.8
Benzene	PetroHydrocarbon	ppb	5	0.1	0%	100	0.05	-	-	-	-	0.05
Beryllium	Metals	ppm	20	0.001	0%	1.1	0.0005	-	-	-	-	0.0005
Bicarbonate	General Chemistry	ppm $CaCO_3$	20	5	100%	-	74	110	28	107	138	139
Bismuth	Metals	ppm	20	0.001	0%	-	0.0005	-	-	-	-	0.001
Boron	Metals	ppm	20	0.0001	100%	0.2	0.029	0.4	0.9	0.1	1.4	4.0
Bromodichloromethane	THMs	ppb	2	0.1	0%	200	0.05	-	-	-	-	0.05
Bromoform	THMs	ppb	2	0.1	0%	60	0.05	-	-	-	-	0.05
Cadmium	Metals	ppm	20	0.0001	0%	1.7E-05	0.00005	-	-	-	-	0.00005
Calcium	Metals	ppm	20	0.0001	100%	-	24	42	13	40	62	62
Carbonate	General Chemistry	ppm $CaCO_3$	20	5	25%	-	2.5	7.8	9.7	4.4	29.1	29.7
Cesium	Metals	ppm	20	0.0001	10%	-	0.00005	0.00006	0.00003	0.00006	0.0001	0.0002
Chemical Oxygen Demand	Nutrients	ppm	5	1	100%	-	12	14	1.3	14	15	15
Chloroform	THMs	ppb	2	0.1	0%	1.8	0.05	-	-	-	-	0.05
Chromium	Metals	ppm	20	0.0001	100%	0.05	0.0006	0.004	0.004	0.002	0.01	0.01
Chromium (III)	Metals	ppm	5	0.0001	100%	0.0089	0.001	0.001	0.001	0.001	0.002	0.002
Chromium(VI)	Metals	ppm	5	0.005	0%	0.001	0.0025	-	-	-	-	0.0025
Cobalt	Metals	ppm	20	0.0001	100%	0.0009	0.0002	0.0006	0.0005	0.0004	0.001	0.002
Conductivity	General Chemistry	mS/m	20	0.1	100%	-	60	199	145	156	436	436
Copper	Metals	ppm	20	0.0001	100%	0.003	0.0012	0.0017	0.0005	0.0017	0.003	0.003
Dibromochloromethane	THMs	ppb	2	0.1	0%	-	0.05	-	-	-	-	0.05

Table B.3.1-6: Stormwater Management Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
E.coli	Bacteria	/100mL	20	1	95%		0.5	782	999.7	84.5	2557	2880
Ethylbenzene	PetroHydrocarbon	ppb	5	0.1	0%	8	0.05	-	-	-	-	0.05
F1 Petroleum Hydrocarbons C6-10	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F2 Petroleum Hydrocarbons C10-16	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F3 Petroleum Hydrocarbons C16-34	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F4 Petroleum Hydrocarbons C34-50	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
Field pH	General Chemistry	Units	4	-	100%	-	8.2	8.5	0.2	8.5	8.7	8.7
Field Temperature	General Chemistry	Deg C	4	-	100%	-	11.3	18.3	4.9	17.7	21.8	21.9
Field Tot. Res. Chlorine	General Chemistry	mg/L	1	0.002	0%	-	0.001	-	-	-	-	0.001
Field Tot. Res. Chlorine	General Chemistry	ppm	1	0.002	0%	-	0.001	-	-	-	-	0.001
Hydrazine	Special	ppm	8	0.005	0%	-	0.0025	-	-	-	-	0.0025
Hydroxide	General Chemistry	ppm $CaCO_3$	20	5	0%	-	2.5	-	-	-	-	2.5
Iron	Metals	ppm	20	0.001	100%	0.3	0.2	0.3	0.09	0.3	0.4	0.6
Lead	Metals	ppm	20	0.0001	100%	0.004	0.0003	0.0008	0.0006	0.0007	0.002	0.003
Lithium	Metals	ppm	20	0.0001	100%	-	0.002	0.003	0.0009	0.003	0.004	0.005
m/p-Xylene	PetroHydrocarbon	ppb	5	0.1	0%	-	0.05	-	-	-	-	0.05
Magnesium	Metals	ppm	20	0.0001	100%	-	5	16	9	13	30	31
Manganese	Metals	ppm	20	0.0001	100%	-	0.02	0.03	0.01	0.03	0.05	0.05
Mercury	Metals-Special	ppm	8	0.0001	0%	2.6E-05	0.00005	-	-	-	-	0.00005
Molybdenum	Metals	ppm	20	0.0001	100%	0.04	0.0005	0.001	0.0004	0.001	0.0016	0.0017
Morpholine	Special	ppm	12	0.001	8%	0.004	0.0005	0.0008	0.0009	0.0006	0.002	0.004
Nickel	Metals	ppm	20	0.0001	100%	0.025	0.0006	0.0018	0.0012	0.0015	0.004	0.004
Nitrate	Nutrients	ppm	20	0.01	95%	-	0.005	1.13	1.4	0.43	3.5	4.15
Nitrite	Nutrients	ppm	20	0.01	50%	-	0.005	0.015	0.015	0.01	0.04	0.04
o-Xylene	PetroHydrocarbon	ppb	5	0.1	0%	-	0.05	-	-	-	-	0.05
PCB in Water	PCB	ppb	8	0.05	0%	0.001	0.025	-	-	-	-	0.025
pH	General Chemistry	units	20	-	100%	-	7.7	8.2	0.4	8.2	8.9	8.9
Phosphorus	Nutrients	ppm	20	0.002 (15); 0.01 (5)	75%	-	0.005	0.02	0.01	0.02	0.03	0.03
Potassium	Metals	ppm	20	0.001	100%	-	1.6	2.6	1.1	2.4	4.3	4.4
Selenium	Metals	ppm	20	0.001	20%	0.001	0.0005	0.0006	0.00027	0.0006	0.00123	0.00125

Table B.3.1-6: Stormwater Management Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Silver	Metals	ppm	20	0.0001	0%	0.0001	0.00005	-	-	-	-	0.00005
Sodium	Metals	ppm	20	0.0001	100%	200	100	307	229	242	750	765
Strontium	Metals	ppm	20	0.0001	100%	-	0.34	0.96	0.50	0.83	1.72	1.75
Thallium	Metals	ppm	20	0.0001	0%	0.0003	0.00005	-	-	-	-	0.00005
Thorium	Metals	ppm	20	0.0001	25%	-	0.00005	0.0001	0.0001	0.00007	0.0003	0.0005
Tin	Metals	ppm	20	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Titanium	Metals	ppm	20	0.0001	100%	-	0.009	0.02	0.01	0.02	0.04	0.05
Toluene	PetroHydrocarbon	ppb	5	0.1	0%	0.8	0.05	-	-	-	-	0.05
Total Coliforms	Bacteria	/100mL	20	1	100%	-	420	21009	33244	5167	88200	111000
Total Dissolved Solids(105 C)	General Chemistry	ppm	20	2	100%	-	318	1063	770	832	2321	2330
Total Hardness	General Chemistry	ppm $CaCO_3$	20	1	100%	-	80	169	68	155	278	281
Total Kjeldahl Nitrogen-	Nutrients	ppm	20	0.5	0%	-	0.25	-	-	-	-	0.25
Total Organic Carbon	Nutrients	ppm	8	0.2	100%	-	3.4	4.0	0.8	3.9	5.3	6.0
Total Suspended Solids (105 C)	General Chemistry	ppm	20	2	100%	-	2.1	10.5	4.6	9.5	16.3	21.8
Tungsten	Metals	ppm	20	0.0001	85%	0.03	0.00005	0.00013	0.00005	0.00012	0.00019	0.00025
Turbidity	General Chemistry	NTU	20	0.1	100%	-	5.6	8.9	2.5	8.6	13.2	14.9
Uranium	Metals	ppm	20	0.0001	100%	0.005	0.00017	0.00038	0.00022	0.00033	0.00075	0.00076
Vanadium	Metals	ppm	20	0.0001	100%	0.006	0.0003	0.001	0.0007	0.0009	0.002	0.0025
Zinc	Metals	ppm	20	0.0001	100%	0.02	0.006	0.01	0.004	0.009	0.02	0.02
Zirconium	Metals	ppm	20	0.0001	100%	0.004	0.0002	0.005	0.01	0.0008	0.02	0.04

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 ppm, and 10 samples analyzed at 0.004 ppm) 0.001 (130); '0.004 (10).

Table B.3.1-7: Treefrog Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Alkalinity	General Chemistry	ppm $CaCO_3$	20	5	100%	-	170	192	20	191	224	226
Aluminum	Metals	ppm	20	0.0001	100%	0.1	0.03	1.5	2.5	0.2	5.9	6.7
Aluminum (filtered)	Metals	ppm	20	0.0001	100%	0.075	0.006	0.02	0.01	0.01	0.04	0.04
Ammonia	Nutrients	ppm	20	0.01	100%	-	0.02	0.03	0.009	0.03	0.04	0.05
Ammonia (unionised)	Nutrients	ppm	20	-	100%	0.02	0.0001	0.0003	0.0002	0.0003	0.0005	0.0008
Antimony	Metals	ppm	20	0.001	5%	0.02	0.0005	0.0005	0.0002	0.0005	0.0005	0.001
Arsenic	Metals	ppm	20	0.001 (15); 0.004 (5)	0%	0.005	0.0005	-	-	-	-	0.002
Barium	Metals	ppm	20	0.0001	100%	1000	0.03	0.1	0.1	0.06	0.3	0.4
Benzene	PetroHydrocarbon	ppb	5	0.1	0%	100	0.05	-	-	-	-	0.05
Beryllium	Metals	ppm	20	0.001	0%	1.1	0.0005	-	-	-	-	0.0005
Bicarbonate	General Chemistry	ppm $CaCO_3$	20	5	100%	-	170	192	20	191	224	226
Bismuth	Metals	ppm	20	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	Metals	ppm	20	0.0001	100%	0.2	0.002	0.4	0.8	0.02	1.7	2.6
Bromodichloromethane	THMs	ppb	2	0.1	0%	200	0.05	-	-	-	-	0.05
Bromoform	THMs	ppb	2	0.1	0%	60	0.05	-	-	-	-	0.05
Cadmium	Metals	ppm	20	0.0001	0%	0.000017	0.00005	-	-	-	-	0.00005
Calcium	Metals	ppm	20	0.0001	100%	-	51.5	72.7	17.5	70.7	92.8	93.0
Carbonate	General Chemistry	ppm $CaCO_3$	20	5	0%	-	2.5	-	-	-	-	2.5
Cesium	Metals	ppm	20	0.0001	25%	-	0.00005	0.0001	0.0001	0.00008	0.0004	0.0004
Chemical Oxygen Demand	Nutrients	ppm	5	1	100%	-	32	43	11	42	58	62
Chloroform	THMs	ppb	2	0.1	100%	1.8	0.1	-	-	-	-	0.2
Chromium	Metals	ppm	20	0.0001	75%	0.05	0.00005	0.002	0.002	0.0007	0.006	0.006
Chromium (III)	Metals	ppm	5	0.0001	100%	0.009	0.004	0.005	0.001	0.005	0.006	0.006
Chromium(VI)	Metals	ppm	5	0.005	0%	0.001	0.0025	-	-	-	-	0.0025
Cobalt	Metals	ppm	20	0.0001	100%	0.0009	0.0003	0.001	0.002	0.0006	0.005	0.005
Conductivity	General Chemistry	mS/m	20	0.1	100%	-	33	43	9	42	56	57
Copper	Metals	ppm	20	0.0001	100%	0.003	0.0004	0.002	0.002	0.001	0.004	0.004
Dibromochloromethane	THMs	ppb	2	0.1	0%	-	0.05	-	-	-	-	0.05
E.coli	Bacteria	/100mL	20	1	100%	-	3	51	59	23	165	165

Table B.3.1-7: Treefrog Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ethylbenzene	PetroHydrocarbon	ppb	5	0.1	0%	8	0.05	-	-	-	-	0.05
F1 Petroleum Hydrocarbons C6-10	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F2 Petroleum Hydrocarbons C10-16	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
F3 Petroleum Hydrocarbons C16-34	PetroHydrocarbon	ppb	8	100	25%	-	50	66	31	61	119	129
F4 Petroleum Hydrocarbons C34-50	PetroHydrocarbon	ppb	8	100	0%	-	50	-	-	-	-	50
Field pH	General Chemistry	Units	4	-	100%	-	7.1	7.4	0.2	7.4	7.6	7.6
Field Temperature	General Chemistry	Deg C	4	-	100%	-	8.2	15	4.9	14	19.1	19.5
Field Tot. Res. Chlorine	General Chemistry	ppm	1	0.002	0%	-	0.001	-	-	-	-	0.001
Hydrazine	Special	ppm	8	0.005	0%	-	0.0025	-	-	-	-	0.0025
Hydroxide	General Chemistry	ppm $CaCO_3$	20	5	0%	-	2.5	-	-	-	-	2.5
Iron	Metals	ppm	20	0.001	100%	0.3	0.2	1.0	1.3	0.5	3.4	3.9
Lead	Metals	ppm	20	0.0001	100%	0.004	0.0001	0.0006	0.0008	0.0003	0.002	0.002
Lithium	Metals	ppm	20	0.0001	100%	-	0.00041	0.001	0.001	0.001	0.004	0.004
m/p-Xylene	PetroHydrocarbon	ppb	5	0.1	0%	-	0.05	-	-	-	-	0.05
Magnesium	Metals	ppm	20	0.0001	100%	-	6.0	8.7	1.8	8.5	11.2	11.2
Manganese	Metals	ppm	20	0.0001	100%	-	0.04	0.3	0.3	0.1	0.72	0.75
Mercury	Metals-Special	ppm	8	0.0001	0%	0.000026	0.00005	-	-	-	-	0.00005
Molybdenum	Metals	ppm	20	0.0001	90%	0.04	0.00005	0.0006	0.0007	0.0003	0.002	0.002
Morpholine	Special	ppm	12	0.001	0%	0.004	0.0005	-	-	-	-	0.0005
Nickel	Metals	ppm	20	0.0001	100%	0.025	0.0003	0.001	0.001	0.0008	0.003	0.003
Nitrate	Nutrients	ppm	20	0.01	75%	-	0.005	0.9	3.3	0.07	1.4	15
Nitrite	Nutrients	ppm	20	0.01	0%	-	0.005	-	-	-	-	0.005
o-Xylene	PetroHydrocarbon	ppb	5	0.1	0%	-	0.05	-	-	-	-	0.05
PCB in Water	PCB	ppb	8	0.05	0%	0.001	0.025	-	-	-	-	0.025
pH	General Chemistry	units	20	-	100%	-	7.2	7.5	0.2	7.5	7.7	7.7
Phosphorus	Nutrients	ppm	20	0.002 (15); 0.01 (5)	100%	-	0.02	0.04	0.03	0.03	0.1	0.1
Potassium	Metals	ppm	20	0.001	100%	-	2.3	5.1	3.7	4.1	11.5	11.8
Selenium	Metals	ppm	20	0.001	0%	0.001	0.0005	-	-	-	-	0.0005
Silver	Metals	ppm	20	0.0001	0%	0.0001	0.00005	-	-	-	-	0.00005
Sodium	Metals	ppm	20	0.0001	100%	200	2.2	5.4	3.4	4.6	11.2	11.8

Table B.3.1-7: Treefrog Pond Conventional Surface Water Data

Constituent	Type	Units	N	MDL	% above MDL	Criteria	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Strontium	Metals	ppm	20	0.0001	100%	-	0.17	0.2	0.04	0.2	0.3	0.3
Thallium	Metals	ppm	20	0.0001	0%	0.0003	0.00005	-	-	-	-	0.00005
Thorium	Metals	ppm	20	0.0001	25%	-	0.00005	0.000	0.0003	0.0001	0.0007	0.0008
Tin	Metals	ppm	20	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Titanium	Metals	ppm	20	0.0001	100%	-	0.002	0.065	0.1	0.01	0.3	0.3
Toluene	PetroHydrocarbon	ppb	5	0.1	0%	0.8	0.05	-	-	-	-	0.05
Total Coliforms	Bacteria	/100mL	20	1	100%	-	200	4198	3194	2412	10169	10910
Total Dissolved Solids(105 C)	General Chemistry	ppm	20	2	100%	-	214	276	62	269	381	407
Total Hardness	General Chemistry	ppm $CaCO_3$	20	1	100%	-	154	217	50	212	278	279
Total Kjeldahl Nitrogen	Nutrients	ppm	20	0.06 (5); 0.5 (15)	100%	-	0.5	0.70	0.12	0.7	0.8	1.0
Total Organic Carbon	Nutrients	ppm	8	0.2	100%	-	9.8	12.4	2.0	12.3	14.0	14.1
Total Suspended Solids (105 C)	General Chemistry	ppm	20	2	95%	-	0.57	19.2	28.7	6.2	69.7	80.33
Tungsten	Metals	ppm	20	0.0001	20%	0.03	0.00005	0.00007	0.00006	0.00006	0.0002	0.0003
Turbidity	General Chemistry	NTU	20	0.1	100%	-	1.2	9.3	11.4	4.6	30.7	30.8
Uranium	Metals	ppm	20	0.0001	100%	0.005	0.0003	0.001	0.0009	0.0008	0.0025	0.0025
Vanadium	Metals	ppm	20	0.0001	75%	0.006	0.00005	0.0004	0.0003	0.0003	0.0008	0.0008
Zinc	Metals	ppm	20	0.0001	100%	0.02	0.001	0.005	0.003	0.004	0.01	0.01
Zirconium	Metals	ppm	20	0.0001	90%	0.004	0.00005	0.004	0.007	0.0004	0.017	0.02

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 ppm, and 10 samples analyzed at 0.004 ppm) 0.001 (130); '0.004 (10).

B.3.1.2 Radiological Surface Water Data

Table B.3.1-8: Site (Lake Ontario) Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/L	71	2	0%	-	1	-	-	-	-	1
Ba-140 by gamma	Bq/L	71	5 (64); 6(4); 7(1); 9(1); 12(1)	0%	-	2.5	-	-	-	-	6
Be-7 by gamma	Bq/L	71	10	0%	-	5	-	-	-	-	5
Carbon-14	Bq/L	47	0.5	0%	-	0.25	-	-	-	-	0.25
Ce-141 by gamma	Bq/L	71	2 (1); 1 (70)	0%	-	0.5	-	-	-	-	1
Ce-144 by gamma	Bq/L	71	5	0%	-	2.5	-	-	-	-	2.5
Chlorine-36	Bq/L	11	10	0%	-	5	-	-	-	-	5
Co-57 by gamma	Bq/L	71	1	0%	-	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/L	71	1	0%	-	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/L	71	1	0%	-	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/L	71	10	0%	-	5	-	-	-	-	5
Cs-134 by gamma	Bq/L	71	1	0%	-	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/L	71	1	0%	50	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/L	71	3	0%	-	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/L	71	3 (1); 2 (70)	0%	-	1	-	-	-	-	1.5
Fe-59 by gamma	Bq/L	71	2 (70); 3 (1)	0%	-	1	-	-	-	-	1.5
Gross Beta	Bq/L	71	0.1	11%	-	0.05	0.057	0.023	0.055	0.1	0.2
I-131 by gamma	Bq/L	71	2 (67); 3(3); 4(1)	0%	10	1	-	-	-	-	2
Iodine-129	Bq/L	5	10	0%	-	5	-	-	-	-	5
Iodine-129 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
K-40 by gamma	Bq/L	71	10	0%	-	5	-	-	-	-	5
La-140 by gamma	Bq/L	71	2 (69); 3 (2)	0%	-	1	-	-	-	-	1.5
Mn-54 by gamma	Bq/L	71	1	0%	-	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/L	71	1	0%	-	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/L	71	1	0%	-	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/L	71	10	0%	-	5	-	-	-	-	5
Sb-124 by gamma	Bq/L	71	2 (69); 3 (1); 4 (1)	0%	-	1	-	-	-	-	2
Sb-125 by gamma	Bq/L	71	2 (70); 3(1)	0%	-	1	-	-	-	-	1.5
Se-75 by gamma	Bq/L	71	1	0%	-	0.5	-	-	-	-	0.5
Strontium-89	Bq/L	41	0.1	0%	-	0.05	-	-	-	-	0.05
Strontium-90	Bq/L	41	0.1	0%	10	0.05	-	-	-	-	0.05
Technicium-99	Bq/L	5	10	0%	-	5	-	-	-	-	5

Table B.3.1-8: Site (Lake Ontario) Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Technicium-99 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
Tritium	Bq/L	71	15	0%	7000	7.5	-	-	-	-	7.5
Zn-65 by gamma	Bq/L	71	3	0%	-	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/L	71	2	0%	-	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10). The drinking water criteria for human health were used for the radionuclides in the absence of ecological criteria.

Table B.3.1-9: Local (Lake Ontario) Background Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/L	66	2	0%	-	1	-	-	-	-	1
Ba-140 by gamma	Bq/L	66	5 (64); 8 (2)	0%	-	2.5	-	-	-	-	4
Be-7 by gamma	Bq/L	66	10	0%	-	5	-	-	-	-	5
Carbon-14	Bq/L	42	0.5 (42)	0%	-	0.25	-	-	-	-	0.25
Ce-141 by gamma	Bq/L	66	1 (65); 2 (1)	0%	-	0.5	-	-	-	-	1
Ce-144 by gamma	Bq/L	66	5	0%	-	2.5	-	-	-	-	2.5
Chlorine-36	Bq/L	11	10	0%	-	5	-	-	-	-	5
Co-57 by gamma	Bq/L	66	1	0%	-	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/L	66	1	0%	-	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/L	66	1	0%	-	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/L	66	10	0%	-	5	-	-	-	-	5
Cs-134 by gamma	Bq/L	66	1	0%	-	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/L	66	1	0%	50	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/L	66	3	0%	-	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/L	66	2	0%	-	1	-	-	-	-	1
Fe-59 by gamma	Bq/L	66	2	0%	-	1	-	-	-	-	1
Gross Beta	Bq/L	66	0.1	17%	-	0.05	0.06	0.03	0.06	0.1	0.2
I-131 by gamma	Bq/L	66	2 (64); 3 (2)	0%	10	1	-	-	-	-	1.5
Iodine-129	Bq/L	5	10	0%	-	5	-	-	-	-	5
Iodine-129 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
K-40 by gamma	Bq/L	66	10	0%	-	5	-	-	-	-	5
La-140 by gamma	Bq/L	66	2	0%	-	1	-	-	-	-	1

Table B.3.1-9: Local (Lake Ontario) Background Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Mn-54 by gamma	Bq/L	66	1	0%	-	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/L	66	1	0%	-	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/L	66	1	0%	-	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/L	66	10	0%	-	5	-	-	-	-	5
Sb-124 by gamma	Bq/L	66	2(65); 3 (1)	0%	-	1	-	-	-	-	1.5
Sb-125 by gamma	Bq/L	66	2	0%	-	1	-	-	-	-	1
Se-75 by gamma	Bq/L	66	1	0%	-	0.5	-	-	-	-	0.5
Strontium-89	Bq/L	36	0.1	0%	-	0.05	-	-	-	-	0.05
Strontium-90	Bq/L	36	0.1	0%	10	0.05	-	-	-	-	0.05
Technicium-99	Bq/L	5	10	0%	-	5	-	-	-	-	5
Technicium-99 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
Tritium	Bq/L	66	15	0%	7000	7.5	-	-	-	-	7.5
Zn-65 by gamma	Bq/L	66	3	0%	-	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/L	66	2	0%	-	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10). The drinking water criteria for human health were used for the radionuclides in the absence of ecological criteria.

Table B.3.1-10: Regional (Lake Ontario) Background Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/L	18	2	0%	-	1	-	-	-	-	1
Ba-140 by gamma	Bq/L	18	5	0%	-	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/L	18	10	0%	-	5	-	-	-	-	5
Carbon-14	Bq/L	6	0.5	0%	-	0.25	-	-	-	-	0.25
Ce-141 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/L	18	5	0%	-	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/L	18	10	0%	-	5	-	-	-	-	5
Cs-134 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/L	18	1	0%	50	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/L	18	3	0%	-	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/L	18	2	0%	-	1	-	-	-	-	1
Fe-59 by gamma	Bq/L	18	2	0%	-	1	-	-	-	-	1
Gross Beta	Bq/L	18	0.1	0%	-	0.05	-	-	-	-	0.05
I-131 by gamma	Bq/L	18	2	0%	10	1	-	-	-	-	1
K-40 by gamma	Bq/L	18	10	0%	-	5	-	-	-	-	5
La-140 by gamma	Bq/L	18	2	0%	-	1	-	-	-	-	1
Mn-54 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/L	18	10	0%	-	5	-	-	-	-	5
Sb-124 by gamma	Bq/L	18	2	0%	-	1	-	-	-	-	1
Sb-125 by gamma	Bq/L	18	2	0%	-	1	-	-	-	-	1
Se-75 by gamma	Bq/L	18	1	0%	-	0.5	-	-	-	-	0.5
Tritium	Bq/L	18	15	0%	7000	7.5	-	-	-	-	7.5
Zn-65 by gamma	Bq/L	18	3	0%	-	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/L	18	2	0%	-	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10). The drinking water criteria for human health were used for the radionuclides in the absence of ecological criteria.

Table B.3.1-11: Coots Pond Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/L	26	2	0%	-	1	-	-	-	-	1
Ba-140 by gamma	Bq/L	26	5 (24); 7 (1); 9 (1)	8%	-	2.5	2.62	0.43	2.59	3.25	4.5
Be-7 by gamma	Bq/L	26	10	0%	-	5	-	-	-	-	5
Carbon-14	Bq/L	5	0.5	0%	-	0.25	-	-	-	-	0.25
Ce-141 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/L	26	5	0%	-	2.5	-	-	-	-	2.5
Chlorine-36	Bq/L	11	10	0%	-	5	-	-	-	-	5
Co-57 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/L	26	10	0%	-	5	-	-	-	-	5
Cs-134 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/L	26	1	0%	50	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/L	26	3	0%	-	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/L	26	2	0%	-	1	-	-	-	-	1
Fe-59 by gamma	Bq/L	26	2	0%	-	1	-	-	-	-	1
Gross Beta	Bq/L	26	0.1	85%	-	0.05	0.41	0.28	0.30	0.9	0.9
I-131 by gamma	Bq/L	26	2 (24); 3 (1); 4 (1)	8%	10	1	1.06	0.22	1.04	1.38	2
Iodine-129	Bq/L	5	10	0%	-	5	-	-	-	-	5
Iodine-129 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
K-40 by gamma	Bq/L	26	10	0%	-	5	-	-	-	-	5
La-140 by gamma	Bq/L	26	2	0%	-	1	-	-	-	-	1
Mn-54 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/L	26	10	0%	-	5	-	-	-	-	5
Sb-124 by gamma	Bq/L	26	2	0%	-	1	-	-	-	-	1
Sb-125 by gamma	Bq/L	26	2	0%	-	1	-	-	-	-	1
Se-75 by gamma	Bq/L	26	1	0%	-	0.5	-	-	-	-	0.5
Strontium-89	Bq/L	11	0.1	0%	-	0.05	-	-	-	-	0.05
Strontium-90	Bq/L	11	0.1	0%	10	0.05	-	-	-	-	0.05

Table B.3.1-11: Coots Pond Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Technicium-99	Bq/L	5	10	0%	-	5	-	-	-	-	5
Technicium-99 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
Tritium	Bq/L	26	15	100%	7000	18	51.0	17.3	47.8	77.5	78
Zn-65 by gamma	Bq/L	26	3	0%	-	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/L	26	2	0%	-	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10). The drinking water criteria for human health were used for the radionuclides in the absence of ecological criteria.

Table B.3.1-12: Darlington Creek Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Ba-140 by gamma	Bq/L	29	5 (28); 6 (1)	3%	-	2.5	2.52	0.09	2.52	2.5	3
Be-7 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Carbon-14	Bq/L	5	0.5	0%	-	0.25	-	-	-	-	0.25
Ce-141 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/L	29	5	0%	-	2.5	-	-	-	-	2.5
Chlorine-36	Bq/L	9	10	0%	-	5	-	-	-	-	5
Co-57 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Cs-134 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/L	29	1	0%	50	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/L	29	3	0%	-	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Fe-59 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Gross Beta	Bq/L	29	0.1	62%	-	0.05	0.61	0.82	0.21	2.16	2.3
I-131 by gamma	Bq/L	29	2 (28); 3 (1)	3%	10	1	1.02	0.09	1.01	1	1.5
Iodine-129	Bq/L	3	10	0%	-	5	-	-	-	-	5
Iodine-129 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5

Table B.3.1-12: Darlington Creek Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
K-40 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
La-140 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Mn-54 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Sb-124 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Sb-125 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Se-75 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Strontium-89	Bq/L	14	0.1	0%	-	0.05	-	-	-	-	0.05
Strontium-90	Bq/L	14	0.1	0%	10	0.05	-	-	-	-	0.05
Technicium-99	Bq/L	3	10	0%	-	5	-	-	-	-	5
Technicium-99 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
Tritium	Bq/L	29	15	10%	7000	7.5	8.9	4.2	8.3	19	24
Zn-65 by gamma	Bq/L	29	3	0%	-	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10). The drinking water criteria for human health were used for the radionuclides in the absence of ecological criteria. Sample point is at an offsite location in a tributary that has no interaction with the Darlington site (see Surface Water Existing Condition TSD). Water quality is similar to Coot's pond and reflect water quality within the general area creeks and ponds.

Table B.3.1-13: McLaughlin Bay Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/L	11	2	0%	-	1	-	-	-	-	1
Ba-140 by gamma	Bq/L	11	5	0%	-	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/L	11	10	0%	-	5	-	-	-	-	5
Carbon-14	Bq/L	5	0.5	0%	-	0.25	-	-	-	-	0.25
Ce-141 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/L	11	5	0%	-	2.5	-	-	-	-	2.5
Chlorine-36	Bq/L	11	10	0%	-	5	-	-	-	-	5
Co-57 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5

Table B.3.1-13: McLaughlin Bay Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Co-60 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/L	11	10	0%	-	5	-	-	-	-	5
Cs-134 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/L	11	1	0%	50	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/L	11	3	0%	-	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/L	11	2	0%	-	1	-	-	-	-	1
Fe-59 by gamma	Bq/L	11	2	0%	-	1	-	-	-	-	1
Gross Beta	Bq/L	5	0.1	100%	-	0.2	0.2	0	0.2	0.2	0.2
I-131 by gamma	Bq/L	11	2	0%	10	1	-	-	-	-	1
Iodine-129	Bq/L	5	10	0%	-	5	-	-	-	-	5
Iodine-129 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
K-40 by gamma	Bq/L	11	10	0%	-	5	-	-	-	-	5
La-140 by gamma	Bq/L	11	2	0%	-	1	-	-	-	-	1
Mn-54 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/L	11	10	0%	-	5	-	-	-	-	5
Sb-124 by gamma	Bq/L	11	2	0%	-	1	-	-	-	-	1
Sb-125 by gamma	Bq/L	11	2	0%	-	1	-	-	-	-	1
Se-75 by gamma	Bq/L	11	1	0%	-	0.5	-	-	-	-	0.5
Strontium-89	Bq/L	11	0.1	0%	-	0.05	-	-	-	-	0.05
Strontium-90	Bq/L	11	0.1	0%	10	0.05	-	-	-	-	0.05
Technicium-99	Bq/L	5	10	0%	-	5	-	-	-	-	5
Technicium-99 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
Tritium	Bq/L	5	15	100%	7000	26	27.8	2.2	27.7	30.6	31
Zn-65 by gamma	Bq/L	11	3	0%	-	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/L	11	2	0%	-	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10). The drinking water criteria for human health were used for the radionuclides in the absence of ecological criteria.

Table B.3.1-14: Stormwater Management Pond Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Ba-140 by gamma	Bq/L	29	5 (28); 6 (1)	3%	-	2.5	2.52	0.09	2.52	2.5	3
Be-7 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Carbon-14	Bq/L	5	0.5	0%	-	0.25	-	-	-	-	0.25
Ce-141 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/L	29	5	0%	-	2.5	-	-	-	-	2.5
Chlorine-36	Bq/L	9	10	0%	-	5	-	-	-	-	5
Co-57 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Cs-134 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/L	29	1	0%	50	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/L	29	3	0%	-	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Fe-59 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Gross Beta	Bq/L	29	0.1	38%	-	0.05	0.12	0.15	0.08	0.32	0.8
I-131 by gamma	Bq/L	29	2 (27); 3 (2)	7%	10	1	1.03	0.13	1.03	1.3	1.5
Iodine-129	Bq/L	3	10	0%	-	5	-	-	-	-	5
Iodine-129 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
K-40 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
La-140 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Mn-54 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Sb-124 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Sb-125 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Se-75 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Strontium-89	Bq/L	14	0.1	0%	-	0.05	-	-	-	-	0.05
Strontium-90	Bq/L	14	0.1	0%	10	0.05	-	-	-	-	0.05
Technicium-99	Bq/L	3	10	0%	-	5	-	-	-	-	5
Technicium-99 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5

Table B.3.1-14: Stormwater Management Pond Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Tritium	Bq/L	29	15	100%	7000	59	142.8	135.3	112.8	520	538
Zn-65 by gamma	Bq/L	29	3	0%	-	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10). The drinking water criteria for human health were used for the radionuclides in the absence of ecological criteria.

Table B.3.1-15: Treefrog Pond Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Ba-140 by gamma	Bq/L	29	5 (27); 6 (1); 9 (1)	7%	-	2.5	2.59	0.38	2.57	2.8	4.5
Be-7 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Carbon-14	Bq/L	5	0.5	0%	-	0.25	-	-	-	-	0.25
Ce-141 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/L	29	5	0%	-	2.5	-	-	-	-	2.5
Chlorine-36	Bq/L	9	10	0%	-	5	-	-	-	-	5
Co-57 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Cs-134 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/L	29	1	0%	50	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/L	29	3	0%	-	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Fe-59 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Gross Beta	Bq/L	29	0.1	83%	-	0.05	0.41	0.26	0.30	0.8	0.8
I-131 by gamma	Bq/L	29	2 (27); 3 (1); 5(1)	7%	10	1	1.07	0.29	1.05	1.3	2.5
Iodine-129	Bq/L	3	10	0%	-	5	-	-	-	-	5
Iodine-129 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
K-40 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
La-140 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Mn-54 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5

Table B.3.1-15: Treefrog Pond Radiological Surface Water Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ru-103 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/L	29	10	0%	-	5	-	-	-	-	5
Sb-124 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Sb-125 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1
Se-75 by gamma	Bq/L	29	1	0%	-	0.5	-	-	-	-	0.5
Strontium-89	Bq/L	14	0.1	0%	-	0.05	-	-	-	-	0.05
Strontium-90	Bq/L	14	0.1	0%	10	0.05	-	-	-	-	0.05
Technicium-99	Bq/L	3	10	0%	-	5	-	-	-	-	5
Technicium-99 by ICPMS	Bq/L	6	10	0%	-	5	-	-	-	-	5
Tritium	Bq/L	29	7	100%	7000	44	82.9	31.1	77.9	130	158
Zn-65 by gamma	Bq/L	29	3	0%	-	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/L	29	2	0%	-	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10). The drinking water criteria for human health were used for the radionuclides in the absence of ecological criteria.

B.3.2 Sediment Data Tables

The tables in Section B.3.2 are of sediment data collected at the surface water (SW) and pond sampling locations identified in Table B.2-1.

B.3.2.1 Conventional Sediment Data Tables

Table B.3.2-1: Site (Lake Ontario) Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	16	1	100%	-	1313.3	7801.9	8573.6	5131.2	21144.7	34862.6
Antimony	mg/kg	16	0.05	100%	-	0.04	0.16	0.21	0.12	0.40	0.93
Arsenic	mg/kg	16	0.05	100%	5.9	1.16	2.32	1.73	2.04	4.44	8.63
Barium	mg/kg	16	0.5	100%	-	124.0	261.8	88.5	245.5	369.0	415.1
Beryllium	mg/kg	16	0.5	100%	-	0.85	1.18	0.22	1.16	1.52	1.62
Bismuth	mg/kg	16	0.05	100%	-	0.08	0.23	0.16	0.19	0.46	0.74
Boron	mg/kg	16	0.05	100%	-	10.5	16.3	10.7	14.7	29.7	55.1
Boron-hot water	mg/kg	16	0.05 (15); 0.02 (1)	6%	-	0.03	0.17	0.57	0.03	0.59	2.30
Cadmium	mg/kg	16	0.05	100%	0.6	0.10	0.20	0.29	0.15	0.45	1.30
Calcium	mg/kg	16	1	100%	-	47025	77083	24826	73853	115742	148826
Cesium	mg/kg	16	0.05	100%	-	0.19	0.43	0.60	0.32	0.97	2.66
Chromium	mg/kg	16	1	100%	26	12.7	28.5	11.0	26.4	46.9	49.3
Cobalt	mg/kg	16	0.05	100%	50	3.57	7.56	2.76	7.05	11.99	12.39
Copper	mg/kg	16	1	100%	16	1.6	5.4	10.5	3.2	15.1	44.6
Iron	mg/kg	16	0.5	100%	20000	8229	24519	13112	21213	47736	48742
Lead	mg/kg	16	0.05	100%	31	6.7	12.3	7.9	10.9	22.0	39.2
Lithium	mg/kg	16	0.005	100%	-	6.1	8.1	4.9	7.5	12.9	26.2
Magnesium	mg/kg	16	0.5	100%	-	3039	6358	2387	5937	9607	12500
Manganese	mg/kg	16	1	100%	460	241	545	207	503	835	876
Mercury	mg/kg	16	0.01 (15); 0.05 (1)	6%	0.17	0.005	0.014	0.036	0.006	0.041	0.150
Molybdenum	mg/kg	16	0.05	100%	13.8	0.19	0.50	0.23	0.45	0.82	1.05
Nickel	mg/kg	16	1	100%	16	4.0	7.9	6.0	6.9	14.5	29.6
PCBs (Total)	mg/kg	16	0.05	0%	0.0341	0.025	-	-	-	-	0.025

Table B.3.2-1: Site (Lake Ontario) Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Petroleum Hydrocarbons F1	mg/kg	16	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F2	mg/kg	16	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F3	mg/kg	16	10	19%	-	5	24	60	8	103	244
Petroleum Hydrocarbons F4	mg/kg	16	10	13%	-	5	14	32	7	44	135
Phosphorus	mg/kg	16	0.5	100%	600	249	562	315	494	1146	1251
Potassium	mg/kg	16	1	100%	-	4310	8149	2723	7757	11488	15887
Selenium	mg/kg	16	0.05	100%	1.9	0.17	1.12	0.70	0.81	1.91	2.04
Silver	mg/kg	16	0.05	6%	0.5	0.025	0.069	0.176	0.031	0.201	0.730
Sodium	mg/kg	16	5	100%	-	4815	7877	1805	7679	10574	10811
Strontium	mg/kg	16	1	100%	-	185	267	48	263	325	377
Thallium	mg/kg	16	0.05	100%	-	0.09	0.21	0.12	0.19	0.37	0.56
Thorium	mg/kg	16	0.05	100%	-	0.96	2.91	1.57	2.51	5.38	6.41
Tin	mg/kg	16	0.05	100%	-	0.25	1.99	1.09	1.70	3.61	5.15
Titanium	mg/kg	16	0.5	100%	-	619	1686	817	1489	2841	3069
Tungsten	mg/kg	16	0.005	100%	-	0.06	0.22	0.24	0.17	0.51	1.08
Uranium	mg/kg	16	0.01	100%	104.4	0.96	2.13	0.76	1.98	2.97	3.21
Vanadium	mg/kg	16	2.5	100%	35.2	20.6	59.2	27.8	52.5	105.3	107.7
Zinc	mg/kg	16	2	100%	120	20.9	37.4	24.3	33.5	64.8	124.1
Zirconium	mg/kg	16	1	100%	-	22.8	84.5	49.3	69.6	160.3	168.7

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/kg, and 10 samples analyzed at 0.004 mg/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-2: Local (Lake Ontario) Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	1	1	100%	-	23869.6	-	-	-	-	23869.6
Antimony	mg/kg	1	0.05	100%	-	0.20	-	-	-	-	0.20
Arsenic	mg/kg	1	0.05	100%	5.9	4.35	-	-	-	-	4.35
Barium	mg/kg	1	0.5	100%	-	450.4	-	-	-	-	450.4
Beryllium	mg/kg	1	0.5	100%	-	1.71	-	-	-	-	1.71
Bismuth	mg/kg	1	0.05	100%	-	0.64	-	-	-	-	0.64
Boron	mg/kg	1	0.05	100%	-	34.5	-	-	-	-	34.5
Boron-hot water	mg/kg	1	1	0%	-	0.5	-	-	-	-	0.5
Cadmium	mg/kg	1	0.05	100%	0.6	0.36	-	-	-	-	0.36
Calcium	mg/kg	1	1	100%	-	68158	-	-	-	-	68158

Table B.3.2-2: Local (Lake Ontario) Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Cesium	mg/kg	1	0.05	100%	-	1.49	-	-	-	-	1.49
Chromium	mg/kg	1	1	100%	26	35.1	-	-	-	-	35.1
Cobalt	mg/kg	1	0.05	100%	50	9.76	-	-	-	-	9.76
Copper	mg/kg	1	1	100%	16	14.6	-	-	-	-	14.6
Iron	mg/kg	1	0.5	100%	20000	21939	-	-	-	-	21939
Lead	mg/kg	1	0.05	100%	31	19.0	-	-	-	-	19.0
Lithium	mg/kg	1	0.005	100%	-	16.3	-	-	-	-	16.3
Magnesium	mg/kg	1	0.5	100%	-	7922	-	-	-	-	7922
Manganese	mg/kg	1	1	100%	460	534	-	-	-	-	534
Mercury	mg/kg	1	0.05	100%	0.17	0.042	-	-	-	-	0.042
Molybdenum	mg/kg	1	0.05	100%	13.8	0.40	-	-	-	-	0.40
Nickel	mg/kg	1	1	100%	16	16.0	-	-	-	-	16.0
PCBs (Total)	mg/kg	1	0.05	0%	0.0341	0.025	-	-	-	-	0.025
Petroleum Hydrocarbons F1	mg/kg	1	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F2	mg/kg	1	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F3	mg/kg	1	10	100%	-	72	-	-	-	-	72
Petroleum Hydrocarbons F4	mg/kg	1	10	100%	-	18	-	-	-	-	18
Phosphorus	mg/kg	1	0.5	100%	600	809	-	-	-	-	809
Potassium	mg/kg	1	1	100%	-	16791	-	-	-	-	16791
Selenium	mg/kg	1	0.05	100%	1.9	0.40	-	-	-	-	0.40
Silver	mg/kg	1	0.05	100%	0.5	0.310	-	-	-	-	0.310
Sodium	mg/kg	1	5	100%	-	14674	-	-	-	-	14674
Strontium	mg/kg	1	1	100%	-	287	-	-	-	-	287
Thallium	mg/kg	1	0.05	100%	-	0.48	-	-	-	-	0.48
Thorium	mg/kg	1	0.05	100%	-	4.07	-	-	-	-	4.07
Tin	mg/kg	1	0.05	100%	-	2.85	-	-	-	-	2.85
Titanium	mg/kg	1	0.5	100%	-	2857	-	-	-	-	2857
Tungsten	mg/kg	1	0.005	100%	-	0.54	-	-	-	-	0.54
Uranium	mg/kg	1	0.01	100%	104.4	1.47	-	-	-	-	1.47
Vanadium	mg/kg	1	2.5	100%	35.2	58.7	-	-	-	-	58.7
Zinc	mg/kg	1	2	100%	120	47.9	-	-	-	-	47.9
Zirconium	mg/kg	1	1	100%	-	70.0	-	-	-	-	70.0

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/kg, and 10 samples analyzed at 0.004 mg/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-3: Regional (Lake Ontario) Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	10	1	100%	-	2410.8	5234.1	1903.7	4890.1	7908.7	8153.8
Antimony	mg/kg	10	0.5	0%	-	0.25	-	-	-	-	0.25
Arsenic	mg/kg	10	0.05	100%	5.9	1.66	2.54	0.70	2.46	3.45	3.53
Barium	mg/kg	10	0.5	100%	-	176.1	223.8	31.3	221.8	264.3	272.7
Beryllium	mg/kg	10	0.5	100%	-	0.56	0.94	0.19	0.92	1.17	1.20
Bismuth	mg/kg	10	0.5	0%	-	0.25	-	-	-	-	0.25
Boron	mg/kg	10	1.25	100%	-	3.2	5.9	1.2	5.8	7.1	7.1
Cadmium	mg/kg	10	0.05	100%	0.6	0.06	0.11	0.04	0.10	0.16	0.17
Calcium	mg/kg	10	1	100%	-	56136	82789	23458	79730	107576	109980
Cesium	mg/kg	10	0.05	100%	-	0.17	0.19	0.01	0.19	0.21	0.21
Chromium	mg/kg	10	1	100%	26	15.1	30.1	10.6	28.3	42.3	42.4
Cobalt	mg/kg	10	1	100%	50	4.26	9.23	3.49	8.59	13.16	13.44
Copper	mg/kg	10	0.1	100%	16	2.0	3.2	1.2	3.0	4.8	5.2
Iron	mg/kg	10	0.5	100%	20000	10849	25173	12668	22217	41967	43482
Lead	mg/kg	10	0.05	100%	31	6.1	8.7	2.2	8.5	12.3	13.9
Lithium	mg/kg	10	0.5	100%	-	3.4	5.5	1.6	5.3	7.2	7.3
Magnesium	mg/kg	10	0.5	100%	-	4111	7287	2885	6755	10501	10565
Manganese	mg/kg	10	1	100%	460	295	624	270	569	958	979
Molybdenum	mg/kg	10	0.05	100%	13.8	0.32	0.68	0.30	0.61	1.03	1.07
Nickel	mg/kg	10	1	100%	16	4.1	7.1	2.1	6.8	9.8	10.3
PCBs (Total)	mg/kg	10	0.05	0%	0.0341	0.025	-	-	-	-	0.025
Petroleum Hydrocarbons F1	mg/kg	10	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F2	mg/kg	10	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F3	mg/kg	10	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F4	mg/kg	10	10	0%	-	5	-	-	-	-	5
Phosphorus	mg/kg	10	0.5	100%	600	374	830	434	721	1327	1330
Potassium	mg/kg	10	1	100%		6050	7324	910	7273	8494	8752
Selenium	mg/kg	10	0.05 (5); 0.5 (5)	50%	1.9	0.25	0.49	0.26	0.42	0.83	0.88
Silver	mg/kg	10	0.05	100%	0.5	0.132	0.295	0.150	0.259	0.458	0.462
Sodium	mg/kg	10	5	100%	-	6138	8294	1023	8231	9154	9211
Strontium	mg/kg	10	1	100%	-	185	244	25	242	270	276
Thallium	mg/kg	10	0.05	100%	-	0.10	0.14	0.02	0.14	0.17	0.17
Thorium	mg/kg	10	0.05	100%	-	1.07	2.55	1.38	2.20	4.34	4.68
Tin	mg/kg	10	0.05	100%	-	0.84	1.90	0.94	1.68	3.01	3.07

Table B.3.2-3: Regional (Lake Ontario) Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Titanium	mg/kg	10	0.5	100%	-	995	2360	1038	2134	3534	3603
Tungsten	mg/kg	10	0.005	100%	-	0.10	0.32	0.19	0.27	0.58	0.65
Uranium	mg/kg	10	0.01	100%	104.4	0.99	1.92	0.92	1.72	2.99	3.03
Vanadium	mg/kg	10	2.5	100%	35.2	26.0	59.0	27.2	53.0	92.1	93.1
Zinc	mg/kg	10	2	100%	120	17.6	34.2	11.8	32.2	47.5	47.7
Zirconium	mg/kg	10	1	100%	-	27.9	71.4	39.7	61.1	122.2	122.5

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/kg, and 10 samples analyzed at 0.004 mg/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-4: Coots Pond Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	1	100%	-	24147	26282	1926	26226	28529	28715
Antimony	mg/kg	5	0.05	100%	-	0.20	0.35	0.09	0.34	0.41	0.41
Arsenic	mg/kg	5	0.05	100%	5.9	2.11	2.80	0.45	2.77	3.27	3.35
Barium	mg/kg	5	0.5	100%	-	330	337	5	337	341	342
Beryllium	mg/kg	5	0.5	100%	-	1.29	1.36	0.05	1.36	1.41	1.41
Bismuth	mg/kg	5	0.05	100%	-	0.20	0.24	0.03	0.24	0.27	0.27
Boron	mg/kg	5	0.05	100%	-	29.8	48.4	10.5	47.2	55.0	55.1
Boron-hot water	mg/kg	5	0.02	100%	-	0.89	5.16	4.58	3.44	11.07	12.24
Cadmium	mg/kg	5	0.05	100%	0.6	0.14	0.23	0.05	0.22	0.25	0.25
Calcium	mg/kg	5	1	100%	-	136332	179021	25377	177420	199697	201620
Cesium	mg/kg	5	0.05	100%	-	1.15	2.10	0.54	2.03	2.45	2.46
Chromium	mg/kg	5	1	100%	26	19.1	22.9	2.5	22.8	25.2	25.3
Cobalt	mg/kg	5	0.05	100%	50	7.6	9.3	1.0	9.2	9.9	9.9
Copper	mg/kg	5	1	100%	16	13.4	24.0	6.0	23.2	26.9	26.9
Iron	mg/kg	5	0.5	100%	20000	11462	13374	1186	13329	14377	14387
Lead	mg/kg	5	0.05	100%	31	13.4	16.7	2.1	16.6	18.7	19.0
Lithium	mg/kg	5	0.005	100%	-	15.6	25.4	5.6	24.8	29.1	29.2
Magnesium	mg/kg	5	0.5	100%	-	8947	9849	522	9837	10229	10257
Manganese	mg/kg	5	1	100%	460	368	461	54	458	502	503
Mercury	mg/kg	5	0.05	100%	0.17	0.0137	0.0237	0.0077	0.0226	0.0325	0.0334
Molybdenum	mg/kg	5	0.05	100%	13.8	0.48	1.16	0.39	1.08	1.40	1.41
Nickel	mg/kg	5	1	100%	16	8.5	11.3	1.7	11.2	12.6	12.7

Table B.3.2-4: Coots Pond Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
PCB in solid	mg/kg	5	0.05	0%	0.0341	0.025	-	-	-	-	0.025
Petroleum Hydrocarbons F1	mg/kg	5	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F2	mg/kg	5	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F3	mg/kg	5	10	100%	-	209.0	268.8	39.9	266.3	308.0	313.0
Petroleum Hydrocarbons F4	mg/kg	5	10	100%	-	38.0	49.0	8.1	48.4	57.6	59.0
Phosphorus	mg/kg	5	0.5	100%	600	592	651	33	650	671	673
Potassium	mg/kg	5	1	100%	-	10756	11479	500	11470	11957	11959
Selenium	mg/kg	5	0.05	100%	1.9	0.23	0.77	0.32	0.68	1.04	1.06
Silver	mg/kg	5	0.05	0%	0.5	0.025	-	-	-	-	0.025
Sodium	mg/kg	5	5	100%	-	5403	6313	1483	6195	8330	8949
Strontium	mg/kg	5	1	100%	-	452	608	100	601	699	701.6
Thallium	mg/kg	5	0.05	100%	-	0.30	0.37	0.04	0.37	0.39	0.40
Thorium	mg/kg	5	0.05	100%	-	3.76	5.36	0.91	5.29	5.95	5.99
Tin	mg/kg	5	0.05	100%	-	1.24	1.78	0.34	1.75	2.12	2.17
Titanium	mg/kg	5	0.5	100%	-	779	940	125	934	1086	1103
Tungsten	mg/kg	5	0.005	100%	-	0.29	0.55	0.17	0.52	0.72	0.74
Uranium	mg/kg	5	0.01	100%	104.4	1.46	2.21	0.44	2.16	2.57	2.62
Vanadium	mg/kg	5	2.5	100%	35.2	31.5	38.1	3.9	37.9	40.9	40.9
Zinc	mg/kg	5	2	100%	120	43.5	70.7	16.1	68.9	82.8	82.8
Zirconium by ICP	mg/kg	5	1	100%	-	22.1	26.8	5.3	26.4	34.0	35.9

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/kg, and 10 samples analyzed at 0.004 mg/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-5: Darlington Creek Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	1	100%	-	15438	21374	3565	21105	24445	24861
Antimony	mg/kg	5	0.05	100%	-	0.14	0.19	0.05	0.19	0.26	0.28
Arsenic	mg/kg	5	0.05	100%	5.9	1.73	2.35	0.48	2.31	2.91	3.02
Barium	mg/kg	5	0.5	100%	-	326	338	11	338	350	350
Beryllium	mg/kg	5	0.5	100%	-	1.25	1.38	0.11	1.37	1.49	1.50
Bismuth	mg/kg	5	0.05	100%	-	0.18	0.23	0.04	0.23	0.27	0.27
Boron	mg/kg	5	0.05	100%	-	17.6	20.7	3.3	20.5	24.9	25.7
Boron-hot water	mg/kg	5	0.02	100%	-	0.16	0.18	0.02	0.18	0.21	0.21
Cadmium	mg/kg	5	0.05	100%	0.6	0.20	0.24	0.04	0.24	0.28	0.29

Table B.3.2-5: Darlington Creek Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Calcium	mg/kg	5	1	100%	-	58285	61844	5221	61679	68898	71093
Cesium	mg/kg	5	0.05	100%	-	0.82	1.09	0.30	1.06	1.48	1.56
Chromium	mg/kg	5	1	100%	26	21.0	24.3	2.7	24.1	27.3	27.6
Cobalt	mg/kg	5	0.05	100%	50	6.7	7.8	1.0	7.8	9.1	9.3
Copper	mg/kg	5	1	100%	16	14.0	18.2	3.2	17.9	22.1	23.0
Iron	mg/kg	5	0.5	100%	20000	13634	15637	1658	15567	17667	17979
Lead	mg/kg	5	0.05	100%	31	15.5	19.8	2.8	19.6	22.2	22.4
Lithium	mg/kg	5	0.005	100%	-	14.4	18.0	4.2	17.6	23.6	24.8
Magnesium	mg/kg	5	0.5	100%	-	4683	5643	678	5610	6380	6508
Manganese	mg/kg	5	1	100%	460	341	418	50	415	457	458
Mercury	mg/kg	5	0.05	100%	0.17	0.0205	0.0255	0.0044	0.0252	0.0308	0.0313
Molybdenum	mg/kg	5	0.05	100%	13.8	0.39	0.46	0.08	0.46	0.56	0.58
Nickel	mg/kg	5	1	100%	16	7.1	8.6	1.6	8.4	10.7	11.0
PCB in solid	mg/kg	5	0.05	0%	0.0341	0.025	-	-	-	-	0.025
Petroleum Hydrocarbons F1	mg/kg	5	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F2	mg/kg	5	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F3	mg/kg	5	10	100%	-	18.0	71.0	41.3	59.0	119.4	128.0
Petroleum Hydrocarbons F4	mg/kg	5	10	80%	-	5.0	19.6	12.1	16.2	34.8	38.0
Phosphorus	mg/kg	5	0.5	100%	600	456	641	107	633	719	727
Potassium	mg/kg	5	1	100%	-	10092	10860	442	10852	11146	11151
Selenium	mg/kg	5	0.05	100%	1.9	0.11	0.29	0.27	0.22	0.66	0.76
Silver	mg/kg	5	0.05	0%	0.5	0.025	-	-	-	-	0.025
Sodium	mg/kg	5	5	100%	-	8306	9220	616	9203	9844	9905
Strontium	mg/kg	5	1	100%	-	271	288	25	287	321	327
Thallium	mg/kg	5	0.05	100%	-	0.27	0.31	0.04	0.31	0.35	0.36
Thorium	mg/kg	5	0.05	100%	-	2.54	3.33	0.74	3.27	4.29	4.47
Tin	mg/kg	5	0.05	100%	-	1.37	1.82	0.30	1.80	2.13	2.16
Titanium	mg/kg	5	0.5	100%	-	1155	1294	82	1291	1354	1358
Tungsten	mg/kg	5	0.005	100%	-	0.16	0.24	0.07	0.23	0.33	0.35
Uranium	mg/kg	5	0.01	100%	104.4	1.14	1.17	0.03	1.17	1.20	1.21
Vanadium	mg/kg	5	2.5	100%	35.2	36.0	40.7	3.3	40.6	44.2	44.5
Zinc	mg/kg	5	2	100%	120	44.1	53.1	8.9	52.5	64.7	67.0
Zirconium by ICP	mg/kg	5	1	100%	-	42.1	43.8	1.7	43.8	45.9	46.2

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/kg, and 10 samples analyzed at 0.004 mg/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-6: Stormwater Management Pond Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	1	100%	-	21390	25882	3208	25717	28844	29119
Antimony	mg/kg	5	0.05	100%	-	0.54	0.77	0.16	0.76	0.95	0.97
Arsenic	mg/kg	5	0.05	100%	5.9	1.94	2.60	0.50	2.56	3.07	3.09
Barium	mg/kg	5	0.5	100%	-	314	330	10	330	340	342
Beryllium	mg/kg	5	0.5	100%	-	1.26	1.38	0.07	1.38	1.43	1.44
Bismuth	mg/kg	5	0.05	100%	-	0.25	0.31	0.04	0.30	0.34	0.34
Boron	mg/kg	5	0.05	100%	-	24.1	28.9	3.6	28.7	32.7	33.0
Boron-hot water	mg/kg	5	0.02	100%	-	0.30	0.39	0.08	0.38	0.49	0.50
Cadmium	mg/kg	5	0.05	100%	0.6	0.25	0.32	0.05	0.31	0.38	0.39
Calcium	mg/kg	5	1	100%	-	95355	134872	25263	132760	156046	156498
Cesium	mg/kg	5	0.05	100%	-	1.27	1.71	0.27	1.69	1.95	1.97
Chromium	mg/kg	5	1	100%	26	27.2	30.1	2.3	30.0	32.5	32.7
Cobalt	mg/kg	5	0.05	100%	50	8.6	9.4	0.5	9.3	9.8	9.9
Copper	mg/kg	5	1	100%	16	19.6	22.6	2.3	22.5	25.2	25.6
Iron	mg/kg	5	0.5	100%	20000	13683	14560	575	14551	15057	15084
Lead	mg/kg	5	0.05	100%	31	35.8	44.3	6.3	44.0	50.5	50.6
Lithium	mg/kg	5	0.005	100%	-	19.1	22.4	2.4	22.3	24.7	24.9
Magnesium	mg/kg	5	0.5	100%	-	7680	8300	556	8285	8842	8876
Manganese	mg/kg	5	1	100%	460	359	382	14	381	393	393
Mercury	mg/kg	5	0.05	100%	0.17	0.0221	0.0248	0.0022	0.0247	0.0265	0.0265
Molybdenum	mg/kg	5	0.05	100%	13.8	0.95	1.20	0.20	1.19	1.43	1.44
Nickel	mg/kg	5	1	100%	16	10.3	11.5	0.9	11.4	12.2	12.2
PCB in solid	mg/kg	5	0.05	0%	0.0341	0.025	-	-	-	-	0.025
Petroleum Hydrocarbons F1	mg/kg	5	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F2	mg/kg	5	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F3	mg/kg	5	10	100%	-	309.0	394.6	101.1	385.4	528.6	563.0
Petroleum Hydrocarbons F4	mg/kg	5	10	100%	-	221	276.6	70.7	270.2	371.4	395
Phosphorus	mg/kg	5	0.5	100%	600	545	583	27	582	612	615
Potassium	mg/kg	5	1	100%	-	10337	11145	561	11134	11753	11849
Selenium	mg/kg	5	0.05	100%	1.9	0.47	0.60	0.09	0.60	0.69	0.71
Silver	mg/kg	5	0.05	0%	0.5	0.025	-	-	-	-	0.025
Sodium	mg/kg	5	5	100%	-	7458	7650	170	7648	7859	7893
Strontium	mg/kg	5	1	100%	-	431	489	34	488	515	516
Thallium	mg/kg	5	0.05	100%	-	0.32	0.37	0.03	0.37	0.41	0.41

Table B.3.2-6: Stormwater Management Pond Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Thorium	mg/kg	5	0.05	100%	-	4.40	5.04	0.58	5.02	5.53	5.54
Tin	mg/kg	5	0.05	100%	-	2.35	2.65	0.38	2.63	3.17	3.30
Titanium	mg/kg	5	0.5	100%	-	1031	1060	31	1060	1099	1107
Tungsten	mg/kg	5	0.005	100%	-	0.43	0.53	0.09	0.52	0.64	0.65
Uranium	mg/kg	5	0.01	100%	104.4	1.25	1.34	0.05	1.34	1.39	1.40
Vanadium	mg/kg	5	2.5	100%	35.2	37.5	39.1	1.2	39.1	40.3	40.4
Zinc	mg/kg	5	2	100%	120	130.1	165.2	24.6	163.7	190.2	192.3
Zirconium by ICP	mg/kg	5	1	100%	-	36.1	38.1	1.2	38.1	39.1	39.2

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/kg, and 10 samples analyzed at 0.004 mg/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-7: Treefrog Pond Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	1	100%	-	3661	8580	3870	7817	13245	14021
Antimony	mg/kg	5	0.05	100%	-	0.12	0.16	0.04	0.16	0.21	0.21
Arsenic	mg/kg	5	0.05	100%	5.9	2.45	2.79	0.27	2.78	3.12	3.18
Barium	mg/kg	5	0.5	100%	-	321	428	69	424	491	494
Beryllium	mg/kg	5	0.5	100%	-	1.40	1.72	0.26	1.70	1.98	2.01
Bismuth	mg/kg	5	0.05	100%	-	0.31	0.36	0.04	0.36	0.40	0.41
Boron	mg/kg	5	0.05	100%	-	29.6	34.4	4.4	34.1	39.7	40.9
Boron-hot water	mg/kg	5	0.02 (4); 0.05 (1)	80%	-	0.03	0.09	0.04	0.08	0.13	0.14
Cadmium	mg/kg	5	0.05	100%	0.6	0.21	0.30	0.08	0.29	0.38	0.38
Calcium	mg/kg	5	1	100%	-	47838	58623	7903	58186	67273	68349
Cesium	mg/kg	5	0.05	100%	-	1.29	1.54	0.26	1.53	1.89	1.97
Chromium	mg/kg	5	1	100%	26	37.6	43.1	3.8	43.0	46.8	47.0
Cobalt	mg/kg	5	0.05	100%	50	11.3	12.9	1.2	12.9	14.3	14.5
Copper	mg/kg	5	1	100%	16	15.1	20.7	4.3	20.4	25.0	25.2
Iron	mg/kg	5	0.5	100%	20000	21165	24127	1843	24069	25925	26228
Lead	mg/kg	5	0.05	100%	31	14.9	19.1	4.4	18.8	24.8	25.8
Lithium	mg/kg	5	0.005	100%	-	23.2	28.9	4.7	28.6	34.2	34.8
Magnesium	mg/kg	5	0.5	100%	-	4807	5614	793	5572	6654	6836
Manganese	mg/kg	5	1	100%	460	431	461	35	460	508	517
Mercury	mg/kg	5	0.05	100%	0.17	0.0412	0.0491	0.0088	0.0485	0.0609	0.0637

Table B.3.2-7: Treefrog Pond Conventional Sediment Data

Constituent	Units	N	MDL	% above MDL	Criteria	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Molybdenum	mg/kg	5	0.05	100%	13.8	0.37	0.52	0.14	0.51	0.70	0.73
Nickel	mg/kg	5	1	100%	16	15.8	17.9	1.8	17.8	19.9	20.1
PCB in solid	mg/kg	5	0.05	0%	0.0341	0.025	-	-	-	-	0.025
Petroleum Hydrocarbons F1	mg/kg	5	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F2	mg/kg	5	10	0%	-	5	-	-	-	-	5
Petroleum Hydrocarbons F3	mg/kg	5	10	100%	-	16.0	19.8	4.8	19.4	25.0	25.0
Petroleum Hydrocarbons F4	mg/kg	5	10	0%	-	5	-	-	-	-	5
Phosphorus	mg/kg	5	0.5	100%	600	538	664	83	660	724	725
Potassium	mg/kg	5	1	100%	-	8899	11578	1979	11440	13843	14152
Selenium	mg/kg	5	0.05	100%	1.9	0.15	0.18	0.04	0.18	0.24	0.25
Silver	mg/kg	5	0.05	0%	0.5	0.025	-	-	-	-	0.025
Sodium	mg/kg	5	5	100%	-	4396	5912	926	5848	6706	6752
Strontium	mg/kg	5	1	100%	-	162	183	17	183	201	202
Thallium	mg/kg	5	0.05	100%	-	0.39	0.52	0.08	0.51	0.60	0.61
Thorium	mg/kg	5	0.05	100%	-	1.94	2.79	1.10	2.65	4.30	4.72
Tin	mg/kg	5	0.05	100%	-	1.76	2.14	0.32	2.12	2.51	2.55
Titanium	mg/kg	5	0.5	100%	-	798	1557	449	1489	1897	1920
Tungsten	mg/kg	5	0.005	100%	-	0.14	0.23	0.08	0.22	0.33	0.35
Uranium	mg/kg	5	0.01	100%	104.4	1.49	1.74	0.21	1.73	1.94	1.95
Vanadium	mg/kg	5	2.5	100%	35.2	58.2	65.0	4.7	64.9	70.0	70.8
Zinc	mg/kg	5	2	100%	120	57.0	69.1	10.4	68.5	80.6	81.9
Zirconium by ICP	mg/kg	5	1	100%	-	45.9	50.8	3.0	50.7	53.7	54.0

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/kg, and 10 samples analyzed at 0.004 mg/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

B.3.2.2 Radiological Sediment Data

Table B.3.2-8: Site (Lake Ontario) Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	11	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	11	5 (10); 6 (1)	0%	2.5	-	-	-	-	3.0
Be-7 by gamma	Bq/kg	11	10	9%	5.0	6.2	3.9	5.6	11.5	18.0
Carbon-14	Bq/kg-C	11	100	9%	50	60.5	35.0	55.8	50	166
Ce-141 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	11	5	0%	2.5	-	-	-	-	2.5
Chlorine-36	Bq/kg	1	100	0%	50	-	-	-	-	50
Co-57 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	11	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	11	1	9%	0.5	0.56	0.21	0.54	0.85	1.2
Eu-154 by gamma	Bq/kg	11	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	11	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	11	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	11	0.1	100%	360	478	140	463	710	830
I-131 by gamma	Bq/kg	11	2	0%	1	-	-	-	-	1
Iodine-129	Bq/kg	1	100	0%	50	-	-	-	-	50
K-40 by gamma	Bq/kg	11	10	100%	57	202	58	190	260	279
La-140 by gamma	Bq/kg	11	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	11	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	11	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	11	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	11	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg	1	20	0%	10	-	-	-	-	10
Strontium-90	Bq/kg	11	20	0%	10	-	-	-	-	10
Technicium-99	Bq/kg	1	100	0%	50	-	-	-	-	50
Tritium	Bq/kg	11	15	0%	7.5	-	-	-	-	7.5
Zn-65 by gamma	Bq/kg	11	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	11	2	0%	1	-	-	-	-	1

Table B.3.2-9: Local (Lake Ontario) Background Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	St Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	1	9	0%	4.5	-	-	-	-	4.5
Be-7 by gamma	Bq/kg	1	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	1	100	0%	50	-	-	-	-	50
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Chlorine-36	Bq/kg	1	100	0%	50	-	-	-	-	50
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	1	0.1	100%	940	-	-	-	-	940
I-131 by gamma	Bq/kg	1	4	0%	2	-	-	-	-	2
K-40 by gamma	Bq/kg	1	10	100%	174	-	-	-	-	174
La-140 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Technicium-99 by ICPMS	Bq/kg	1	100	0%	50	-	-	-	-	50
Tritium	Bq/kg	1	15	0%	7.5	-	-	-	-	7.5
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/kg, and 10 samples analyzed at 0.004 Bq/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-10: Regional (Lake Ontario) Background Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	10	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	10	5 (8); 6 (2)	0%	2.5	-	-	-	-	3.0
Be-7 by gamma	Bq/kg	10	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	10	100	0%	50	-	-	-	-	50
Ce-141 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	10	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	10	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	10	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	10	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	10	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	10	0.1	100%	360	483	99	474	631	640
I-131 by gamma	Bq/kg	10	2 (2); 3 (8)	0%	1	-	-	-	-	1.5
K-40 by gamma	Bq/kg	10	10	100%	200	220	12	219	233.75	236
La-140 by gamma	Bq/kg	10	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	10	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	10	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	10	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	10	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg	10	20	0%	10	-	-	-	-	10
Strontium-90	Bq/kg	10	20	0%	10	-	-	-	-	10
Th-series- gamma	Bq/kg	10	3	100%	3.1	9.0	5.3	7.5	15	15
Tritium	Bq/kg	10	15	0%	7.5	-	-	-	-	7.5
U-series- gamma	Bq/kg	10	3	100%	5.4	16.4	10.4	13.1	27.6	28
Zn-65 by gamma	Bq/kg	10	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	10	2	0%	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/kg, and 10 samples analyzed at 0.004 Bq/kg) 0.001 (130); '0.004 (10). All units on a dry weight basis.

Table B.3.2-11: Coots Pond Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	5	100	100%	104	184.6	46.8	178.5	217.6	218
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	5	0.1	100%	580	740	93	735	812	820
I-131 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	5	10	100%	82	109.8	47.0	103.7	174.2	193
La-140 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	20	0%	10	-	-	-	-	10
Tritium	Bq/kg	5	7	100%	132	241.2	64.3	232.4	292.8	298
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/kg, and 10 samples analyzed at 0.004 Bq/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-12: Darlington Creek Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2 (4); 3 (1)	0%	1	-	-	-	-	1.5
Ba-140 by gamma	Bq/kg	5	8 (2); 10(1); 13 (1); 15(1)	0%	4	-	-	-	-	7.5
Be-7 by gamma	Bq/kg	5	10 (2); 11 (1); 12(1); 14(1)	0%	5	-	-	-	-	7
Carbon-14	Bq/kg-C	5	100	80%	50	97.4	27.0	93.4	114.2	117
Ce-141 by gamma	Bq/kg	5	2 (1); 3(2); 4(1); 5(1)	0%	1	-	-	-	-	2.5
Ce-144 by gamma	Bq/kg	5	7 (1); 8(1); 9(1); 10(2)	0%	3.5	-	-	-	-	5
Co-57 by gamma	Bq/kg	5	1 (3); 2 (2)	0%	0.5	-	-	-	-	1
Co-58 by gamma	Bq/kg	5	1(4); 2(1)	0%	0.5	-	-	-	-	1
Co-60 by gamma	Bq/kg	5	1 (4); 2(1)	0%	0.5	-	-	-	-	1
Cr-51 by gamma	Bq/kg	5	10(1); 12(1); 13(1); 17(1); 24(1)	0%	5	-	-	-	-	12
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	40%	0.5	0.9	0.6	0.8	1.68	1.8
Eu-154 by gamma	Bq/kg	5	3 (3); 4(2)	0%	1.5	-	-	-	-	2
Eu-155 by gamma	Bq/kg	5	4 (3); 5(1); 6(1)	0%	2	-	-	-	-	3
Fe-59 by gamma	Bq/kg	5	2 (3); 3(1); 4(1)	0%	1	-	-	-	-	2
Gross Beta	Bq/kg	5	0.1	100%	1170	1948	622	1870	2714	2910
I-131 by gamma	Bq/kg	5	3 (2); 4 (2); 6(1); 7(1)	0%	1.5	-	-	-	-	3.5
K-40 by gamma	Bq/kg	5	10	100%	261	297.6	24.3	296.8	320.4	322
La-140 by gamma	Bq/kg	5	2 (2); 3(2); 5(1)	0%	1	-	-	-	-	2.5
Mn-54 by gamma	Bq/kg	5	1 (4); 2 (1)	0%	0.5	-	-	-	-	1
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	5	1 (3); 2(1); 3(1)	0%	0.5	-	-	-	-	1.5
Ru-106 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	5	2(4); 3 (1)	0%	1	-	-	-	-	1.5
Sb-125 by gamma	Bq/kg	5	3(3); 5(2)	0%	1.5	-	-	-	-	2.5
Se-75 by gamma	Bq/kg	5	1 (1); 2(2); 3(2)	0%	0.5	-	-	-	-	1.5

Table B.3.2-12: Darlington Creek Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Strontium-90	Bq/kg	5	20	0%	10	-	-	-	-	10
Tritium	Bq/kg	5	15	0%	7.5	-	-	-	-	7.5
Uranium-235	ppm	5	1	100%	0.0082	0.0084	0.0001	0.0084	0.0085	0.0085
Uranium-238	ppm	5	0.01	100%	1.15	1.16	0.02	1.16	1.18	1.19
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2 (3); 3(1); 4(1)	0%	1	-	-	-	-	2

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/kg, and 10 samples analyzed at 0.004 Bq/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-13: Stormwater Management Pond Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	5	10	100%	17	29.2	11.0	27.4	39.8	41
Carbon-14	Bq/kg-C	5	100	40%	50	73.4	32.1	68.1	109.2	112
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	5	0.1	100%	740	862	100	857	984	1000
I-131 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	5	10	100%	158	185.8	16.8	185.2	198.8	199
La-140 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5

Table B.3.2-13: Stormwater Management Pond Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	20	0%	10	-	-	-	-	10
Tritium	Bq/kg	5	7	100%	170	183.8	15.3	183.3	204.4	210
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/kg, and 10 samples analyzed at 0.004 Bq/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

Table B.3.2-14: Treefrog Pond Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	5	5(4); 6(1)	0%	3	-	-	-	-	3
Be-7 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	5	100	100%	145	194.0	33.6	191.5	225.6	230
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	20%	0.5	0.6	0.2	0.6	0.9	1
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	5	0.1	100%	760	866	114	860	1018	1050
I-131 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	5	10	100%	237	259.4	21.8	258.7	286.6	291
La-140 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1

Table B.3.2-14: Treefrog Pond Radiological Sediment Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	20	0%	10	-	-	-	-	10
Tritium	Bq/kg	5	7	100%	145	193.6	35.4	191.0	235.2	242
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/kg, and 10 samples analyzed at 0.004 Bq/kg) 0.001 (130); '0.004 (10).
All units on a dry weight basis.

B.3.3 Groundwater Data Tables

The tables in Section B.3.3 are of data collected at the monitoring well (MW) sampling locations identified in Table B.2-1.

B.3.3.1 Conventional Groundwater Data

Table B.3.3-1: Conventional Groundwater Data – Polygon AB

Constituent	Units	N	MDL	% above MDL	MOE 2004 Table 3	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/L	19	0.0001	95%	-	0.0043	0.018	0.032	0.011	0.040	0.145
Antimony	mg/L	18	0.001	0%	16	0.0005	-	-	-	-	0.0005
Arsenic	mg/L	18	0.001	72%	0.48	0.00050	0.0021	0.0021	0.0014	0.0058	0.0070
Barium	mg/L	18	0.0001	100%	23	0.016	0.12	0.12	0.07	0.32	0.42
Beryllium	mg/L	18	0.001	0%	0.053	0.0005	-	-	-	-	0.0005
Bismuth	mg/L	18	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	mg/L	18	0.0001	100%	50	0.0170	0.039	0.023	0.034	0.086	0.087
Cadmium	mg/L	18	0.0001	6%	0.011	0.00005	-	-	-	-	0.0001
Calcium	mg/L	18	0.0001	100%	-	49.3	150.1	71.0	133.4	249.7	320.1
Cesium	mg/L	18	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Chromium (Total)	mg/L	18	0.0001	83%	2	0.0001	0.0021	0.0037	0.0007	0.0098	0.0143
Cobalt	mg/L	18	0.0001	100%	0.1	0.0002	0.0011	0.0009	0.0008	0.0024	0.0037
Copper	mg/L	18	0.0001	100%	0.023	0.00030	0.00102	0.00054	0.00090	0.00198	0.00240
Iron	mg/L	18	0.001	100%	-	0.025	0.28	0.26	0.16	0.69	0.83
Lead	mg/L	18	0.0001	17%	0.032	0.00005	0.00007	0.00005	0.00006	0.00013	0.00023
Lithium	mg/L	18	0.0001	100%	-	0.0043	0.0117	0.0042	0.0110	0.0191	0.0209
Magnesium	mg/L	18	0.0001	100%	-	28.6	63.2	26.5	57.8	92.8	130.8
Manganese	mg/L	18	0.0001	100%	-	0.0138	0.108	0.105	0.068	0.280	0.350
Mercury	mg/L	11	0.0001	0%	0.12	0.00005	-	-	-	-	0.00005
Molybdenum	mg/L	18	0.0001	100%	7.3	0.00070	0.007	0.006	0.004	0.015	0.019
Nickel	mg/L	18	0.0001	100%	1.6	0.00034	0.0021	0.0018	0.0016	0.0042	0.0084
Phosphorus	mg/L	18	0.02	17%	-	0.010	0.013	0.008	0.012	0.028	0.038
Potassium	mg/L	18	0.001	100%	-	1.56	4.61	3.28	3.85	8.30	15.61
Selenium	mg/L	18	0.001	44%	0.05	0.0005	0.0013	0.0013	0.0009	0.0035	0.0044
Silver	mg/L	18	0.0001	0%	0.0012	0.00005	-	-	-	-	0.00005
Sodium	mg/L	18	0.0001	100%	-	6.88	64.60	95.74	26.40	244.71	264.69
Strontium	mg/L	18	0.0001	100%	-	0.34	1.01	0.94	0.75	2.94	3.27
Thallium	mg/L	18	0.0001	0%	0.4	0.00005	-	-	-	-	0.00005
Thorium	mg/L	18	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Tin	mg/L	18	0.0001	28%	-	0.00005	0.00009	0.00006	0.00007	0.00020	0.00024

Table B.3.3-1: Conventional Groundwater Data – Polygon AB

Constituent	Units	N	MDL	% above MDL	MOE 2004 Table 3	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Titanium	mg/L	18	0.0001	100%	-	0.00186	0.0047	0.0022	0.0042	0.0092	0.0097
Tungsten	mg/L	18	0.0001	6%	-	0.00005	0.0001	0.0001	0.0001	0.0001	0.0003
Uranium	mg/L	18	0.0001	100%	-	0.0002	0.0062	0.0036	0.0042	0.0108	0.0128
Vanadium	mg/L	18	0.0001	100%	0.2	0.00016	0.00097	0.00144	0.00052	0.00483	0.00484
Zinc	mg/L	18	0.0001	94%	1.1	0.0001	0.0019	0.0017	0.0013	0.0047	0.0078
Zirconium	mg/L	18	0.0001	61%	-	0.00005	0.00019	0.00016	0.00013	0.00043	0.00060

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/L, and 10 samples analyzed at 0.004 mg/L) 0.001 (130); '0.004 (10).

Table B.3.3-2: Conventional Groundwater Data – Polygon C

Constituent	Units	N	MDL	% above MDL	MOE 2004 Table 3	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/L	6	0.0001	100%	-	0.0039	0.0076	0.0030	0.0071	0.0110	0.0114
Antimony	mg/L	6	0.001	0%	16	0.0005	-	-	-	-	0.0005
Arsenic	mg/L	6	0.001	17%	0.48	0.00025	0.00046	0.00010	0.00044	0.00050	0.00050
Barium	mg/L	6	0.0001	100%	23	0.043	0.071	0.029	0.066	0.110	0.117
Beryllium	mg/L	6	0.001	0%	0.053	0.0005	-	-	-	-	0.0005
Bismuth	mg/L	6	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	mg/L	6	0.0001	100%	50	0.0108	0.015	0.004	0.014	0.020	0.021
Cadmium	mg/L	6	0.0001	67%	0.011	0.00005	-	-	-	-	0.00005
Calcium	mg/L	6	0.0001	100%	-	86.5	114.0	33.3	110.4	162.3	174.0
Cesium	mg/L	6	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Chromium (Total)	mg/L	6	0.0001	83%	2	0.0001	0.0021	0.0016	0.0011	0.0041	0.0044
Cobalt	mg/L	6	0.0001	100%	0.1	0.0002	0.0004	0.0003	0.0004	0.0007	0.0008
Copper	mg/L	6	0.0001	100%	0.023	0.00060	0.00124	0.00101	0.00104	0.00271	0.00330
Iron	mg/L	6	0.001	83%	-	0.001	0.017	0.013	0.010	0.031	0.034
Lead	mg/L	6	0.0001	0%	0.032	0.00005	-	-	-	-	0.00005
Lithium	mg/L	6	0.0001	100%	-	0.0020	0.0058	0.0038	0.0047	0.0100	0.0102
Magnesium	mg/L	6	0.0001	100%	-	18.2	21.9	3.9	21.6	27.4	28.7
Manganese	mg/L	6	0.0001	100%	-	0.0076	0.0379	0.0374	0.0244	0.0919	0.1005
Mercury	mg/L	4	0.0001	0%	0.12	0.00005	-	-	-	-	0.00005
Molybdenum	mg/L	6	0.0001	100%	7.3	0.00029	0.0012	0.0010	0.0009	0.0023	0.0024
Nickel	mg/L	6	0.0001	100%	1.6	0.00035	0.00079	0.00045	0.00070	0.00144	0.00164
Phosphorus	mg/L	6	0.02	0%	-	0.010	-	-	-	-	0.010
Potassium	mg/L	6	0.001	100%	-	0.92	1.31	0.34	1.27	1.72	1.75
Selenium	mg/L	6	0.001	17%	0.05	0.0005	0.0007	0.0004	0.0006	0.0013	0.0016

Table B.3.3-2: Conventional Groundwater Data – Polygon C

Constituent	Units	N	MDL	% above MDL	MOE 2004 Table 3	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Silver	mg/L	6	0.0001	0%	0.0012	0.00005	-	-	-	-	0.00005
Sodium	mg/L	6	0.0001	100%	-	5.99	10.8	5.1	9.9	18.3	19.6
Strontium	mg/L	6	0.0001	100%	-	0.26	0.38	0.09	0.37	0.50	0.51
Thallium	mg/L	6	0.0001	0%	0.4	0.00005	-	-	-	-	0.00005
Thorium	mg/L	6	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Tin	mg/L	6	0.0001	50%	-	0.00005	0.00008	0.00003	0.00007	0.00011	0.00011
Titanium	mg/L	6	0.0001	100%	-	0.00058	0.00086	0.00028	0.00082	0.00120	0.00126
Tungsten	mg/L	6	0.0001	17%	-	0.00005	0.00024	0.00047	0.00008	0.00091	0.00119
Uranium	mg/L	6	0.0001	100%	-	0.0009	0.0021	0.0013	0.0018	0.0038	0.0038
Vanadium	mg/L	6	0.0001	83%	0.2	0.00005	0.00028	0.00023	0.00020	0.00059	0.00067
Zinc	mg/L	6	0.0001	100%	1.1	0.0008	0.0016	0.0008	0.0014	0.0027	0.0027
Zirconium	mg/L	6	0.0001	17%	-	0.00005	0.00007	0.00005	0.00006	0.00014	0.00017

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/L, and 10 samples analyzed at 0.004 mg/L) 0.001 (130); '0.004 (10).

Table B.3.3-3: Conventional Groundwater Data – Polygon D

Constituent	Units	N	MDL	% above MDL	MOE 2004 Table 3	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/L	14	0.0001	100%	-	0.0064	0.012	0.004	0.011	0.017	0.019
Antimony	mg/L	14	0.001	0%	16	0.0005	-	-	-	-	0.0005
Arsenic	mg/L	14	0.001	29%	0.48	0.00050	0.00070	0.00042	0.00063	0.00159	0.00171
Barium	mg/L	14	0.0001	100%	23	0.010	0.033	0.025	0.024	0.071	0.075
Beryllium	mg/L	14	0.001	0%	0.053	0.0005	-	-	-	-	0.0005
Bismuth	mg/L	14	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	mg/L	14	0.0001	100%	50	0.0171	0.043	0.032	0.035	0.101	0.128
Cadmium	mg/L	14	0.0001	0%	0.011	0.00005	-	-	-	-	0.00005
Calcium	mg/L	14	0.0001	100%	-	9.4	94.1	47.3	72.3	140.4	169.5
Cesium	mg/L	14	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Chromium (Total)	mg/L	14	0.0001	57%	2	0.0001	0.0009	0.0010	0.0003	0.0025	0.0025
Cobalt	mg/L	14	0.0001	86%	0.1	0.0001	0.0011	0.0008	0.0006	0.0023	0.0032
Copper	mg/L	14	0.0001	100%	0.023	0.00023	0.00090	0.00049	0.00078	0.00177	0.00197
Iron	mg/L	14	0.001	93%	-	0.001	0.061	0.088	0.027	0.211	0.327
Lead	mg/L	14	0.0001	21%	0.032	0.00005	0.00007	0.00003	0.00006	0.00013	0.00014
Lithium	mg/L	14	0.0001	100%	-	0.0023	0.0063	0.0033	0.0056	0.0124	0.0126
Magnesium	mg/L	14	0.0001	100%	-	10.8	26.4	8.5	25.1	38.8	46.9
Manganese	mg/L	14	0.0001	100%	-	0.0030	0.045	0.031	0.031	0.094	0.101

Table B.3.3-3: Conventional Groundwater Data – Polygon D

Constituent	Units	N	MDL	% above MDL	MOE 2004 Table 3	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Mercury	mg/L	9	0.0001	0%	0.12	0.00005	-	-	-	-	0.00005
Molybdenum	mg/L	14	0.0001	100%	7.3	0.00268	0.011	0.009	0.008	0.025	0.037
Nickel	mg/L	14	0.0001	93%	1.6	0.00005	0.0014	0.0011	0.0010	0.0031	0.0041
Phosphorus	mg/L	14	0.02	0%	-	0.010	0.010	0.000	0.010	0.010	0.010
Potassium	mg/L	14	0.001	100%	-	0.48	2.60	1.14	2.22	4.00	4.35
Selenium	mg/L	14	0.001	7%	0.05	0.0005	0.0005	0.0001	0.0005	0.0007	0.0010
Silver	mg/L	14	0.0001	0%	0.0012	0.00005	-	-	-	-	0.00005
Sodium	mg/L	14	0.0001	100%	-	7.49	19.42	11.12	16.91	40.29	43.28
Strontium	mg/L	14	0.0001	100%	-	0.25	0.43	0.10	0.42	0.54	0.62
Thallium	mg/L	14	0.0001	0%	0.4	0.00005	-	-	-	-	0.00005
Thorium	mg/L	14	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Tin	mg/L	14	0.0001	21%	-	0.00005	0.00011	0.00016	0.00007	0.00041	0.00059
Titanium	mg/L	14	0.0001	93%	-	0.00005	0.0017	0.0010	0.0011	0.0029	0.0034
Tungsten	mg/L	14	0.0001	79%	-	0.00005	0.0054	0.0169	0.0004	0.0275	0.0637
Uranium	mg/L	14	0.0001	93%	-	0.0001	0.0057	0.0056	0.0028	0.0164	0.0202
Vanadium	mg/L	14	0.0001	86%	0.2	0.00005	0.00039	0.00034	0.00028	0.00103	0.00136
Zinc	mg/L	14	0.0001	100%	1.1	0.0002	0.0018	0.0013	0.0014	0.0041	0.0045
Zirconium	mg/L	14	0.0001	57%	-	0.00005	0.00012	0.00007	0.00010	0.00022	0.00026

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/L, and 10 samples analyzed at 0.004 mg/L) 0.001 (130); '0.004 (10).

Table B.3.3-4: Conventional Groundwater Data – Polygon E

Constituent	Units	N	MDL	% above MDL	MOE 2004 Table 3	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/L	5	0.0001	100%	-	0.0016	0.2586	0.5374	0.0238	0.9836	1.2194
Antimony	mg/L	5	0.001	0%	16	0.0005	-	-	-	-	0.0005
Arsenic	mg/L	5	0.001	20%	0.48	0.00033	0.00047	0.00008	0.00046	0.00050	0.00050
Barium	mg/L	5	0.0001	100%	23	0.085	0.119	0.024	0.117	0.147	0.152
Beryllium	mg/L	5	0.001	0%	0.053	0.0005	-	-	-	-	0.0005
Bismuth	mg/L	5	0.001	0%	-	0.0005	-	-	-	-	0.0005
Boron	mg/L	5	0.0001	100%	50	0.0095	0.0267	0.0152	0.0225	0.0421	0.0436
Cadmium	mg/L	5	0.0001	0%	0.011	0.00005	-	-	-	-	0.00005
Calcium	mg/L	5	0.0001	100%	-	27.8	84.5	68.7	63.0	160.8	161.6
Cesium	mg/L	5	0.0001	0%	-	0.00005	-	-	-	-	0.00005
Chromium (Total)	mg/L	5	0.0001	60%	2	0.0001	0.0003	0.0004	0.0001	0.0008	0.0009
Cobalt	mg/L	5	0.0001	80%	0.1	0.0001	0.0007	0.0010	0.0003	0.0021	0.0025

Table B.3.3-4: Conventional Groundwater Data – Polygon E

Constituent	Units	N	MDL	% above MDL	MOE 2004 Table 3	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Copper	mg/L	5	0.0001	100%	0.023	0.00025	0.00140	0.00112	0.00103	0.00287	0.00315
Iron	mg/L	5	0.001	80%	-	0.003	0.155	0.325	0.019	0.593	0.737
Lead	mg/L	5	0.0001	20%	0.032	0.00005	0.00010	0.00011	0.00007	0.00024	0.00029
Lithium	mg/L	5	0.0001	100%	-	0.0071	0.0095	0.0021	0.0093	0.0122	0.0127
Magnesium	mg/L	5	0.0001	100%	-	22.4	32.7	10.7	31.3	46.0	48.0
Manganese	mg/L	5	0.0001	100%	-	0.0087	0.0391	0.0522	0.0224	0.1104	0.1316
Mercury	mg/L	4	0.0001	0%	0.12	0.00005	-	-	-	-	0.00005
Molybdenum	mg/L	5	0.0001	100%	7.3	0.00064	0.00216	0.00186	0.00165	0.00465	0.00533
Nickel	mg/L	5	0.0001	100%	1.6	0.00036	0.00117	0.00074	0.00095	0.00199	0.00207
Phosphorus	mg/L	5	0.02	40%	-	0.010	0.016	0.010	0.014	0.029	0.032
Potassium	mg/L	5	0.001	100%	-	1.09	1.64	0.50	1.58	2.16	2.17
Selenium	mg/L	5	0.001	40%	0.05	0.0005	0.0010	0.0007	0.0008	0.0017	0.0017
Silver	mg/L	5	0.0001	0%	0.0012	0.00005	-	-	-	-	0.00005
Sodium	mg/L	5	0.0001	100%	-	9.65	12.90	3.61	12.51	17.30	17.72
Strontium	mg/L	5	0.0001	100%	-	0.43	0.53	0.11	0.52	0.66	0.67
Thallium	mg/L	5	0.0001	0%	0.4	0.00005	-	-	-	-	0.00005
Thorium	mg/L	5	0.0001	20%	-	0.00005	0.00007	0.00005	0.00006	0.00015	0.00017
Tin	mg/L	5	0.0001	40%	-	0.00005	0.00008	0.00004	0.00007	0.00013	0.00013
Titanium	mg/L	5	0.0001	100%	-	0.00035	0.01101	0.02092	0.00225	0.03934	0.04835
Tungsten	mg/L	5	0.0001	40%	-	0.00005	0.00012	0.00010	0.00009	0.00026	0.00028
Uranium	mg/L	5	0.0001	100%	-	0.0004	0.0069	0.0086	0.0022	0.0167	0.0170
Vanadium	mg/L	5	0.0001	80%	0.2	0.00005	0.00078	0.00073	0.00045	0.00173	0.00189
Zinc	mg/L	5	0.0001	100%	1.1	0.0003	0.0030	0.0034	0.0018	0.0077	0.0089
Zirconium	mg/L	5	0.0001	60%	-	0.00005	0.00028	0.00037	0.00015	0.00080	0.00093

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 mg/L, and 10 samples analyzed at 0.004 mg/L) 0.001 (130); '0.004 (10).

B.3.3.2 Radiological Groundwater Data

Table B.3.3-5: Radiological Groundwater Data – Polygon AB

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	St Dev	Geometric Mean	95th Percentile	Max
Antimony(Sb)124	Bq/L	9	2	0%	1	-	-	-	-	1
Antimony(Sb)125	Bq/L	9	2	0%	1	-	-	-	-	1
Barium(Ba)140	Bq/L	9	5	0%	2.5	-	-	-	-	2.5
Beryllium(Be)7	Bq/L	9	10	0%	5	-	-	-	-	5
Carbon(C)14	Bq/L	18	0.5	0%	0.25	-	-	-	-	0.25
Cerium(Ce)141	Bq/L	9	1	0%	0.5	-	-	-	-	0.5
Cerium(Ce)144	Bq/L	9	5	0%	2.5	-	-	-	-	2.5
Cesium(Cs)134	Bq/L	16	1	0%	0.5	-	-	-	-	0.5
Cesium(Cs)137	Bq/L	16	1	0%	0.5	-	-	-	-	0.5
Chromium(Cr)51	Bq/L	9	10	0%	5	-	-	-	-	5
Cobalt(Co)57	Bq/L	9	1	0%	0.5	-	-	-	-	0.5
Cobalt(Co)58	Bq/L	9	1	0%	0.5	-	-	-	-	0.5
Cobalt(Co)60	Bq/L	16	1	0%	0.5	-	-	-	-	0.5
Europium(Eu)154	Bq/L	9	3	0%	1.5	-	-	-	-	1.5
Europium(Eu)155	Bq/L	9	2	0%	1	-	-	-	-	1
Gamma - Th Series	Bq/L	9	3	0%	1.5	-	-	-	-	1.5
Gamma - U Series	Bq/L	9	3	0%	1.5	-	-	-	-	1.5
Iodine(I)131	Bq/L	9	2	0%	1	-	-	-	-	1
Iron(Fe)59	Bq/L	9	2	0%	1	-	-	-	-	1
Lanthanum(La)140	Bq/L	9	2	0%	1	-	-	-	-	1
Manganese(Mn)54	Bq/L	9	1	0%	0.5	-	-	-	-	0.5
Niobium(Nb)95	Bq/L	9	1	0%	0.5	-	-	-	-	0.5
Potassium(K)40	Bq/L	9	10	0%	5	-	-	-	-	5
Ruthenium(Ru)103	Bq/L	9	1	0%	0.5	-	-	-	-	0.5
Ruthenium(Ru)106	Bq/L	9	10	0%	5	-	-	-	-	5
Selenium(Se)75	Bq/L	9	1	0%	0.5	-	-	-	-	0.5
Silver(Ag)110	Bq/L	9	2	0%	1	-	-	-	-	1
Strontium(Sr)90	Bq/L	18	0.1	0%	0.05	-	-	-	-	0.05
Tritium	Bq/L	16	7 (7), 15(9)	63%	3.5	17.8	14.0	12.9	42.0	42.0
Zinc(Zn)65	Bq/L	9	3	0%	1.5	-	-	-	-	1.5
Zirconium(Zr)95	Bq/L	9	2	0%	1	-	-	-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10).

Table B.3.3-6: Radiological Groundwater Data – Polygon C

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	St Dev	Geometric Mean	95th Percentile	Max
Antimony(Sb)124	Bq/L	3	2	0%	1	-		-	-	1
Antimony(Sb)125	Bq/L	3	2	0%	1	-		-	-	1
Barium(Ba)140	Bq/L	3	5	0%	2.5	-		-	-	2.5
Beryllium(Be)7	Bq/L	3	10	0%	5	-		-	-	5
Carbon(C)14	Bq/L	6	0.5	0%	0.25	-		-	-	0.25
Cerium(Ce)141	Bq/L	3	1	0%	0.5	-		-	-	0.5
Cerium(Ce)144	Bq/L	3	5	0%	2.5	-		-	-	2.5
Cesium(Cs)134	Bq/L	5	1	0%	0.5	-		-	-	0.5
Cesium(Cs)137	Bq/L	5	1	0%	0.5	-		-	-	0.5
Chromium(Cr)51	Bq/L	3	10	0%	5	-		-	-	5
Cobalt(Co)57	Bq/L	3	1	0%	0.5	-		-	-	0.5
Cobalt(Co)58	Bq/L	3	1	0%	0.5	-		-	-	0.5
Cobalt(Co)60	Bq/L	5	1	0%	0.5	-		-	-	0.5
Europium(Eu)154	Bq/L	3	3	0%	1.5	-		-	-	1.5
Europium(Eu)155	Bq/L	3	2	0%	1	-		-	-	1
Gamma - Th Series	Bq/L	3	3	0%	1.5	-		-	-	1.5
Gamma - U Series	Bq/L	3	3	0%	1.5	-		-	-	1.5
Iodine(I)131	Bq/L	3	2	0%	1	-		-	-	1
Iron(Fe)59	Bq/L	3	2	0%	1	-		-	-	1
Lanthanum(La)140	Bq/L	3	2	0%	1	-		-	-	1
Manganese(Mn)54	Bq/L	3	1	0%	0.5	-		-	-	0.5
Niobium(Nb)95	Bq/L	3	1	0%	0.5	-		-	-	0.5
Potassium(K)40	Bq/L	3	10	0%	5	-		-	-	5
Ruthenium(Ru)103	Bq/L	3	1	0%	0.5	-		-	-	0.5
Ruthenium(Ru)106	Bq/L	3	10	0%	5	-		-	-	5
Selenium(Se)75	Bq/L	3	1	0%	0.5	-		-	-	0.5
Silver(Ag)110	Bq/L	3	2	0%	1	-		-	-	1
Strontium(Sr)90	Bq/L	6	0.1	0%	0.05	-		-	-	0.05
Tritium	Bq/L	5	7 (2), 15(3)	100%	22	37.8	10.2	36.5	48.0	49.0
Zinc(Zn)65	Bq/L	3	3	0%	1.5	-		-	-	1.5
Zirconium(Zr)95	Bq/L	3	2	0%	1	-		-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10).

Table B.3.3-7: Radiological Groundwater Data – Polygon D

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Antimony(Sb)124	Bq/L	8	2	0%	1	-		-	-	1
Antimony(Sb)125	Bq/L	8	2	0%	1	-		-	-	1
Barium(Ba)140	Bq/L	8	5	0%	2.5	-		-	-	2.5
Beryllium(Be)7	Bq/L	8	10	0%	5	-		-	-	5
Carbon(C)14	Bq/L	14	0.5	0%	0.25	-		-	-	0.25
Cerium(Ce)141	Bq/L	8	1	0%	0.5	-		-	-	0.5
Cerium(Ce)144	Bq/L	8	5	0%	2.5	-		-	-	2.5
Cesium(Cs)134	Bq/L	13	1	0%	0.5	-		-	-	0.5
Cesium(Cs)137	Bq/L	13	1	0%	0.5	-		-	-	0.5
Chromium(Cr)51	Bq/L	8	10	0%	5	-		-	-	5
Cobalt(Co)57	Bq/L	8	1	0%	0.5	-		-	-	0.5
Cobalt(Co)58	Bq/L	8	1	0%	0.5	-		-	-	0.5
Cobalt(Co)60	Bq/L	13	1	0%	0.5	-		-	-	0.5
Europium(Eu)154	Bq/L	8	3	0%	1.5	-		-	-	1.5
Europium(Eu)155	Bq/L	8	2	0%	1	-		-	-	1
Gamma - Th Series	Bq/L	8	3	0%	1.5	-		-	-	1.5
Gamma - U Series	Bq/L	8	3	0%	1.5	-		-	-	1.5
Iodine(I)131	Bq/L	8	2	0%	1	-		-	-	1
Iron(Fe)59	Bq/L	8	2	0%	1	-		-	-	1
Lanthanum(La)140	Bq/L	8	2	0%	1	-		-	-	1
Manganese(Mn)54	Bq/L	8	1	0%	0.5	-		-	-	0.5
Niobium(Nb)95	Bq/L	8	1	0%	0.5	-		-	-	0.5
Potassium(K)40	Bq/L	8	10	0%	5	-		-	-	5
Ruthenium(Ru)103	Bq/L	8	1	0%	0.5	-		-	-	0.5
Ruthenium(Ru)106	Bq/L	8	10	0%	5	-		-	-	5
Selenium(Se)75	Bq/L	8	1	0%	0.5	-		-	-	0.5
Silver(Ag)110	Bq/L	8	2	0%	1	-		-	-	1
Strontium(Sr)90	Bq/L	14	0.1	0%	0.05	-		-	-	0.05
Tritium	Bq/L	13	7 (5), 15(8)	62%	3.5	27.7	24.9	17.7	64.8	66.0
Zinc(Zn)65	Bq/L	8	3	0%	1.5	-		-	-	1.5
Zirconium(Zr)95	Bq/L	8	2	0%	1	-		-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10).

Table B.3.3-8: Radiological Groundwater Data – Polygon E

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Antimony(Sb)124	Bq/L	4	2	0%	1	-		-	-	1
Antimony(Sb)125	Bq/L	4	2	0%	1	-		-	-	1
Barium(Ba)140	Bq/L	4	5	0%	2.5	-		-	-	2.5
Beryllium(Be)7	Bq/L	4	10	0%	5	-		-	-	5
Carbon(C)14	Bq/L	4	0.5	0%	0.25	-		-	-	0.25
Cerium(Ce)141	Bq/L	4	1	0%	0.5	-		-	-	0.5
Cerium(Ce)144	Bq/L	4	5	0%	2.5	-		-	-	2.5
Cesium(Cs)134	Bq/L	5	1	0%	0.5	-		-	-	0.5
Cesium(Cs)137	Bq/L	5	1	0%	0.5	-		-	-	0.5
Chromium(Cr)51	Bq/L	4	10	0%	5	-		-	-	5
Cobalt(Co)57	Bq/L	4	1	0%	0.5	-		-	-	0.5
Cobalt(Co)58	Bq/L	4	1	0%	0.5	-		-	-	0.5
Cobalt(Co)60	Bq/L	5	1	0%	0.5	-		-	-	0.5
Europium(Eu)154	Bq/L	4	3	0%	1.5	-		-	-	1.5
Europium(Eu)155	Bq/L	4	2	0%	1	-		-	-	1
Gamma - Th Series	Bq/L	4	3	0%	1.5	-		-	-	1.5
Gamma - U Series	Bq/L	4	3	0%	1.5	-		-	-	1.5
Iodine(I)131	Bq/L	4	2	0%	1	-		-	-	1
Iron(Fe)59	Bq/L	4	2	0%	1	-		-	-	1
Lanthanum(La)140	Bq/L	4	2	0%	1	-		-	-	1
Manganese(Mn)54	Bq/L	4	1	0%	0.5	-		-	-	0.5
Niobium(Nb)95	Bq/L	4	1	0%	0.5	-		-	-	0.5
Potassium(K)40	Bq/L	4	10	0%	5	-		-	-	5
Ruthenium(Ru)103	Bq/L	4	1	0%	0.5	-		-	-	0.5
Ruthenium(Ru)106	Bq/L	4	10	0%	5	-		-	-	5
Selenium(Se)75	Bq/L	4	1	0%	0.5	-		-	-	0.5
Silver(Ag)110	Bq/L	4	2	0%	1	-		-	-	1
Strontium(Sr)90	Bq/L	4	0.1	0%	0.05	-		-	-	0.05
Tritium	Bq/L	5	7 (1), 15(4)	40%	3.5	11.7	7.9	9.5	21.2	22.0
Zinc(Zn)65	Bq/L	4	3	0%	1.5	-		-	-	1.5
Zirconium(Zr)95	Bq/L	4	2	0%	1	-		-	-	1

Note: Where more than one method detection limit (MDL) applies, the number of samples analyzed at each MDL is indicated e.g (130 samples analyzed at 0.001 Bq/L, and 10 samples analyzed at 0.004 Bq/L) 0.001 (130); '0.004 (10).

B.3.4 Soil Data Tables

The tables in Section B.3.4 are of soil data collected in the Polygon locations identified in Section 3.1.2.2 of the main report.

B.3.4.1 Conventional Soil Data

Table B.3.4-1: Polygon AB Conventional Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	µg/g	13	0.05	100%	6930	16387	5355	16387	22980	25200
Antimony	µg/g	13	0.025	100%	0.056	0.203	0.064	0.203	0.286	0.296
Arsenic	µg/g	13	0.025	100%	3.68	6.60	2.93	6.60	10.72	12.32
Barium	µg/g	13	0.05	100%	99.5	342.1	103.0	342.1	405.4	409.0
Beryllium	µg/g	13	0.1	100%	0.74	1.06	0.13	1.06	1.18	1.18
Bismuth	µg/g	13	0.025	100%	0.100	0.147	0.030	0.147	0.184	0.200
Boron	µg/g	13	0.05	100%	16.97	25.75	4.40	25.75	31.32	31.70
Boron-hot water	µg/g	13	0.02	100%	0.061	0.156	0.056	0.156	0.230	0.24
Cadmium	µg/g	13	0.025	100%	0.28	0.35	0.04	0.35	0.39	0.40
Calcium	µg/g	13	0.05	100%	15300	22300	8060	22300	39120	40200
Cesium	µg/g	13	0.025	100%	0.69	1.12	0.38	1.12	1.84	2.05
Chromium	µg/g	13	0.5	100%	27.1	34.6	3.5	34.6	38.8	39.2
Cobalt	µg/g	13	0.5	100%	6.35	7.25	0.59	7.25	7.94	8.05
Copper	µg/g	13	0.5	100%	8.03	13.26	4.76	13.26	22.68	23.70
Iron	µg/g	13	1.0	100%	17300	20423	1588	20423	22400	22400
Lead	µg/g	13	0.05	100%	18.42	34.61	13.11	34.61	50.94	54.11
Lithium	µg/g	13	0.005	100%	8.94	15.90	5.05	15.90	23.18	29.06
Magnesium	µg/g	13	0.005	100%	2940	4758	830	4758	5982	6120
Manganese	µg/g	13	0.005	100%	418	523	72	523	643	659
Mercury	µg/g	13	0.025	0%	0.013	-	-	-	-	0.013
Molybdenum	µg/g	13	0.025	100%	0.50	0.71	0.13	0.71	0.93	1.00
Nickel	µg/g	13	0.5	100%	11.7	14.1	1.4	14.1	15.8	15.9
Phosphorus	µg/g	13	5.0	100%	565	704	101	704	861	938
Potassium	µg/g	13	0.05	100%	4020	11994	3396	11994	14620	15100
Selenium	µg/g	13	0.025	100%	0.261	0.498	0.106	0.498	0.650	0.706
Silver	µg/g	13	0.025	100%	0.077	0.173	0.036	0.173	0.209	0.221
Sodium	µg/g	13	0.005	100%	375	7620	3227	7620	9802	9970
Strontium	µg/g	13	0.05	100%	42.1	145.0	45.7	145.0	197.6	200.0
Thallium	µg/g	13	0.025	100%	0.23	0.35	0.05	0.35	0.40	0.41

Table B.3.4-1: Polygon AB Conventional Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Thorium	µg/g	13	0.05	100%	0.81	1.93	1.89	1.93	6.03	6.49
Tin	µg/g	13	0.025	100%	1.43	3.03	1.13	3.03	4.63	4.70
Titanium	µg/g	13	0.005	100%	966	1486	236	1486	1804	1810
Tungsten	µg/g	13	0.025	92%	0.013	0.209	0.075	0.209	0.277	0.295
Uranium	µg/g	13	0.01	100%	0.81	1.12	0.19	1.12	1.38	1.67
Vanadium	µg/g	13	1.25	100%	41.7	54.2	5.4	54.2	60.4	60.9
Zinc	µg/g	13	1	100%	62.1	74.6	6.9	74.6	82.6	84.3
Zirconium	µg/g	13	0.005	100%	22.1	61.2	13.3	61.2	72.3	74.0

Note: all units on a dry weight basis.

Table B.3.4-2: Polygon C Conventional Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	µg/g	6	0.05	100%	15100	21317	5241	20778	27675	28200
Antimony	µg/g	6	0.025	100%	0.139	0.146	0.008	0.145	0.157	0.159
Arsenic	µg/g	6	0.025	100%	3.15	3.70	0.38	3.68	4.08	4.14
Barium	µg/g	6	0.05	100%	387.0	402.7	16.1	402.4	424.0	428.0
Beryllium	µg/g	6	0.1	100%	1.18	1.24	0.06	1.24	1.33	1.35
Bismuth	µg/g	6	0.025	100%	0.118	0.125	0.005	0.125	0.132	0.132
Boron	µg/g	6	0.05	100%	31.54	38.46	4.98	38.19	44.66	45.85
Boron-hot water	µg/g	6	0.02	100%	0.059	0.490	0.399	0.319	1.026	1.13
Cadmium	µg/g	6	0.025	100%	0.19	0.22	0.02	0.22	0.25	0.25
Calcium	µg/g	6	-	100%	27400	31583	4012	31378	36750	36900
Cesium	µg/g	6	0.025	100%	1.14	1.26	0.06	1.26	1.32	1.32
Chromium	µg/g	6	0.5	100%	40.8	45.5	4.4	45.4	51.8	53.0
Cobalt	µg/g	6	0.5	100%	8.86	9.45	0.58	9.43	10.26	10.40
Copper	µg/g	6	0.5	100%	11.70	13.17	1.07	13.13	14.53	14.80
Iron	µg/g	6	1.0	100%	22600	24083	1564	24042	26325	26900
Lead	µg/g	6	0.05	100%	15.35	16.71	1.06	16.69	18.09	18.35
Lithium	µg/g	6	0.005	100%	19.23	22.01	2.06	21.93	24.59	24.97
Magnesium	µg/g	6	0.005	100%	5220	6142	670	6111	6878	6890
Manganese	µg/g	6	0.005	100%	619	647	37	646	702	714
Mercury	µg/g	6	0.025	0%	0.013	-	-	-	-	0.013
Molybdenum	µg/g	6	0.025	100%	0.84	1.14	0.26	1.12	1.46	1.46
Nickel	µg/g	6	0.5	100%	18.9	21.3	2.2	21.2	24.5	25.2
Phosphorus	µg/g	6	5.0	100%	629	666	24	666	689	690

Table B.3.4-2: Polygon C Conventional Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Potassium	µg/g	6	0.05	100%	15400	16467	689	16454	17000	17000
Selenium	µg/g	6	0.025	100%	0.211	0.303	0.071	0.296	0.380	0.385
Silver	µg/g	6	0.025	100%	0.162	0.210	0.035	0.207	0.253	0.258
Sodium	µg/g	6	0.005	100%	7180	7727	342	7720	8138	8200
Strontium	µg/g	6	0.05	100%	158.0	166.2	8.0	166.0	177.5	180.0
Thallium	µg/g	6	0.025	100%	0.40	0.46	0.09	0.45	0.59	0.64
Thorium	µg/g	6	0.05	100%	1.14	1.45	0.27	1.43	1.82	1.87
Tin	µg/g	6	0.025	100%	1.92	9.16	5.18	7.55	15.23	15.41
Titanium	µg/g	6	0.005	100%	1370	1577	162	1570	1780	1820
Tungsten	µg/g	6	0.025	100%	0.184	0.215	0.018	0.215	0.234	0.236
Uranium	µg/g	6	0.01	100%	1.09	1.14	0.05	1.14	1.21	1.23
Vanadium	µg/g	6	1.25	100%	61.6	65.4	4.4	65.2	71.8	73.7
Zinc	µg/g	6	1	100%	63.4	67.6	3.1	67.5	71.7	72.5
Zirconium	µg/g	6	0.005	100%	57.8	65.0	6.9	64.7	73.3	74.1

Note: all units on a dry weight basis.

Table B.3.4-3: Polygon D Conventional Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	µg/g	6	0.05	100%	11600	20083	8543	18645	31275	32200
Antimony	µg/g	6	0.025	100%	0.129	0.149	0.025	0.147	0.185	0.193
Arsenic	µg/g	6	0.025	100%	2.29	2.67	0.34	2.65	3.13	3.22
Barium	µg/g	6	0.05	100%	243.0	393.0	89.7	383.5	495.5	525.0
Beryllium	µg/g	6	0.1	100%	0.87	1.08	0.14	1.08	1.26	1.31
Bismuth	µg/g	6	0.025	100%	0.101	0.118	0.012	0.118	0.132	0.135
Boron	µg/g	6	0.05	100%	16.88	23.20	8.01	22.19	34.60	35.93
Boron-hot water	µg/g	6	0.02	100%	0.589	1.012	0.308	0.972	1.415	1.51
Cadmium	µg/g	6	0.025	100%	0.19	0.21	0.02	0.21	0.24	0.24
Calcium	µg/g	6	0.05	100%	57900	62050	3824	61953	67025	67400
Cesium	µg/g	6	0.025	100%	0.69	1.07	0.29	1.04	1.45	1.55
Chromium	µg/g	6	0.5	100%	33.2	35.8	2.6	35.7	39.1	39.3
Cobalt	µg/g	6	0.5	100%	7.06	7.57	0.41	7.56	8.04	8.09
Copper	µg/g	6	0.5	100%	11.00	11.93	0.96	11.90	13.20	13.30
Iron	µg/g	6	1.0	100%	19200	20583	1341	20548	22425	22800
Lead	µg/g	6	0.05	100%	14.01	16.74	2.97	16.54	21.13	22.13
Lithium	µg/g	6	0.005	100%	13.66	14.74	1.34	14.69	16.72	17.12

Table B.3.4-3: Polygon D Conventional Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Magnesium	µg/g	6	0.005	100%	5200	6707	1222	6616	8345	8580
Manganese	µg/g	6	0.005	100%	489	512	27	511	552	559
Mercury	µg/g	6	0.025	0%	0.013	-	-	-	-	0.013
Molybdenum	µg/g	6	0.025	100%	0.71	0.84	0.15	0.83	1.06	1.10
Nickel	µg/g	6	0.5	100%	14.4	15.9	1.3	15.9	17.8	18.2
Phosphorus	µg/g	6	5.0	100%	539	730	125	721	889	921
Potassium	µg/g	6	0.05	100%	10400	15233	3396	14913	19625	20500
Selenium	µg/g	6	0.025	100%	0.086	0.334	0.184	0.278	0.543	0.566
Silver	µg/g	6	0.025	100%	0.134	0.209	0.047	0.204	0.264	0.271
Sodium	µg/g	6	0.005	100%	3910	9192	3583	8553	13693	15200
Strontium	µg/g	6	0.05	100%	145.0	220.8	50.6	215.9	284.8	304.0
Thallium	µg/g	6	0.025	100%	0.29	0.36	0.06	0.35	0.43	0.45
Thorium	µg/g	6	0.05	100%	1.51	2.49	1.14	2.32	4.17	4.65
Tin	µg/g	6	0.025	100%	4.69	7.82	2.69	7.42	10.68	10.85
Titanium	µg/g	6	0.005	100%	1190	1705	448	1661	2328	2540
Tungsten	µg/g	6	0.025	100%	0.134	0.313	0.121	0.290	0.459	0.479
Uranium	µg/g	6	0.01	100%	0.90	1.04	0.14	1.03	1.23	1.28
Vanadium	µg/g	6	1.25	100%	51.7	56.1	3.9	55.9	61.5	62.6
Zinc	µg/g	6	1	100%	59.4	65.0	5.7	64.8	73.2	75.3
Zirconium	µg/g	6	0.005	100%	42.0	59.7	12.0	58.7	75.0	78.7

Note: all units on a dry weight basis.

Table B.3.4-4: Polygon E Conventional Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	µg/g	7	0.05	100%	5850	7733	2693	7434	11840	13700
Antimony	µg/g	7	0.025	100%	0.144	0.157	0.012	0.157	0.174	0.180
Arsenic	µg/g	7	0.025	100%	2.11	2.62	0.36	2.60	3.09	3.12
Barium	µg/g	7	0.05	100%	389.0	421.1	20.9	420.7	445.4	449.0
Beryllium	µg/g	7	0.1	100%	1.09	1.13	0.04	1.13	1.18	1.18
Bismuth	µg/g	7	0.025	100%	0.080	0.119	0.050	0.111	0.192	0.193
Boron	µg/g	7	0.05	100%	10.52	15.76	5.53	15.02	24.14	25.10
Boron-hot water	µg/g	7	0.02	100%	0.076	0.338	0.300	0.231	0.780	0.84
Cadmium	µg/g	7	0.025	100%	0.18	0.21	0.02	0.21	0.23	0.23
Calcium	µg/g	7	0.05	100%	11600	13743	1917	13633	16500	17100
Cesium	µg/g	7	0.025	100%	0.78	0.89	0.15	0.88	1.11	1.12

Table B.3.4-4: Polygon E Conventional Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Chromium	µg/g	7	0.5	100%	31.5	32.9	1.2	32.9	34.4	34.5
Cobalt	µg/g	7	0.5	100%	6.93	7.28	0.28	7.27	7.67	7.75
Copper	µg/g	7	0.5	100%	5.48	7.27	1.24	7.18	8.86	9.23
Iron	µg/g	7	1.0	100%	18700	19743	779	19730	20500	20500
Lead	µg/g	7	0.05	100%	12.81	18.40	8.37	17.05	30.72	30.90
Lithium	µg/g	7	0.005	100%	8.76	11.66	4.11	11.14	17.88	18.27
Magnesium	µg/g	7	0.005	100%	2650	2906	256	2897	3296	3440
Manganese	µg/g	7	0.005	100%	469	497	22	497	521	521
Mercury	µg/g	7	0.025	0%	0.013	-	-	-	-	0.013
Molybdenum	µg/g	7	0.025	100%	0.46	0.53	0.06	0.53	0.61	0.61
Nickel	µg/g	7	0.5	100%	12.0	12.9	0.7	12.8	13.7	13.9
Phosphorus	µg/g	7	5.0	100%	373	454	57	451	515	517
Potassium	µg/g	7	0.05	100%	12200	13200	781	13181	14300	14600
Selenium	µg/g	7	0.025	100%	0.207	0.292	0.077	0.284	0.406	0.435
Silver	µg/g	7	0.025	100%	0.149	0.210	0.040	0.206	0.263	0.281
Sodium	µg/g	7	0.005	100%	9420	10421	894	10389	11470	11500
Strontium	µg/g	7	0.05	100%	147.0	159.6	8.6	159.4	169.0	169.0
Thallium	µg/g	7	0.025	100%	0.26	0.36	0.15	0.34	0.60	0.61
Thorium	µg/g	7	0.05	100%	0.58	0.85	0.28	0.82	1.28	1.32
Tin	µg/g	7	0.025	100%	1.41	1.99	0.37	1.96	2.46	2.58
Titanium	µg/g	7	0.005	100%	1570	1787	128	1783	1933	1960
Tungsten	µg/g	7	0.025	100%	0.204	1.035	0.884	0.745	2.370	2.735
Uranium	µg/g	7	0.01	100%	0.78	1.29	0.81	1.12	2.53	2.62
Vanadium	µg/g	7	1.25	100%	52.2	54.8	2.0	54.8	56.9	57.2
Zinc	µg/g	7	1	100%	52.9	57.8	3.5	57.7	62.6	63.7
Zirconium	µg/g	7	0.005	100%	64.4	71.1	4.3	71.0	74.9	75.1

Note: all units on a dry weight basis.

B.3.4.2 Radiological Soil Data

Table B.3.4-5: Polygon AB Radiological Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	12	0%	6	-	-	-	-	6
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	13	100	100%	152	232.8	31.9	230.5	270.2	281
Ce-141 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Chlorine-36	Bq/kg	13	100	0%	50	-	-	-	-	50
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	100%	7.6	-	-	-	-	7.6
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	1	300	100%	1000	-	-	-	-	1000
I-131 by gamma	Bq/kg	1	8(1)	0%	4	-	-	-	-	4
Iodine-129 by ICPMS	Bq/kg	13	100	0%	50	-	-	-	-	50
K-40 by gamma	Bq/kg	1	10	100%	432	-	-	-	-	432
La-140 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	13	20	0%	10	-	-	-	-	10
Technicium-99 by ICPMS	Bq/kg	13	100	0%	50	-	-	-	-	50
Th-series- gamma	Bq/kg	1	3	100%	17	-	-	-	-	17
U-series- gamma	Bq/kg	1	3	100%	14	-	-	-	-	14
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1

Note: all isotopes analyzed by gamma were on a wet weight basis where as all other isotopes were on a dry weight basis.

Table B.3.4-6: Polygon C Radiological Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	St Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	0	2	-	-	-	-	-	-	-
Ba-140 by gamma	Bq/kg	0	10	-	-	-	-	-	-	-
Be-7 by gamma	Bq/kg	0	10	-	-	-	-	-	-	-
Carbon-14	Bq/kg-C	6	100	100%	161	189	189	187.6	223	228
Ce-141 by gamma	Bq/kg	0	2	-	-	-	-	-	-	-
Ce-144 by gamma	Bq/kg	0	5	-	-	-	-	-	-	-
Chlorine-36	Bq/kg	6	100	0%	50	-	-	-	-	50
Co-57 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Co-58 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Co-60 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Cr-51 by gamma	Bq/kg	0	10	-	-	-	-	-	-	-
Cs-134 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Cs-137 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Eu-154 by gamma	Bq/kg	0	3	-	-	-	-	-	-	-
Eu-155 by gamma	Bq/kg	0	2	-	-	-	-	-	-	-
Fe-59 by gamma	Bq/kg	0	2	-	-	-	-	-	-	-
Gross Beta	Bq/kg	0	300	-	-	-	-	-	-	-
I-131 by gamma	Bq/kg	0	2	-	-	-	-	-	-	-
Iodine-129 by ICPMS	Bq/kg	6	100	0%	50	-	-	-	-	50
K-40 by gamma	Bq/kg	0	10	-	-	-	-	-	-	-
La-140 by gamma	Bq/kg	0	3	-	-	-	-	-	-	-
Mn-54 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Nb-95 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Ru-103 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Ru-106 by gamma	Bq/kg	0	10	-	-	-	-	-	-	-
Sb-124 by gamma	Bq/kg	0	2	-	-	-	-	-	-	-
Sb-125 by gamma	Bq/kg	0	2	-	-	-	-	-	-	-
Se-75 by gamma	Bq/kg	0	1	-	-	-	-	-	-	-
Strontium-90	Bq/kg	6	20	0%	10	-	-	-	-	10
Technicium-99 by ICPMS	Bq/kg	6	100	0%	50	-	-	-	-	50
Th-series- gamma	Bq/kg	0	3	-	-	-	-	-	-	-
U-series- gamma	Bq/kg	0	3	-	-	-	-	-	-	-
Zn-65 by gamma	Bq/kg	0	3	-	-	-	-	-	-	-
Zr-95 by gamma	Bq/kg	0	2	-	-	-	-	-	-	-

Note: all isotopes analyzed by gamma were on a wet weight basis where as all other isotopes were on a dry weight basis.

Table B.3.4-7: Polygon D Radiological Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	St Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	5	5(2); 6(1); 7(1); 9(1)	0%	2.5	-	-	-	-	3.5
Be-7 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	6	100	100%	120	147.5	18.9	146.4	165.8	167
Ce-141 by gamma	Bq/kg	5	1(3); 2(2)	0%	0.5	-	-	-	-	1
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Chlorine-36	Bq/kg	6	100	0%	50	-	-	-	-	50
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	100%	1.7	3.18	1.16	3.00	4.46	4.6
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	5	300	100%	730	882.0	92.6	877.9	966	980
I-131 by gamma	Bq/kg	5	3(2); 4(1); 5(2)	0%	1.5	-	-	-	-	2.5
Iodine-129 by ICPMS	Bq/kg	6	100	0%	50	-	-	-	-	50
K-40 by gamma	Bq/kg	5	10	100%	339	389.2	57.9	385.9	466.2	480
La-140 by gamma	Bq/kg	5	2(4); 3(1)	0%	1	-	-	-	-	1.5
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	6	20	0%	10	-	-	-	-	10
Technicium-99 by ICPMS	Bq/kg	6	100	0%	50	-	-	-	-	50
Th-series- gamma	Bq/kg	5	3	100%	12	14.6	2.4	14.5	17.6	18
U-series- gamma	Bq/kg	5	3	100%	11	12.2	1.3	12.2	13.8	14
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1	-	-	-	-	1

Note: all isotopes analyzed by gamma were on a wet weight basis where as all other isotopes were on a dry weight basis.

Table B.3.4-8: Polygon E Radiological Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	St Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	7	5(3); 6(1); 7(1); 8(1);10(1)	0%	2.5	-	-	-	-	5
Be-7 by gamma	Bq/kg	7	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	7	100	100%	232	260.3	23.16	259.4	292	301
Ce-141 by gamma	Bq/kg	7	1(4); 2(3)	0%	0.5	-	-	-	-	1
Ce-144 by gamma	Bq/kg	7	5	0%	2.5	-	-	-	-	2.5
Chlorine-36	Bq/kg	7	100	0%	50	-	-	-	-	50
Co-57 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	7	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	7	1	100%	4.9	6.49	1.27	6.38	8.21	8.3
Eu-154 by gamma	Bq/kg	7	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	7	300	100%	930	1004.3	65.03	1002.5	1100	1130
I-131 by gamma	Bq/kg	7	4(2); 5(4); 7(1)	0%	2	-	-	-	-	3.5
Iodine-129 by ICPMS	Bq/kg	7	100	0%	50	-	-	-	-	50
K-40 by gamma	Bq/kg	7	10	100%	486	549.7	51.9	547.6	597.4	598
La-140 by gamma	Bq/kg	7	2(6); 3(1)	0%	1	-	-	-	-	1.5
Mn-54 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	7	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	7	20	0%	10	-	-	-	-	10
Technicium-99 by ICPMS	Bq/kg	7	100	0%	50	-	-	-	-	50
Th-series- gamma	Bq/kg	7	3	100%	14	15.4	0.97	15.4	16.7	17
U-series- gamma	Bq/kg	7	3	100%	13	14.6	1.1	14.5	15.7	16
Zn-65 by gamma	Bq/kg	7	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1

Note: all isotopes analyzed by gamma were on a wet weight basis where as all other isotopes were on a dry weight basis.

Table B.3.4-9: All Radiological Soil Data

Constituent	Units	N	MDL	% above MDL	Minimum	Mean	St Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	20	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	20	5(10); 6(2); 7(3); 8(2); 9(1); 10(1); 12(1)	0%	2.5	3.2	0.96	3.1	5.1	6
Be-7 by gamma	Bq/kg	20	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	39	100	97%	50	196.9	58.9	186.5	272	301
Ce-141 by gamma	Bq/kg	20	1(13); 2(7)	0%	0.5	-	-	-	-	1
Ce-144 by gamma	Bq/kg	20	5	0%	2.5	-	-	-	-	2.5
Chlorine-36	Bq/kg	39	100	0%	50	-	-	-	-	50
Co-57 by gamma	Bq/kg	20	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	20	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	20	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	20	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	20	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	20	1	100%	1.7	4.4	2.1	3.9	8.0	8.3
Eu-154 by gamma	Bq/kg	20	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	20	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	20	2	0%	1	-	-	-	-	1
Gross Beta	Bq/kg	20	300	100%	730	925.5	93.1	921	1035	1130
I-131 by gamma	Bq/kg	20	3(2); 4(7);5(8); 6(1); 7(1); 8(1)	0%	1.5	2.4	0.6	2.3	3.5	4
Iodine-129 by ICPMS	Bq/kg	39	100	0%	50	-	-	-	-	50
K-40 by gamma	Bq/kg	20	10	100%	339	450.8	85.7	443.4	596.1	598
La-140 by gamma	Bq/kg	20	2(16); 3(4)	0%	1	-	-	-	-	1.5
Mn-54 by gamma	Bq/kg	20	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	20	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	20	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	20	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	20	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	20	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	20	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	39	20	0%	10	-	-	-	-	10
Technicium-99 by ICPMS	Bq/kg	39	100	0%	50	-	-	-	-	50
Th-series- gamma	Bq/kg	20	3	100%	12	14.8	1.6	14.7	17.1	18
U-series- gamma	Bq/kg	20	3	100%	11	13.8	1.6	13.7	16	16
Zn-65 by gamma	Bq/kg	20	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	20	2	0%	1	-	-	-	-	1

Note: all isotopes analyzed by gamma were on a wet weight basis where as all other isotopes were on a dry weight basis.

B.3.5 Biota Data Tables

The tables in Section B.3.5 are of biota data collected in the Polygon locations identified in Section 3.1.2.2 of the main report.

B.3.5.1 Conventional Biota Data Tables

Table B.3.5-1: Concentrations of Conventional Constituents in Terrestrial Vegetation in Polygon AB

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	6	0.01	100%	18.3	66.7	47.5	54.8	134.3	157.0
Antimony	mg/kg	6	0.01	100%	0.035	0.100	0.038	0.092	0.139	0.144
Arsenic	mg/kg	6	0.01	100%	0.011	0.026	0.009	0.025	0.037	0.037
Barium	mg/kg	6	0.01	100%	3.9	39.9	57.9	20.4	124.6	156.9
Beryllium	mg/kg	6	0.01	0%	0.005	-	-	-	-	0.005
Bismuth	mg/kg	6	0.01	0%	0.005	-	-	-	-	0.005
Boron	mg/kg	6	0.01	100%	20.36	50.75	42.92	41.21	113.88	136.67
Cadmium	mg/kg	6	0.01	67%	0.005	0.018	0.015	0.013	0.039	0.041
Calcium	mg/kg	6	0.01	100%	11620	24269	10655	22142	36943	38213
Cesium	mg/kg	6	0.01	33%	0.005	0.007	0.003	0.006	0.011	0.012
Chromium	mg/kg	6	0.01	100%	0.374	1.013	0.615	0.860	1.784	1.795
Cobalt	mg/kg	6	0.01	100%	0.058	0.095	0.028	0.092	0.133	0.142
Copper	mg/kg	6	0.01	100%	4.44	7.11	3.04	6.69	11.54	13.09
Iron	mg/kg	6	0.01	100%	57.7	86.2	17.4	84.6	106.7	109.7
Lead	mg/kg	6	0.01	100%	0.078	0.205	0.109	0.181	0.352	0.389
Lithium	mg/kg	6	0.01	100%	0.031	0.149	0.196	0.090	0.435	0.543
Magnesium	mg/kg	6	0.01	100%	1646	2888	905	2763	3977	4122
Manganese	mg/kg	6	0.01	100%	20.2	29.2	5.5	28.7	35.1	36.1
Molybdenum	mg/kg	6	0.01	100%	0.230	1.341	1.083	0.967	2.846	3.054
Nickel	mg/kg	6	0.01	100%	0.29	0.80	0.41	0.70	1.30	1.37
Phosphorus	mg/kg	6	0.01	100%	1209	2082	1405	1810	4199	4831
Potassium	mg/kg	6	0.01	100%	14878	18609	2786	18435	22110	22521
Selenium	mg/kg	6	0.01	100%	0.014	0.069	0.058	0.052	0.153	0.180
Silver	mg/kg	6	0.01	67%	0.005	0.015	0.011	0.012	0.031	0.035
Sodium	mg/kg	6	0.01	100%	6.8	64.7	136.9	16.0	260.8	344.1
Strontium	mg/kg	6	0.01	100%	17.0	72.9	53.4	57.1	147.1	155.8
Thallium	mg/kg	6	0.01	0%	0.005	-	-	-	-	0.005
Thorium	mg/kg	6	0.01	0%	0.005	-	-	-	-	0.005
Tin	mg/kg	6	0.01	100%	0.042	0.082	0.038	0.074	0.122	0.122
Titanium	mg/kg	6	0.01	100%	1.34	2.60	0.66	2.51	3.17	3.21
Tungsten	mg/kg	6	0.01	83%	0.005	0.017	0.009	0.015	0.030	0.032
Uranium	mg/kg	6	0.01	67%	0.005	0.013	0.010	0.010	0.027	0.031
Vanadium	mg/kg	6	0.01	100%	0.051	0.113	0.038	0.106	0.148	0.151
Zinc	mg/kg	6	0.01	100%	14.9	38.8	45.2	27.2	105.6	130.5
Zirconium	mg/kg	6	0.01	100%	0.043	0.227	0.308	0.137	0.671	0.853

Note: all units on a dry weight basis.

Table B.3.5-2: Concentrations of Conventional Constituents in Terrestrial Vegetation at Polygon C

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	3	0.01	100%	32.1	-	-	-	-	129.0
Antimony	mg/kg	3	0.01	100%	0.069	-	-	-	-	0.115
Arsenic	mg/kg	3	0.01	100%	0.020	-	-	-	-	0.028
Barium	mg/kg	3	0.01	100%	6.3	-	-	-	-	19.4
Beryllium	mg/kg	3	0.01	0%	0.005	-	-	-	-	0.005
Bismuth	mg/kg	3	0.01	0%	0.005	-	-	-	-	0.005
Boron	mg/kg	3	0.01	100%	27.11	-	-	-	-	43.53
Cadmium	mg/kg	3	0.01	33%	0.005	-	-	-	-	0.115
Calcium	mg/kg	3	0.01	100%	20644	-	-	-	-	26280
Cesium	mg/kg	3	0.01	33%	0.005	-	-	-	-	0.035
Chromium	mg/kg	3	0.01	100%	0.423	-	-	-	-	3.228
Cobalt	mg/kg	3	0.01	100%	0.099	-	-	-	-	0.125
Copper	mg/kg	3	0.01	100%	5.42	-	-	-	-	20.82
Iron	mg/kg	3	0.01	100%	70.9	-	-	-	-	146.3
Lead	mg/kg	3	0.01	100%	0.119	-	-	-	-	0.216
Lithium	mg/kg	3	0.01	100%	0.087	-	-	-	-	0.152
Magnesium	mg/kg	3	0.01	100%	2295	-	-	-	-	2767
Manganese	mg/kg	3	0.01	100%	32.4	-	-	-	-	46.6
Molybdenum	mg/kg	3	0.01	100%	0.172	-	-	-	-	0.343
Nickel	mg/kg	3	0.01	100%	0.49	-	-	-	-	1.52
Phosphorus	mg/kg	3	0.01	100%	1411	-	-	-	-	2665
Potassium	mg/kg	3	0.01	100%	17817	-	-	-	-	22208
Selenium	mg/kg	3	0.01	100%	0.039	-	-	-	-	0.056
Silver	mg/kg	3	0.01	33%	0.005	-	-	-	-	0.081
Sodium	mg/kg	3	0.01	100%	7.2	-	-	-	-	13.4
Strontium	mg/kg	3	0.01	100%	40.6	-	-	-	-	52.1
Thallium	mg/kg	3	0.01	0%	0.005	-	-	-	-	0.005
Thorium	mg/kg	3	0.01	33%	0.005	-	-	-	-	0.017
Tin	mg/kg	3	0.01	100%	0.046	-	-	-	-	0.088
Titanium	mg/kg	3	0.01	100%	2.33	-	-	-	-	8.26
Tungsten	mg/kg	3	0.01	67%	0.005	-	-	-	-	0.012
Uranium	mg/kg	3	0.01	33%	0.005	-	-	-	-	0.020
Vanadium	mg/kg	3	0.01	100%	0.059	-	-	-	-	0.262
Zinc	mg/kg	3	0.01	100%	16.9	-	-	-	-	29.7
Zirconium	mg/kg	3	0.01	100%	0.091	-	-	-	-	0.148

Note: all units on a dry weight basis.

Table B.3.5-3: Concentrations of Conventional Constituents in Terrestrial Vegetation at Polygon D

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	3	0.01	100%	80.8	-	-	-	-	149.7
Antimony	mg/kg	3	0.01	100%	0.111	-	-	-	-	0.540
Arsenic	mg/kg	3	0.01	100%	0.020	-	-	-	-	0.027
Barium	mg/kg	3	0.01	100%	15.0	-	-	-	-	42.4
Beryllium	mg/kg	3	0.01	0%	0.005	-	-	-	-	0.005
Bismuth	mg/kg	3	0.01	0%	0.005	-	-	-	-	0.005
Boron	mg/kg	3	0.01	100%	41.69	-	-	-	-	44.72
Cadmium	mg/kg	3	0.01	67%	0.005	-	-	-	-	0.057
Calcium	mg/kg	3	0.01	100%	19817	-	-	-	-	28380
Cesium	mg/kg	3	0.01	100%	0.015	-	-	-	-	0.036
Chromium	mg/kg	3	0.01	100%	0.518	-	-	-	-	0.878
Cobalt	mg/kg	3	0.01	100%	0.093	-	-	-	-	0.140
Copper	mg/kg	3	0.01	100%	8.08	-	-	-	-	14.65
Iron	mg/kg	3	0.01	100%	105.2	-	-	-	-	134.5
Lead	mg/kg	3	0.01	100%	0.179	-	-	-	-	0.300
Lithium	mg/kg	3	0.01	100%	0.057	-	-	-	-	0.141
Magnesium	mg/kg	3	0.01	100%	2989	-	-	-	-	4641
Manganese	mg/kg	3	0.01	100%	18.5	-	-	-	-	39.5
Molybdenum	mg/kg	3	0.01	100%	0.174	-	-	-	-	0.471
Nickel	mg/kg	3	0.01	100%	0.35	-	-	-	-	0.83
Phosphorus	mg/kg	3	0.01	100%	1460	-	-	-	-	3220
Potassium	mg/kg	3	0.01	100%	16248	-	-	-	-	20135
Selenium	mg/kg	3	0.01	100%	0.044	-	-	-	-	0.056
Silver	mg/kg	3	0.01	67%	0.005	-	-	-	-	0.077
Sodium	mg/kg	3	0.01	100%	13.7	-	-	-	-	31.5
Strontium	mg/kg	3	0.01	100%	27.6	-	-	-	-	83.0
Thallium	mg/kg	3	0.01	0%	0.005	-	-	-	-	0.005
Thorium	mg/kg	3	0.01	100%	0.010	-	-	-	-	0.018
Tin	mg/kg	3	0.01	100%	0.202	-	-	-	-	6.970
Titanium	mg/kg	3	0.01	100%	3.41	-	-	-	-	6.77
Tungsten	mg/kg	3	0.01	67%	0.005	-	-	-	-	0.024
Uranium	mg/kg	3	0.01	67%	0.005	-	-	-	-	0.037
Vanadium	mg/kg	3	0.01	100%	0.143	-	-	-	-	0.253
Zinc	mg/kg	3	0.01	100%	19.3	-	-	-	-	26.3
Zirconium	mg/kg	3	0.01	100%	0.156	-	-	-	-	0.295

Note: all units on a dry weight basis.

Table B.3.5-4: Concentrations of Conventional Constituents in Caterpillars at Polygon AB

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	2	0.05	100%	5.9	-	-	-	-	18.8
Antimony	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Arsenic	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Barium	mg/kg	2	0.05	100%	2.0	-	-	-	-	3.5
Beryllium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Bismuth	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Boron	mg/kg	2	0.05	100%	1.98	-	-	-	-	2.94
Cadmium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Calcium	mg/kg	2	0.05	100%	2902	-	-	-	-	4020
Cesium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Chromium	mg/kg	2	0.05	100%	0.091	-	-	-	-	0.162
Cobalt	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Copper	mg/kg	2	0.05	100%	2.46	-	-	-	-	5.72
Iron	mg/kg	2	0.05	100%	31.7	-	-	-	-	31.9
Lead	mg/kg	2	0.05	50%	0.025	-	-	-	-	0.059
Lithium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Magnesium	mg/kg	2	0.05	100%	500	-	-	-	-	530
Manganese	mg/kg	2	0.05	100%	3.8	-	-	-	-	3.8
Molybdenum	mg/kg	2	0.05	50%	0.025	-	-	-	-	0.077
Nickel	mg/kg	2	0.05	50%	0.025	-	-	-	-	0.157
Phosphorus	mg/kg	2	0.05	100%	1125	-	-	-	-	1194
Potassium	mg/kg	2	0.05	100%	4253	-	-	-	-	5410
Selenium	mg/kg	2	0.05	100%	0.065	-	-	-	-	0.074
Silver	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Sodium	mg/kg	2	0.05	100%	7.6	-	-	-	-	11.3
Strontium	mg/kg	2	0.05	100%	3.0	-	-	-	-	18.4
Thallium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Thorium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Tin	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Titanium	mg/kg	2	0.05	100%	0.40	-	-	-	-	0.93
Tungsten	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Uranium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Vanadium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Zinc	mg/kg	2	0.05	100%	7.7	-	-	-	-	13.1
Zirconium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025

Note: all units on a wet weight basis.

Table B.3.5-5: Concentrations of Conventional Constituents in Caterpillars at Polygon C

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	1	0.05	100%	4.4	-	-	-	-	4.4
Antimony	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Arsenic	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Barium	mg/kg	1	0.05	100%	1.7	-	-	-	-	1.7
Beryllium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Bismuth	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Boron	mg/kg	1	0.05	100%	1.62	-	-	-	-	1.62
Cadmium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Calcium	mg/kg	1	0.05	100%	1191	-	-	-	-	1191
Cesium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Chromium	mg/kg	1	0.05	100%	0.098	-	-	-	-	0.098
Cobalt	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Copper	mg/kg	1	0.05	100%	1.78	-	-	-	-	1.78
Iron	mg/kg	1	0.05	100%	21.9	-	-	-	-	21.9
Lead	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Lithium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Magnesium	mg/kg	1	0.05	100%	475	-	-	-	-	475
Manganese	mg/kg	1	0.05	100%	2.6	-	-	-	-	2.6
Molybdenum	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Nickel	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Phosphorus	mg/kg	1	0.05	100%	1383	-	-	-	-	1383
Potassium	mg/kg	1	0.05	100%	5268	-	-	-	-	5268
Selenium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Silver	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Sodium	mg/kg	1	0.05	100%	5.1	-	-	-	-	5.1
Strontium	mg/kg	1	0.05	100%	2.0	-	-	-	-	2.0
Thallium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Thorium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Tin	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Titanium	mg/kg	1	0.05	100%	0.33	-	-	-	-	0.33
Tungsten	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Uranium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Vanadium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Zinc	mg/kg	1	0.05	100%	9.2	-	-	-	-	9.2
Zirconium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025

Note: all units on a wet weight basis.

Table B.3.5-6: Concentrations of Conventional Constituents in Caterpillars at Polygon D

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	1	0.05	100%	13.9	-	-	-	-	13.9
Antimony	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Arsenic	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Barium	mg/kg	1	0.05	100%	1.5	-	-	-	-	1.5
Beryllium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Bismuth	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Boron	mg/kg	1	0.05	100%	2.47	-	-	-	-	2.47
Cadmium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Calcium	mg/kg	1	0.05	100%	2986	-	-	-	-	2986
Cesium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Chromium	mg/kg	1	0.05	100%	0.081	-	-	-	-	0.081
Cobalt	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Copper	mg/kg	1	0.05	100%	3.88	-	-	-	-	3.88
Iron	mg/kg	1	0.05	100%	26.7	-	-	-	-	26.7
Lead	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Lithium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Magnesium	mg/kg	1	0.05	100%	494	-	-	-	-	494
Manganese	mg/kg	1	0.05	100%	3.1	-	-	-	-	3.1
Molybdenum	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Nickel	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Phosphorus	mg/kg	1	0.05	100%	1091	-	-	-	-	1091
Potassium	mg/kg	1	0.05	100%	4917	-	-	-	-	4917
Selenium	mg/kg	1	0.05	100%	0.059	-	-	-	-	0.059
Silver	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Sodium	mg/kg	1	0.05	100%	7.6	-	-	-	-	7.6
Strontium	mg/kg	1	0.05	100%	7.6	-	-	-	-	7.6
Thallium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Thorium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Tin	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Titanium	mg/kg	1	0.05	100%	0.40	-	-	-	-	0.40
Tungsten	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Uranium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Vanadium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Zinc	mg/kg	1	0.05	100%	10.7	-	-	-	-	10.7
Zirconium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025

Note: all units on a wet weight basis.

Table B.3.5-7: Concentrations of Conventional Constituents in Earthworms at Polygon AB

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	2	0.05	100%	2662.9	-	-	-	-	4005.6
Antimony	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Arsenic	mg/kg	2	0.05	100%	0.298	-	-	-	-	0.473
Barium	mg/kg	2	0.05	100%	13.6	-	-	-	-	31.2
Beryllium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Bismuth	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Boron	mg/kg	2	0.05	100%	2.16	-	-	-	-	2.65
Cadmium	mg/kg	2	0.05	100%	0.864	-	-	-	-	7.671
Calcium	mg/kg	2	0.05	100%	31603	-	-	-	-	54290
Cesium	mg/kg	2	0.05	100%	0.243	-	-	-	-	0.352
Chromium	mg/kg	2	0.05	100%	4.546	-	-	-	-	7.146
Cobalt	mg/kg	2	0.05	100%	2.307	-	-	-	-	3.015
Copper	mg/kg	2	0.05	100%	6.06	-	-	-	-	7.84
Iron	mg/kg	2	0.05	100%	3027.6	-	-	-	-	4992.9
Lead	mg/kg	2	0.05	100%	2.448	-	-	-	-	3.223
Lithium	mg/kg	2	0.05	100%	1.911	-	-	-	-	2.958
Magnesium	mg/kg	2	0.05	100%	2375	-	-	-	-	3929
Manganese	mg/kg	2	0.05	100%	97.5	-	-	-	-	150.5
Molybdenum	mg/kg	2	0.05	100%	0.118	-	-	-	-	0.204
Nickel	mg/kg	2	0.05	100%	2.65	-	-	-	-	4.41
Phosphorus	mg/kg	2	0.05	100%	4074	-	-	-	-	4664
Potassium	mg/kg	2	0.05	100%	3650	-	-	-	-	4065
Selenium	mg/kg	2	0.05	100%	0.452	-	-	-	-	0.651
Silver	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Sodium	mg/kg	2	0.05	100%	1174.0	-	-	-	-	1203.6
Strontium	mg/kg	2	0.05	100%	53.0	-	-	-	-	104.2
Thallium	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Thorium	mg/kg	2	0.05	100%	0.864	-	-	-	-	1.245
Tin	mg/kg	2	0.05	100%	0.068	-	-	-	-	0.112
Titanium	mg/kg	2	0.05	100%	162.66	-	-	-	-	228.78
Tungsten	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Uranium	mg/kg	2	0.05	100%	0.076	-	-	-	-	0.163
Vanadium	mg/kg	2	0.05	100%	6.195	-	-	-	-	10.137
Zinc	mg/kg	2	0.05	100%	239.1	-	-	-	-	323.9
Zirconium	mg/kg	2	0.05	100%	1.990	-	-	-	-	3.386

Note: all units on a wet weight basis.

Table B.3.5-8: Concentrations of Conventional Constituents in Earthworms at Polygon C

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	1	0.05	100%	1269.3	-	-	-	-	1269.3
Antimony	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Arsenic	mg/kg	1	0.05	100%	0.257	-	-	-	-	0.257
Barium	mg/kg	1	0.05	100%	10.8	-	-	-	-	10.8
Beryllium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Bismuth	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Boron	mg/kg	1	0.05	100%	1.08	-	-	-	-	1.08
Cadmium	mg/kg	1	0.05	100%	0.574	-	-	-	-	0.574
Calcium	mg/kg	1	0.05	100%	12829	-	-	-	-	12829
Cesium	mg/kg	1	0.05	100%	0.104	-	-	-	-	0.104
Chromium	mg/kg	1	0.05	100%	2.044	-	-	-	-	2.044
Cobalt	mg/kg	1	0.05	100%	0.988	-	-	-	-	0.988
Copper	mg/kg	1	0.05	100%	2.84	-	-	-	-	2.84
Iron	mg/kg	1	0.05	100%	1555.9	-	-	-	-	1555.9
Lead	mg/kg	1	0.05	100%	0.787	-	-	-	-	0.787
Lithium	mg/kg	1	0.05	100%	0.863	-	-	-	-	0.863
Magnesium	mg/kg	1	0.05	100%	1162	-	-	-	-	1162
Manganese	mg/kg	1	0.05	100%	44.4	-	-	-	-	44.4
Molybdenum	mg/kg	1	0.05	100%	0.103	-	-	-	-	0.103
Nickel	mg/kg	1	0.05	100%	3.79	-	-	-	-	3.79
Phosphorus	mg/kg	1	0.05	100%	2577	-	-	-	-	2577
Potassium	mg/kg	1	0.05	100%	2347	-	-	-	-	2347
Selenium	mg/kg	1	0.05	100%	0.489	-	-	-	-	0.489
Silver	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Sodium	mg/kg	1	0.05	100%	962.8	-	-	-	-	962.8
Strontium	mg/kg	1	0.05	100%	26.0	-	-	-	-	26.0
Thallium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Thorium	mg/kg	1	0.05	100%	0.382	-	-	-	-	0.382
Tin	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Titanium	mg/kg	1	0.05	100%	83.63	-	-	-	-	83.63
Tungsten	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Uranium	mg/kg	1	0.05	100%	0.055	-	-	-	-	0.055
Vanadium	mg/kg	1	0.05	100%	3.152	-	-	-	-	3.152
Zinc	mg/kg	1	0.05	100%	100.9	-	-	-	-	100.9
Zirconium	mg/kg	1	0.05	100%	1.103	-	-	-	-	1.103

Note: all units on a wet weight basis.

Table B.3.5-9: Concentrations of Conventional Constituents in Earthworms at Polygon D

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	2	0.05	100%	3199.4	-	-	-	-	4207.7
Antimony	mg/kg	2	0.05	50%	0.03	-	-	-	-	0.03
Arsenic	mg/kg	2	0.05	100%	0.292	-	-	-	-	0.860
Barium	mg/kg	2	0.05	100%	22.2	-	-	-	-	71.3
Beryllium	mg/kg	2	0.05	50%	0.025	-	-	-	-	0.256
Bismuth	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Boron	mg/kg	2	0.05	100%	1.73	-	-	-	-	6.51
Cadmium	mg/kg	2	0.05	100%	1.18	-	-	-	-	1.77
Calcium	mg/kg	2	0.05	100%	5980	-	-	-	-	18131
Cesium	mg/kg	2	0.05	100%	0.282	-	-	-	-	0.332
Chromium	mg/kg	2	0.05	100%	5.858	-	-	-	-	6.293
Cobalt	mg/kg	2	0.05	100%	2.99	-	-	-	-	3.38
Copper	mg/kg	2	0.05	100%	5.84	-	-	-	-	7.10
Iron	mg/kg	2	0.05	100%	4165.4	-	-	-	-	4210.0
Lead	mg/kg	2	0.05	100%	2.407	-	-	-	-	2.874
Lithium	mg/kg	2	0.05	100%	2.731	-	-	-	-	2.806
Magnesium	mg/kg	2	0.05	100%	1250	-	-	-	-	1682
Manganese	mg/kg	2	0.05	100%	101.1	-	-	-	-	112.7
Mercury	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Molybdenum	mg/kg	2	0.05	100%	0.098	-	-	-	-	0.401
Nickel	mg/kg	2	0.05	100%	2.86	-	-	-	-	3.76
Phosphorus	mg/kg	2	0.05	100%	3793	-	-	-	-	7103
Potassium	mg/kg	2	0.05	100%	4244	-	-	-	-	5922
Rubidium	mg/kg	1	0.05	100%	8.07	-	-	-	-	8.07
Selenium	mg/kg	2	0.05	100%	0.686	-	-	-	-	2.723
Silver	mg/kg	2	0.05	0%	0.025	-	-	-	-	0.025
Sodium	mg/kg	2	0.05	100%	1410.0	-	-	-	-	2986.6
Strontium	mg/kg	2	0.05	100%	13.4	-	-	-	-	55.8
Thallium	mg/kg	2	0.05	50%	0.025	-	-	-	-	0.057
Thorium	mg/kg	2	0.05	100%	0.879	-	-	-	-	1.015
Tin	mg/kg	2	0.05	100%	0.083	-	-	-	-	0.347
Titanium	mg/kg	2	0.05	100%	242.7	-	-	-	-	496.6
Tungsten	mg/kg	2	0.05	50%	0.025	-	-	-	-	0.130
Uranium	mg/kg	2	0.05	100%	0.053	-	-	-	-	0.256
Vanadium	mg/kg	2	0.05	100%	7.971	-	-	-	-	9.528
Zinc	mg/kg	2	0.05	100%	135.5	-	-	-	-	149.5
Zirconium	mg/kg	2	0.05	100%	2.56	-	-	-	-	16.38

Note: all units on a wet weight basis.

Table B.3.5-10: Concentrations of Conventional Constituents in Frogs at Polygon D

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	1	0.05	100%	927.9	-	-	-	-	927.9
Antimony	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Arsenic	mg/kg	1	0.1	100%	0.210	-	-	-	-	0.210
Barium	mg/kg	1	0.05	100%	12.3	-	-	-	-	12.3
Beryllium	mg/kg	1	0.1	0%	0.05	-	-	-	-	0.05
Bismuth	mg/kg	1	0.1	0%	0.05	-	-	-	-	0.05
Boron	mg/kg	1	0.05	100%	1.40	-	-	-	-	1.40
Cadmium	mg/kg	1	0.1	100%	0.5	-	-	-	-	0.5
Calcium	mg/kg	1	0.05	100%	57569	-	-	-	-	57569
Cesium	mg/kg	1	0.05	100%	0.068	-	-	-	-	0.068
Chromium	mg/kg	1	0.05	100%	2.887	-	-	-	-	2.887
Cobalt	mg/kg	1	0.05	100%	0.564	-	-	-	-	0.564
Copper	mg/kg	1	0.05	100%	15.09	-	-	-	-	15.09
Iron	mg/kg	1	0.05	100%	860.5	-	-	-	-	860.5
Lead	mg/kg	1	0.05	100%	0.618	-	-	-	-	0.618
Lithium	mg/kg	1	0.05	100%	0.705	-	-	-	-	0.705
Magnesium	mg/kg	1	0.05	100%	1685	-	-	-	-	1685
Manganese	mg/kg	1	0.05	100%	28.8	-	-	-	-	28.8
Molybdenum	mg/kg	1	0.05	100%	0.187	-	-	-	-	0.187
Nickel	mg/kg	1	0.05	100%	1.52	-	-	-	-	1.52
Phosphorus	mg/kg	1	0.05	100%	25532	-	-	-	-	25532
Potassium	mg/kg	1	0.05	100%	10011	-	-	-	-	10011
Selenium	mg/kg	1	0.05	100%	1.455	-	-	-	-	1.455
Silver	mg/kg	1	0.01	100%	0.050	-	-	-	-	0.050
Sodium	mg/kg	1	0.05	100%	5869.6	-	-	-	-	5869.6
Strontium	mg/kg	1	0.05	100%	28.0	-	-	-	-	28.0
Thallium	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Thorium	mg/kg	1	0.05	100%	0.165	-	-	-	-	0.165
Tin	mg/kg	1	0.05	100%	0.075	-	-	-	-	0.075
Titanium	mg/kg	1	0.05	100%	42.42	-	-	-	-	42.42
Tungsten	mg/kg	1	0.05	0%	0.025	-	-	-	-	0.025
Uranium	mg/kg	1	0.05	100%	0.060	-	-	-	-	0.060
Vanadium	mg/kg	1	0.05	100%	1.634	-	-	-	-	1.634
Zinc	mg/kg	1	0.1	100%	68.5	-	-	-	-	68.5
Zirconium	mg/kg	1	0.05	100%	0.504	-	-	-	-	0.504

Note: all units on a wet weight basis.

Table B.3.5-11: Concentrations of Conventional Constituents in Mussels at Surface Water Location 8 (Existing Diffuser – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	3	1	100%	32.2	-	-	-	-	211.7
Antimony	mg/kg	3	0.05	100%	0.042	-	-	-	-	0.062
Arsenic	mg/kg	3	0.05	100%	0.374	-	-	-	-	0.909
Barium	mg/kg	3	0.5	100%	31.02	-	-	-	-	53.36
Beryllium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	3	0.05	100%	0.306	-	-	-	-	1.038
Cadmium	mg/kg	3	0.05	100%	0.136	-	-	-	-	0.222
Calcium	mg/kg	3	1	100%	136360	-	-	-	-	270662
Cesium	mg/kg	3	0.02 (2) 0.05 (1)	33%	0.010	-	-	-	-	0.031
Chromium	mg/kg	3	0.05	100%	0.14	-	-	-	-	1.65
Cobalt	mg/kg	3	0.05	100%	0.266	-	-	-	-	0.594
Copper	mg/kg	3	1	100%	1.26	-	-	-	-	2.12
Iron	mg/kg	3	0.5	100%	46.1	-	-	-	-	329.7
Lead	mg/kg	3	0.05	100%	0.099	-	-	-	-	0.782
Lithium	mg/kg	3	0.005	100%	0.0233	-	-	-	-	0.2507
Magnesium	mg/kg	3	0.5	100%	58.8	-	-	-	-	171.6
Manganese	mg/kg	3	1	100%	11.04	-	-	-	-	33.84
Molybdenum	mg/kg	3	0.05	100%	0.028	-	-	-	-	0.056
Nickel	mg/kg	3	0.1	100%	0.619	-	-	-	-	1.225
Phosphorus	mg/kg	3	0.5	100%	252	-	-	-	-	403
Potassium	mg/kg	3	1	100%	102	-	-	-	-	152
Selenium	mg/kg	3	0.05	100%	0.403	-	-	-	-	0.581
Silver	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	3	5	100%	647	-	-	-	-	1017
Strontium	mg/kg	3	1	100%	210.3	-	-	-	-	383.9
Thallium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	3	0.02 (2) 0.05 (1)	33%	0.01	-	-	-	-	0.187
Tin	mg/kg	3	0.02 (2) 0.05 (1)	33%	0.010	-	-	-	-	0.058
Titanium	mg/kg	3	0.005	100%	2.15	-	-	-	-	17.93
Tungsten	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	3	0.01	100%	0.063	-	-	-	-	0.207
Vanadium	mg/kg	3	0.005	100%	0.154	-	-	-	-	1.350
Zinc	mg/kg	3	0.1	100%	2.24	-	-	-	-	3.77
Zirconium	mg/kg	3	0.05	100%	0.057	-	-	-	-	0.598

Note: all units on a wet weight basis.

Table B.3.5-12: Concentrations of Conventional Constituents in Mussels at Surface Water Location 10 (Offshore New Build – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	1	1	100%	30.0	-	-	-	-	30.0
Antimony	mg/kg	1	0.05	100%	0.041	-	-	-	-	0.041
Arsenic	mg/kg	1	0.05	100%	0.372	-	-	-	-	0.372
Barium	mg/kg	1	0.5	100%	31.25	-	-	-	-	31.25
Beryllium	mg/kg	1	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	1	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	1	0.05	100%	0.275	-	-	-	-	0.275
Cadmium	mg/kg	1	0.05	100%	0.169	-	-	-	-	0.169
Calcium	mg/kg	1	1	100%	134949	-	-	-	-	134949
Cesium	mg/kg	1	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	1	0.05	100%	0.12	-	-	-	-	0.12
Cobalt	mg/kg	1	0.05	100%	0.261	-	-	-	-	0.261
Copper	mg/kg	1	1	100%	1.61	-	-	-	-	1.61
Iron	mg/kg	1	0.5	100%	41.3	-	-	-	-	41.3
Lead	mg/kg	1	0.05	100%	0.068	-	-	-	-	0.068
Lithium	mg/kg	1	0.005	100%	0.0234	-	-	-	-	0.0234
Magnesium	mg/kg	1	0.5	100%	59.4	-	-	-	-	59.4
Manganese	mg/kg	1	1	100%	11.24	-	-	-	-	11.24
Molybdenum	mg/kg	1	0.05	100%	0.030	-	-	-	-	0.030
Nickel	mg/kg	1	0.1	100%	0.620	-	-	-	-	0.620
Phosphorus	mg/kg	1	0.5	100%	259	-	-	-	-	259
Potassium	mg/kg	1	1	100%	93	-	-	-	-	93
Selenium	mg/kg	1	0.05	100%	0.547	-	-	-	-	0.547
Silver	mg/kg	1	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	1	5	100%	617	-	-	-	-	617
Strontium	mg/kg	1	1	100%	209.3	-	-	-	-	209.3
Thallium	mg/kg	1	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	1	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	1	0.05	100%	0.048	-	-	-	-	0.048
Titanium	mg/kg	1	0.005	100%	2.12	-	-	-	-	2.12
Tungsten	mg/kg	1	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	1	0.01	100%	0.066	-	-	-	-	0.066
Vanadium	mg/kg	1	0.005	100%	0.163	-	-	-	-	0.163
Zinc	mg/kg	1	0.1	100%	2.45	-	-	-	-	2.45
Zirconium	mg/kg	1	0.05	100%	0.058	-	-	-	-	0.058

Note: all units on a wet weight basis.

Table B.3.5-13: Concentrations of Conventional Constituents in NRR Dace at Surface Water Location 12 (Coots Pond)``

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	3	0.05	100%	537.1	-	-	-	-	720.0
Antimony	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	3	0.05	100%	0.186	-	-	-	-	0.228
Barium	mg/kg	3	0.05	100%	32.69	-	-	-	-	41.28
Beryllium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	3	0.05	100%	4.171	-	-	-	-	5.048
Cadmium	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010
`Calcium	mg/kg	3	0.05	100%	47870	-	-	-	-	58082
Cesium	mg/kg	3	0.05	100%	0.033	-	-	-	-	0.059
Chromium	mg/kg	3	0.05	100%	2.04	-	-	-	-	2.17
Cobalt	mg/kg	3	0.05	100%	0.563	-	-	-	-	0.717
Copper	mg/kg	3	0.1	100%	3.961	-	-	-	-	4.59
Iron	mg/kg	3	1	100%	622.8	-	-	-	-	864.2
Lead	mg/kg	3	0.05	100%	0.587	-	-	-	-	0.704
Lithium	mg/kg	3	0.005	100%	0.475	-	-	-	-	0.753
Magnesium	mg/kg	3	0.005	100%	2208.2	-	-	-	-	2569.5
Manganese	mg/kg	3	0.005	100%	46.3	-	-	-	-	57.2
Mercury	mg/kg	3	0.05	100%	0.091	-	-	-	-	0.093
Molybdenum	mg/kg	3	0.05	100%	0.136	-	-	-	-	0.168
Nickel	mg/kg	3	0.1	100%	1.48	-	-	-	-	1.79
Phosphorus	mg/kg	3	5	100%	31239	-	-	-	-	48179
Potassium	mg/kg	3	0.05	100%	12146	-	-	-	-	12708
Rubidium	mg/kg	3	0.05	100%	3.0	-	-	-	-	3.6
Selenium	mg/kg	3	0.05	100%	0.100	-	-	-	-	0.403
Silicon	mg/kg	3	10	100%	2242	-	-	-	-	3511
Silver	mg/kg	3	0.05	100%	0.023	-	-	-	-	0.027
Sodium	mg/kg	3	0.005	100%	5598	-	-	-	-	6013
Strontium	mg/kg	3	0.05	100%	150	-	-	-	-	186
Thallium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	3	0.05	100%	0.109	-	-	-	-	0.186
Tin	mg/kg	3	0.05	100%	11.1	-	-	-	-	13.9
Titanium	mg/kg	3	0.005	100%	39.6	-	-	-	-	67.4
Tungsten	mg/kg	3	0.005	100%	0.054	-	-	-	-	0.066
Uranium	mg/kg	3	0.01	100%	0.07	-	-	-	-	0.09
Vanadium	mg/kg	3	0.005	100%	1.0	-	-	-	-	1.5
Zinc	mg/kg	3	0.1	100%	330.0	-	-	-	-	352.4
Zirconium	mg/kg	3	0.005	100%	1.00	-	-	-	-	1.36

Note: all units on a wet weight basis.

Table B.3.5-14: Concentrations of Conventional Constituents in Round Goby at Surface Water Location 4 (Offshore Port Darlington – Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	3	0.05	100%	4.50	-	-	-	-	21.04
Antimony	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Arsenic	mg/kg	3	0.05	100%	0.512	-	-	-	-	0.576
Barium	mg/kg	3	0.05	100%	1.74	-	-	-	-	2.44
Beryllium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Cadmium	mg/kg	3	0.02 (1) 0.05 (2)	67%	0.010	-	-	-	-	0.026
Calcium	mg/kg	3	0.05	100%	9249	-	-	-	-	10581
Cesium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	3	0.02 (2) 0.05 (1)	33%	0.010	-	-	-	-	0.065
Cobalt	mg/kg	3	0.05	100%	0.040	-	-	-	-	0.049
Copper	mg/kg	3	0.1	100%	2.82	-	-	-	-	3.30
Iron	mg/kg	3	1	100%	16.0	-	-	-	-	36.6
Lead	mg/kg	3	0.05	100%	0.038	-	-	-	-	0.064
Lithium	mg/kg	3	0.005	100%	0.024	-	-	-	-	0.043
Magnesium	mg/kg	3	0.005	100%	343.0	-	-	-	-	353.9
Manganese	mg/kg	3	0.005	100%	3.36	-	-	-	-	4.71
Molybdenum	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	3	0.1	100%	0.063	-	-	-	-	0.137
Potassium	mg/kg	3	0.05	100%	3294	-	-	-	-	3362
Selenium	mg/kg	3	0.05	100%	1.10	-	-	-	-	1.13
Silver	mg/kg	3	0.02 (1) 0.05 (2)	67%	0.01	-	-	-	-	0.022
Sodium	mg/kg	3	0.005	100%	1030.57	-	-	-	-	1099.41
Strontium	mg/kg	3	0.05	100%	12.02	-	-	-	-	15.06
Thallium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	3	0.05	100%	2.69	-	-	-	-	3.15
Titanium	mg/kg	3	0.005	100%	0.576	-	-	-	-	1.190
Tungsten	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	3	0.1	100%	13.9	-	-	-	-	16.0
Zirconium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01

Note: all units on a wet weight basis.

Table B.3.5-15: Concentrations of Conventional Constituents in Round Goby at Surface Water Location 6 (Offshore Darlington Provincial Park – Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	2	0.05	100%	9.93	-	-	-	-	15.28
Antimony	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Arsenic	mg/kg	2	0.05	100%	0.53	-	-	-	-	0.54
Barium	mg/kg	2	0.05	100%	1.87	-	-	-	-	1.92
Beryllium	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Cadmium	mg/kg	2	0.02 (1) 0.05 (1)	50%	0.01	-	-	-	-	0.020
Calcium	mg/kg	2	0.05	100%	9588	-	-	-	-	10289
Cesium	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	2	0.05	100%	0.094	-	-	-	-	0.142
Cobalt	mg/kg	2	0.05	100%	0.045	-	-	-	-	0.046
Copper	mg/kg	2	0.1	100%	3.62	-	-	-	-	4.00
Iron	mg/kg	2	1	100%	21.5	-	-	-	-	25.4
Lead	mg/kg	2	0.05	100%	0.045	-	-	-	-	0.063
Lithium	mg/kg	2	0.005	100%	0.054	-	-	-	-	0.055
Magnesium	mg/kg	2	0.005	100%	364.1	-	-	-	-	369.3
Manganese	mg/kg	2	0.005	100%	3.59	-	-	-	-	3.90
Molybdenum	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	2	0.1	100%	0.108	-	-	-	-	0.109
Phosphorus	mg/kg	2	5	100%	6349	-	-	-	-	6911
Potassium	mg/kg	2	0.05	100%	3619	-	-	-	-	3729
Selenium	mg/kg	2	0.05	100%	1.14	-	-	-	-	1.19
Silver	mg/kg	2	0.05	100%	0.023	-	-	-	-	0.028
Sodium	mg/kg	2	0.005	100%	1220.8	-	-	-	-	1232.0
Strontium	mg/kg	2	0.05	100%	12.0	-	-	-	-	12.2
Thallium	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	2	0.05	100%	2.71	-	-	-	-	3.91
Titanium	mg/kg	2	0.005	100%	0.640	-	-	-	-	0.948
Tungsten	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	2	0.1	100%	15.4	-	-	-	-	15.8
Zirconium	mg/kg	2	0.02	0%	0.01	-	-	-	-	0.01

Note: all units on a wet weight basis.

Table B.3.5-16: Concentrations of Conventional Constituents in Round Goby at Surface Water Location 8 (Offshore Existing Diffuser – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	3	0.05	100%	4.76	-	-	-	-	7.20
Antimony	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	3	0.05	100%	0.596	-	-	-	-	0.695
Barium	mg/kg	3	0.05	100%	1.54	-	-	-	-	2.71
Beryllium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	3	0.02 (2) 0.2 (1)	0%	0.010	-	-	-	-	0.100
Cadmium	mg/kg	3	0.05	100%	0.025	-	-	-	-	0.031
Calcium	mg/kg	3	0.05	100%	7490	-	-	-	-	12881
Cesium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	3	0.05	100%	0.05	-	-	-	-	0.09
Cobalt	mg/kg	3	0.05	100%	0.034	-	-	-	-	0.050
Copper	mg/kg	3	0.1	100%	3.09	-	-	-	-	3.29
Iron	mg/kg	3	1	100%	14.0	-	-	-	-	19.8
Lead	mg/kg	3	0.05	100%	0.047	-	-	-	-	0.093
Lithium	mg/kg	3	0.005	100%	0.0319	-	-	-	-	0.0354
Magnesium	mg/kg	3	0.005	100%	288.8	-	-	-	-	351.8
Manganese	mg/kg	3	0.005	100%	2.73	-	-	-	-	3.81
Molybdenum	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	3	0.1	100%	0.096	-	-	-	-	0.108
Phosphorus	mg/kg	3	5	100%	5101	-	-	-	-	6569
Potassium	mg/kg	3	0.05	100%	3220	-	-	-	-	3386
Selenium	mg/kg	3	0.05	100%	0.987	-	-	-	-	1.056
Silver	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	3	0.005	100%	1095	-	-	-	-	1129
Strontium	mg/kg	3	0.05	100%	9.58	-	-	-	-	17.75
Thallium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	3	0.05	100%	2.06	-	-	-	-	3.19
Titanium	mg/kg	3	0.005	100%	0.57	-	-	-	-	0.80
Tungsten	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	3	0.1	100%	14.0	-	-	-	-	14.9
Zirconium	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

Table B.3.5-17: Concentrations of Conventional Constituents in Round Goby at Surface Water Location 10 (Offshore New Build – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	3	0.05	100%	4.13	-	-	-	-	6.95
Antimony	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	3	0.05	100%	0.503	-	-	-	-	0.717
Barium	mg/kg	3	0.05	100%	1.34	-	-	-	-	2.26
Beryllium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	3	0.05	100%	0.030	-	-	-	-	0.113
Cadmium	mg/kg	3	0.05	100%	0.022	-	-	-	-	0.026
Calcium	mg/kg	3	1	100%	7715	-	-	-	-	13417
Cesium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Cobalt	mg/kg	3	0.05	100%	0.024	-	-	-	-	0.038
Copper	mg/kg	3	0.05	100%	2.46	-	-	-	-	3.57
Iron	mg/kg	3	0.5	100%	15.5	-	-	-	-	26.2
Lead	mg/kg	3	0.05	100%	0.021	-	-	-	-	0.036
Lithium	mg/kg	3	0.02	0%	0.0100	-	-	-	-	0.0100
Magnesium	mg/kg	3	0.5	100%	286.9	-	-	-	-	307.9
Manganese	mg/kg	3	0.005	100%	3.18	-	-	-	-	5.56
Mercury	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010
Molybdenum	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	3	0.1	100%	0.036	-	-	-	-	0.052
Phosphorus	mg/kg	3	0.5	100%	5383	-	-	-	-	6780
Potassium	mg/kg	3	1	100%	3333	-	-	-	-	3615
Selenium	mg/kg	3	0.05	100%	1.324	-	-	-	-	1.527
Silver	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	3	5	100%	883	-	-	-	-	983
Strontium	mg/kg	3	0.05	100%	9.34	-	-	-	-	17.51
Thallium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	3	0.05	100%	2.18	-	-	-	-	2.95
Titanium	mg/kg	3	0.005	100%	0.46	-	-	-	-	0.51
Tungsten	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	3	2	100%	15.3	-	-	-	-	16.4
Zirconium	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

Table B.3.5-18: Concentrations of Conventional Constituents in Round Goby at Surface Water Location 11 (Offshore Existing Intake – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	3	0.05	100%	5.12	-	-	-	-	7.86
Antimony	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	3	0.05	100%	0.645	-	-	-	-	0.810
Barium	mg/kg	3	0.05	100%	1.70	-	-	-	-	2.70
Beryllium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	3	0.05	100%	0.023	-	-	-	-	0.187
Cadmium	mg/kg	3	0.05	100%	0.025	-	-	-	-	0.027
Calcium	mg/kg	3	1	100%	8908	-	-	-	-	13471
Cesium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Cobalt	mg/kg	3	0.05	100%	0.030	-	-	-	-	0.042
Copper	mg/kg	3	0.05	100%	3.29	-	-	-	-	3.65
Iron	mg/kg	3	0.5	100%	16.2	-	-	-	-	21.8
Lead	mg/kg	3	0.05	100%	0.035	-	-	-	-	0.045
Lithium	mg/kg	3	0.02	0%	0.0100	-	-	-	-	0.0100
Magnesium	mg/kg	3	0.5	100%	297.8	-	-	-	-	333.8
Manganese	mg/kg	3	0.005	100%	3.66	-	-	-	-	5.19
Mercury	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010
Molybdenum	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	3	0.1	100%	0.051	-	-	-	-	0.058
Phosphorus	mg/kg	3	0.5	100%	5538	-	-	-	-	6940
Potassium	mg/kg	3	1	100%	3565	-	-	-	-	3664
Selenium	mg/kg	3	0.05	100%	1.403	-	-	-	-	1.495
Silver	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	3	5	100%	962	-	-	-	-	1064
Strontium	mg/kg	3	0.05	100%	11.24	-	-	-	-	19.33
Thallium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	3	0.05	100%	2.18	-	-	-	-	3.13
Titanium	mg/kg	3	0.005	100%	0.40	-	-	-	-	0.47
Tungsten	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	3	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	3	2	100%	15.4	-	-	-	-	17.5
Zirconium	mg/kg	3	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

Table B.3.5-19: Concentrations of Conventional Constituents in Alewife at Surface Water Location 4 (Offshore Port Darlington - Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	0.05	100%	1.17	3.44	3.95	2.32	8.89	10.41
Antimony	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	5	0.05	100%	0.504	0.533	0.030	0.533	0.573	0.581
Barium	mg/kg	5	0.05	100%	0.69	0.82	0.10	0.81	0.93	0.95
Beryllium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Cadmium	mg/kg	5	0.05	100%	0.046	0.054	0.008	0.053	0.065	0.068
Calcium	mg/kg	5	0.05	100%	7129	8660	1107	8603	9931	10110
Cesium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	5	0.02 (3) 0.05 (2)	40%	0.01	0.04	0.04	0.02	0.10	0.11
Cobalt	mg/kg	5	0.05	100%	0.030	0.035	0.003	0.035	0.038	0.039
Copper	mg/kg	5	0.1	100%	0.88	1.11	0.32	1.08	1.54	1.65
Iron	mg/kg	5	1	100%	27.6	31.6	4.2	31.4	37.2	38.5
Lead	mg/kg	5	0.05	100%	0.065	0.068	0.003	0.068	0.072	0.072
Lithium	mg/kg	5	0.005	100%	0.0196	0.0272	0.0078	0.0263	0.0362	0.0367
Magnesium	mg/kg	5	0.005	100%	298.7	328.7	17.0	328.3	339.8	340.1
Manganese	mg/kg	5	0.005	100%	2.23	2.71	0.33	2.70	3.08	3.14
Molybdenum	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	5	0.1	100%	0.048	0.070	0.019	0.068	0.095	0.101
Phosphorus	mg/kg	5	5	100%	5790	6742	577	6721	7242	7296
Potassium	mg/kg	5	0.05	100%	3136	3309	126	3307	3444	3463
Selenium	mg/kg	5	0.05	100%	0.698	0.753	0.039	0.752	0.798	0.808
Silver	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	5	0.005	100%	814	1019	152	1009	1158	1162
Strontium	mg/kg	5	0.05	100%	6.56	7.99	1.22	7.92	9.52	9.76
Thallium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	5	0.05	100%	1.38	1.85	0.31	1.83	2.16	2.19
Titanium	mg/kg	5	0.005	100%	0.29	0.39	0.11	0.38	0.53	0.57
Tungsten	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	5	0.1	100%	21.6	24.4	2.0	24.4	26.4	26.4
Zirconium	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

Table B.3.5-20: Concentrations of Conventional Constituents in Alewife at Surface Water Location 6 (Offshore Darlington Provincial Park –Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	0.05	100%	4.70	8.24	5.21	7.27	15.31	17.33
Antimony	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	5	0.05	100%	0.494	0.540	0.029	0.540	0.567	0.569
Barium	mg/kg	5	0.05	100%	0.81	0.89	0.10	0.89	1.00	1.01
Beryllium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Cadmium	mg/kg	5	0.05	100%	0.058	0.068	0.008	0.067	0.076	0.076
Calcium	mg/kg	5	0.05	100%	7648	9174	1521	9075	10995	11210
Cesium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	5	0.05	100%	0.04	0.07	0.03	0.06	0.10	0.11
Cobalt	mg/kg	5	0.05	100%	0.032	0.038	0.005	0.038	0.043	0.043
Copper	mg/kg	5	0.1	100%	1.06	1.42	0.55	1.35	2.17	2.38
Iron	mg/kg	5	1	100%	29.8	33.8	2.8	33.7	36.5	36.6
Lead	mg/kg	5	0.05	100%	0.107	0.129	0.025	0.127	0.162	0.167
Lithium	mg/kg	5	0.005	100%	0.0342	0.0400	0.0054	0.0397	0.0462	0.0465
Magnesium	mg/kg	5	0.005	100%	305.2	345.8	26.6	345.0	372.8	377.5
Manganese	mg/kg	5	0.005	100%	2.26	2.83	0.44	2.80	3.27	3.27
Molybdenum	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	5	0.1	100%	0.065	0.076	0.012	0.076	0.092	0.096
Phosphorus	mg/kg	5	5	100%	6250	7246	841	7207	8210	8358
Potassium	mg/kg	5	0.05	100%	3233	3464	156	3461	3605	3621
Selenium	mg/kg	5	0.05	100%	0.723	0.737	0.014	0.737	0.754	0.756
Silver	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	5	0.005	100%	939	1034	56	1033	1074	1075
Strontium	mg/kg	5	0.05	100%	6.74	7.92	1.19	7.84	9.26	9.34
Thallium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	5	0.05	100%	1.24	1.81	0.46	1.76	2.37	2.44
Titanium	mg/kg	5	0.005	100%	0.44	0.50	0.07	0.49	0.58	0.58
Tungsten	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	5	0.1	100%	25.4	28.2	1.7	28.2	29.7	29.8
Zirconium	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

Table B.3.5-21: Concentrations of Conventional Constituents in Alewife at Surface Water Location 8 (Offshore Existing Diffuser – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	0.05	100%	0.90	3.96	3.72	2.56	8.05	8.07
Antimony	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	5	0.05	100%	0.529	-	-	-	-	0.589
Barium	mg/kg	5	0.05	100%	0.57	0.67	0.08	0.67	0.76	0.77
Beryllium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	5	0.2	0%	0.100	-	-	-	-	0.100
Cadmium	mg/kg	5	0.05	100%	0.047	0.051	0.004	0.051	0.057	0.057
Calcium	mg/kg	5	0.05	100%	6354	7563	885	7520	8364	8377
Cesium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	5	0.05	100%	0.02	0.05	0.02	0.04	0.08	0.08
Cobalt	mg/kg	5	0.05	100%	0.027	0.031	0.003	0.031	0.034	0.034
Copper	mg/kg	5	0.1	100%	0.82	1.31	0.65	1.21	2.20	2.38
Iron	mg/kg	5	1	100%	23.0	26.4	2.5	26.3	28.7	28.8
Lead	mg/kg	5	0.05	100%	0.028	0.032	0.003	0.032	0.035	0.035
Lithium	mg/kg	5	0.005	100%	0.0276	0.0351	0.0060	0.0347	0.0422	0.0429
Magnesium	mg/kg	5	0.005	100%	293.5	313.2	16.3	312.9	333.6	337.2
Manganese	mg/kg	5	0.005	100%	1.89	2.30	0.26	2.29	2.55	2.57
Molybdenum	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	5	0.1	100%	0.059	0.066	0.005	0.066	0.072	0.072
Phosphorus	mg/kg	5	5	100%	5617	6280	475	6265	6702	6704
Potassium	mg/kg	5	0.05	100%	3086	3344	218	3338	3602	3625
Selenium	mg/kg	5	0.05	100%	0.659	0.681	0.020	0.681	0.699	0.701
Silver	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	5	0.005	100%	816	950	115	944	1074	1091
Strontium	mg/kg	5	0.05	100%	5.79	6.71	0.75	6.68	7.44	7.51
Thallium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	5	0.05	100%	0.93	1.16	0.15	1.16	1.27	1.27
Titanium	mg/kg	5	0.005	100%	0.33	0.38	0.03	0.38	0.40	0.40
Tungsten	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	5	0.1	100%	23.9	24.9	0.7	24.9	25.7	25.8
Zirconium	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

Table B.3.5-22: Concentrations of Conventional Constituents in Alewife at Surface Water Location 10 (Offshore New Build – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	0.05	100%	0.88	2.45	2.00	1.90	5.12	5.58
Antimony	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	5	0.05	100%	0.448	0.518	0.078	0.513	0.613	0.621
Barium	mg/kg	5	0.05	100%	0.59	0.68	0.07	0.67	0.76	0.77
Beryllium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	5	0.02 (4) 0.05 (1)	20%	0.010	0.051	0.092	0.019	0.175	0.217
Cadmium	mg/kg	5	0.05	100%	0.041	0.048	0.004	0.047	0.052	0.053
Calcium	mg/kg	5	0.05	100%	6826	8020	732	7992	8698	8773
Cesium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	5	0.02 (1) 0.05 (4)	80%	0.01	0.07	0.06	0.05	0.15	0.17
Cobalt	mg/kg	5	0.05	100%	0.030	0.034	0.003	0.034	0.037	0.038
Copper	mg/kg	5	0.1	100%	0.81	1.12	0.54	1.04	1.86	2.09
Iron	mg/kg	5	1	100%	25.7	31.9	3.5	31.7	34.0	34.1
Lead	mg/kg	5	0.05	100%	0.024	0.038	0.022	0.034	0.068	0.077
Lithium	mg/kg	5	0.005	100%	0.0273	0.0491	0.0221	0.0452	0.0738	0.0745
Magnesium	mg/kg	5	0.005	100%	298.5	313.5	10.7	313.3	325.1	326.1
Manganese	mg/kg	5	0.005	100%	2.15	2.51	0.25	2.50	2.73	2.75
Molybdenum	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	5	0.1	100%	0.047	0.068	0.031	0.063	0.111	0.120
Phosphorus	mg/kg	5	5	100%	5788	6451	411	6440	6842	6910
Potassium	mg/kg	5	0.05	100%	3174	3320	131	3318	3474	3486
Selenium	mg/kg	5	0.05	100%	0.636	0.683	0.043	0.682	0.735	0.740
Silver	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	5	0.005	100%	823	872	37	872	917	927
Strontium	mg/kg	5	0.05	100%	5.95	7.19	0.76	7.15	7.79	7.81
Thallium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	5	0.05	100%	1.09	1.35	0.32	1.32	1.76	1.82
Titanium	mg/kg	5	0.005	100%	0.29	0.37	0.05	0.36	0.42	0.42
Tungsten	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	5	0.1	100%	23.9	24.7	1.0	24.7	26.0	26.2
Zirconium	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

Table B.3.5-23: Concentrations of Conventional Constituents in Alewife at Surface Water Location 11 (Offshore Existing Intake – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	0.05	100%	1.99	3.36	1.32	3.17	5.06	5.37
Antimony	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	5	0.05	100%	0.541	0.628	0.083	0.624	0.721	0.730
Barium	mg/kg	5	0.05	100%	0.80	0.91	0.11	0.90	1.03	1.04
Beryllium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	5	0.02 (3) 0.05 (2)	40%	0.010	0.018	0.011	0.015	0.032	0.034
Cadmium	mg/kg	5	0.05	100%	0.067	0.081	0.013	0.081	0.096	0.097
Calcium	mg/kg	5	0.05 (3) 1 (2)	100%	8355	10011	1784	9888	12195	12383
Cesium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Chromium	mg/kg	5	0.02 (2) 0.05 (3)	60%	0.01	0.03	0.02	0.02	0.05	0.05
Cobalt	mg/kg	5	0.05	100%	0.034	0.035	0.001	0.034	0.035	0.035
Copper	mg/kg	5	0.05 (2) 0.1 (3)	100%	0.93	0.97	0.05	0.97	1.03	1.03
Iron	mg/kg	5	0.5 (2) 1 (3)	100%	28.1	31.7	3.1	31.6	34.9	35.1
Lead	mg/kg	5	0.05	100%	0.033	0.149	0.220	0.077	0.449	0.541
Lithium	mg/kg	5	0.005 (3) 0.02 (2)	60%	0.0100	0.0251	0.0138	0.0213	0.0364	0.0367
Magnesium	mg/kg	5	0.005 (3) 0.5 (2)	100%	317.4	329.6	9.6	329.5	340.6	341.8
Manganese	mg/kg	5	0.005	100%	2.54	3.25	0.85	3.17	4.41	4.63
Mercury	mg/kg	2	0.05	100%	0.042	-	-	-	-	0.049
Molybdenum	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	5	0.1	100%	0.036	0.058	0.019	0.055	0.083	0.087
Phosphorus	mg/kg	5	0.5 (2) 5 (3)	100%	6514	7029	378	7021	7475	7551
Potassium	mg/kg	5	0.05 (3) 1 (2)	100%	3087	3293	143	3291	3450	3478
Selenium	mg/kg	5	0.05	100%	0.732	0.831	0.119	0.824	0.988	1.013
Silver	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Sodium	mg/kg	5	0.005 (3) 5 (2)	100%	558	888	247	858	1125	1134
Strontium	mg/kg	5	0.05	100%	8.07	9.74	2.08	9.57	12.35	12.61
Thallium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Thorium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	5	0.05	100%	1.49	1.63	0.14	1.62	1.81	1.83
Titanium	mg/kg	5	0.005	100%	0.27	0.38	0.10	0.37	0.50	0.52
Tungsten	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	5	0.1 (3) 2 (2)	100%	26.0	29.2	3.4	29.0	33.1	33.2
Zirconium	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

Table B.3.5-24: Concentrations of Conventional Constituents in Lake Trout at Surface Water Location 4 (Offshore Port Darlington – Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Aluminum	mg/kg	5	0.05	100%	1.86	6.31	4.89	4.98	12.89	14.17
Antimony	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Arsenic	mg/kg	5	0.05	100%	1.540	2.004	0.692	1.926	2.946	3.211
Barium	mg/kg	5	0.05	100%	0.21	0.33	0.12	0.32	0.49	0.52
Beryllium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Bismuth	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Boron	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Cadmium	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010
Calcium	mg/kg	5	0.05	100%	1294	10447	6711	7535	16157	16270
Cesium	mg/kg	5	0.05	100%	0.027	0.044	0.024	0.040	0.076	0.082
Chromium	mg/kg	5	0.05	100%	0.11	0.28	0.32	0.19	0.71	0.84
Cobalt	mg/kg	5	0.05	100%	0.024	0.094	0.052	0.078	0.144	0.146
Copper	mg/kg	5	0.1	100%	1.36	4.49	3.37	3.61	9.02	9.99
Iron	mg/kg	5	1	100%	47.3	80.9	35.1	75.7	128.0	139.8
Lead	mg/kg	5	0.05	100%	0.022	0.046	0.024	0.041	0.073	0.074
Lithium	mg/kg	5	0.005	100%	0.0309	0.0393	0.0067	0.0388	0.0463	0.0464
Magnesium	mg/kg	5	0.005	100%	547.4	789.2	209.6	767.3	1048.6	1089.2
Manganese	mg/kg	5	0.005	100%	0.45	1.13	0.67	0.97	1.88	1.90
Mercury	mg/kg	5	0.05	100%	0.289	0.451	0.227	0.417	0.761	0.85
Molybdenum	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Nickel	mg/kg	5	0.1	100%	0.018	0.036	0.014	0.034	0.050	0.051
Phosphorus	mg/kg	5	5	100%	7135	10845	3034	10492	14230	14577
Potassium	mg/kg	5	0.05	100%	5756	8501	3361	8069	13094	14294
Rubidium	mg/kg	5	0.05	100%	5.5	7.8	3.5	7.3	12.5	13.3
Selenium	mg/kg	5	0.05	100%	0.290	0.388	0.079	0.381	0.468	0.470
Silicon	mg/kg	5	10	100%	11.6	16.1	4.7	15.6	22.4	23.9
Silver	mg/kg	5	0.02 (2) 0.05 (3)	60%	0.01	0.034	0.025	0.026	0.064	0.068
Sodium	mg/kg	5	0.005	100%	2281	2782	390	2760	3225	3297
Strontium	mg/kg	5	0.05	100%	1.12	9.52	6.06	6.83	14.63	14.79
Thallium	mg/kg	5	0.05	100%	0.032	0.069	0.045	0.058	0.124	0.129
Thorium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Tin	mg/kg	5	0.05	100%	9.5	14.2	5.0	13.6	20.7	21.7
Titanium	mg/kg	5	0.005	100%	3.23	4.18	1.01	4.08	5.31	5.33
Tungsten	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Uranium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Vanadium	mg/kg	5	0.02	0%	0.01	-	-	-	-	0.01
Zinc	mg/kg	5	0.1	100%	16.1	39.7	14.9	36.7	54.4	57.1
Zirconium	mg/kg	5	0.02	0%	0.010	-	-	-	-	0.010

Note: all units on a wet weight basis.

B.3.5. 2 Radiological Biota Data Tables

Table B.3.5-25: Concentrations of Radiological Constituents in Terrestrial Vegetation at Polygon AB

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	7	5 (1) 10 (1) 13 (1) 15 (2) 16 (2)	0%	2.5	-	-	-	-	8
Be-7 by gamma	Bq/kg	7	10	100%	25	59.9	27.8	53.9	90.0	90
Carbon-14	Bq/kg-C	7	100	100%	241	263	18.3	262.5	285.3	288
Ce-141 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	7	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	7	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	7	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	7	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	7	2 (1) 10 (1) 14 (1) 16 (2) 17 (2)	0%	1	-	-	-	-	8.5
K-40 by gamma	Bq/kg	7	10	100%	68	162.0	56.3	151.5	223.5	240
La-140 by gamma	Bq/kg	7	2 (2) 3 (2) 4 (3)	0%	1	-	-	-	-	2
Mn-54 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	7	1	100%	11	23.0	12.2	20.7	41.6	47
Ru-103 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	7	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	7	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	7	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	7	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	7	15	100%	44	163	164	110	419	495
Zn-65 by gamma	Bq/kg	7	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	7	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-26: Concentrations of Radiological Constituents in Terrestrial Vegetation at Polygon C

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	4	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	4	5 (1) 10 (1) 13 (1) 14 (1)	0%	2.5	-	-	-	-	7
Be-7 by gamma	Bq/kg	4	10	100%	30	41.3	8.8	40.5	50.0	51
Carbon-14	Bq/kg-C	4	100	100%	258	495.3	158.2	470.2	577.0	577
Ce-141 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	4	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	4	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	4	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	4	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	4	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	4	2 (1) 11 (1) 14 (2)	0%	1	-	-	-	-	7
K-40 by gamma	Bq/kg	4	10	100%	70	159.3	63.8	146.6	211.7	215
La-140 by gamma	Bq/kg	4	2 (1) 3 (1) 4 (1) 5 (1)	0%	1	-	-	-	-	2.5
Mn-54 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	4	1	100%	28	38.8	13.4	37.2	54.9	58
Ru-103 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	4	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	4	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	4	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	4	15	100%	140	222	57	215	264	266
Zn-65 by gamma	Bq/kg	4	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	4	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-27: Concentrations of Radiological Constituents in Terrestrial Vegetation at Polygon D

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	3	13 (1) 16 (1) 20 (1)	0%	6.5	-	-	-	-	10
Be-7 by gamma	Bq/kg	3	10	100%	66	-	-	-	-	73
Carbon-14	Bq/kg-C	3	100	100%	406	-	-	-	-	568
Ce-141 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10 (2) 11 (1)	0%	5	-	-	-	-	5.5
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	3	13 (1) 21 (1) 23 (1)	0%	6.5	-	-	-	-	11.5
K-40 by gamma	Bq/kg	3	10	100%	150	-	-	-	-	179
La-140 by gamma	Bq/kg	3	4 (2) 6 (1)	0%	2	-	-	-	-	3
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	21	-	-	-	-	32
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	3	15	100%	30	-	-	-	-	55
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-28: Concentrations of Radiological Constituents in On-site Fruit at Polygon AB

Radionuclide	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	1	100	100%	236	-	-	-	-	236
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	1	10	100%	49	-	-	-	-	49
La-140 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	15	-	-	-	-	15
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	15	100%	86	-	-	-	-	86
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-29: Concentrations of Radiological Constituents in On-site Fruit at Polygon C

Radionuclide	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	1	100	100%	253	-	-	-	-	253
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	1	10	100%	53	-	-	-	-	53
La-140 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	18	-	-	-	-	18
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	15	100%	151	-	-	-	-	151
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-30: Concentrations of Radiological Constituents in On-site Fruit at Polygon D

Radionuclide	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	2	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	2	100	100%	277	-	-	-	-	291
Ce-141 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	2	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	2	10	100%	36	-	-	-	-	40
La-140 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	2	1	100%	16	-	-	-	-	18
Ru-103 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	2	15	100%	83	-	-	-	-	93
Zn-65 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-31: Concentrations of Radiological Constituents in On-site Fruit at Polygon E

Radionuclide	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	1	100	100%	297	-	-	-	-	297
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	1	10	100%	60	-	-	-	-	60
La-140 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	34	-	-	-	-	34
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	15	100%	186	-	-	-	-	186
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-32: Concentrations of Radiological Constituents in REMP Fruit at F1

Radionuclide	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	1	10	100%	66	-	-	-	-	66
La-140 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg	1	10	0%	5	-	-	-	-	5
Strontium-90	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1

Note: all units on a wet weight basis.

Table B.3.5-33: Concentrations of Radiological Constituents in REMP Fruit at R65

Radionuclide	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	4	2	0%	1	-	-	-	-	1
Am-241 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Ba-140 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	4	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	4	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	4	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	4	10	100%	70	101.8	21.4	99.8	116.1	117
La-140 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Pu-238 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Pu-239+Pu240	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	4	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	4	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	4	1 (1) 2 (3)	0%	0.5	-	-	-	-	1
Strontium-89	Bq/kg	1	10	0%	5	-	-	-	-	5
Strontium-90	Bq/kg	4	1	0%	0.5	-	-	-	-	0.5
Technicium-99 by ICPMS	Bq/kg	3	100	0%	50	-	-	-	-	50
Zn-65 by gamma	Bq/kg	4	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1

Note: all units on a wet weight basis.

Table B.3.5-34: Concentrations of Radiological Constituents in Aquatic Vegetation at Surface Water Location 12 (Coots Pond)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	5	5	0%	2.50	-	-	-	-	2.50
Be-7 by gamma	Bq/kg	5	10	60%	5.0	12.0	7.3	10.1	20.8	22.0
Carbon-14	Bq/kg-C	5	100	100%	246	277	28	276	309	311
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
K-40 by gamma	Bq/kg	5	10	100%	50	63.0	10.6	62.3	76.0	78
La-140 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	3.0	4.60	1.14	4.48	5.80	6.0
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	1	40%	0.50	0.80	0.41	0.72	1.28	1.30
Th-series- gamma	Bq/kg	5	3	20%	1.50	2.26	1.70	1.93	4.54	5.30
Tritium	Bq/kg	5	7	100%	35.0	37.6	3.2	37.5	42.0	43.0
U-series- gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-35: Concentrations of Radiological Constituents in Aquatic Vegetation at Surface Water Location 13 (Tree Frog Pond)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	5	5	0%	2.50	-	-	-	-	2.50
Be-7 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	5	100	100%	412	440	20	440	459	460
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	5	2 (4) 3 (1)	0%	1.0	-	-	-	-	1.5
K-40 by gamma	Bq/kg	5	10	100%	116	131.6	10.1	131.3	141.4	142
La-140 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	5.0	8.20	2.28	7.92	10.60	11.0
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Th-series- gamma	Bq/kg	5	3	0%	1.50	-	-	-	-	1.50
Tritium	Bq/kg	5	7	100%	46.0	52.6	5.3	52.4	57.6	58.0
U-series- gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-36: Concentrations of Radiological Constituents in Aquatic Vegetation at Surface Water Location 14 (SWM Pond)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	5	5	0%	2.50	-	-	-	-	2.50
Be-7 by gamma	Bq/kg	5	10	100%	11.0	14.4	4.1	14.0	19.8	21.0
Carbon-14	Bq/kg-C	5	100	100%	201	210	6	210	217	218
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
K-40 by gamma	Bq/kg	5	10	100%	36	59.6	13.5	58.1	69.0	70
La-140 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	4.0	4.40	0.55	4.37	5.00	5.0
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Th-series- gamma	Bq/kg	5	3	80%	1.50	4.24	1.82	3.82	6.16	6.40
Tritium	Bq/kg	5	7	100%	112.0	129.8	12.9	129.3	142.0	142.0
U-series- gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-37: Concentrations of Radiological Constituents in Caterpillars at Polygon AB

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	2	7 (1) 8 (1)	0%	3.5	-	-	-	-	4
Be-7 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	2	100	100%	205	-	-	-	-	278
Ce-141 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	2	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	2	4 (1) 6 (1)	0%	2	-	-	-	-	3
K-40 by gamma	Bq/kg	2	10	100%	157	-	-	-	-	161
La-140 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	2	1	100%	7	-	-	-	-	8
Ru-103 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	2	15	100%	50	-	-	-	-	53
Zn-65 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-38: Concentrations of Radiological Constituents in Caterpillars at Polygon C

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	7	0%	3.5	-	-	-	-	3.5
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	1	100	100%	435	-	-	-	-	435
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	8	0%	4	-	-	-	-	4
K-40 by gamma	Bq/kg	1	10	100%	168	-	-	-	-	168
La-140 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	16	-	-	-	-	16
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	15	100%	185	-	-	-	-	185
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-39: Concentrations of Radiological Constituents in Caterpillars at Polygon D

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	1	100	100%	294	-	-	-	-	294
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	4	0%	2	-	-	-	-	2
K-40 by gamma	Bq/kg	1	10	100%	174	-	-	-	-	174
La-140 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	11	-	-	-	-	11
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	15	100%	92	-	-	-	-	92
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-40: Concentrations of Radiological Constituents in Earthworms at Polygon AB

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	2	7 (1) 9 (1)	0%	3.5	-	-	-	-	4.5
Be-7 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	2	100	100%	252	-	-	-	-	276
Ce-141 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	2	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	2	8 (1) 10 (1)	0%	4	-	-	-	-	5
K-40 by gamma	Bq/kg	2	10	100%	86	-	-	-	-	107
La-140 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	2	1	100%	5	-	-	-	-	8
Ru-103 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	2	15	0%	8	-	-	-	-	8
Zn-65 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-41: Concentrations of Radiological Constituents in Earthworms at Polygon C

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	8	0%	4	-	-	-	-	4
Be-7 by gamma	Bq/kg	1	10	100%	12	-	-	-	-	12
Carbon-14	Bq/kg-C	1	100	100%	316	-	-	-	-	316
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	9	0%	4.5	-	-	-	-	4.5
K-40 by gamma	Bq/kg	1	10	100%	98	-	-	-	-	98
La-140 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	11	-	-	-	-	11
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	15	100%	37	-	-	-	-	37
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-42: Concentrations of Radiological Constituents in Earthworms at Polygon D

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	2	7 (1) 8 (1)	0%	3.5	-	-	-	-	4
Be-7 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	1	100	100%	320	-	-	-	-	320
Ce-141 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	2	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	2	2 (1) 12 (1)	0%	1	-	-	-	-	6
K-40 by gamma	Bq/kg	2	10	100%	88	-	-	-	-	129
La-140 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	12	-	-	-	-	12
Ru-103 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	2	2 (1) 3 (1)	0%	1.0	-	-	-	-	1.5
Sb-125 by gamma	Bq/kg	2	2 (1) 3 (1)	0%	1.0	-	-	-	-	1.5
Se-75 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	15	100%	19	-	-	-	-	19
Zn-65 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-43: Concentrations of Radiological Constituents in Frogs at Polygon D

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	1	12	0%	6	-	-	-	-	6
Be-7 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	1	100	100%	278	-	-	-	-	278
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	1	22	0%	11	-	-	-	-	11
K-40 by gamma	Bq/kg	1	10	100%	70	-	-	-	-	70
La-140 by gamma	Bq/kg	1	4	0%	2	-	-	-	-	2
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	13	-	-	-	-	13
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	15	100%	38	-	-	-	-	38
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-44: Concentrations of Radiological Constituents in Alewife at Surface Water Location 2 (Cobourg Off-Shore – Regional)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	1	5	0%	2.50	-	-	-	-	2.50
Be-7 by gamma	Bq/kg	1	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	1	100	100%	234	-	-	-	-	234
Ce-141 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
K-40 by gamma	Bq/kg	1	10	100%	102	-	-	-	-	102
La-140 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	3.0	-	-	-	-	3.0
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	1	7	0%	3.5	-	-	-	-	3.5
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-45: Concentrations of Radiological Constituents in Northern Redbelly Dace at Surface Water Location 12 (Coots Pond)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	3	73 (1) 98 (1) 107 (1)	0%	36.50	-	-	-	-	53.50
Be-7 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	3	100	100%	235	-	-	-	-	287
Ce-141 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	13 (1) 18 (1) 19 (1)	0%	6.5	-	-	-	-	9.5
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	3	204 (1) 293 (1) 318 (1)	0%	102	-	-	-	-	159
K-40 by gamma	Bq/kg	3	10	100%	77	-	-	-	-	83
La-140 by gamma	Bq/kg	3	18 (1) 21 (1) 25 (1)	0%	9.0	-	-	-	-	12.5
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	9.0	-	-	-	-	13.0
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	3	7	100%	68.0	-	-	-	-	77.0
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-46: Concentrations of Radiological Constituents in Black Crappie at Surface Water Location 6b (McLaughlin Bay - Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Am-241 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Ba-140 by gamma	Bq/kg	3	112 (1) 114 (1) 180 (1)	0%	56.0 0	-	-	-	-	90.00
Be-7 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	3	100	100%	217	-	-	-	-	244
Ce-141 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	19 (2) 27 (1)	0%	9.5	-	-	-	-	13.5
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Gross Beta	Bq/kg	3	2	100%	110	-	-	-	-	160
I-131 by gamma	Bq/kg	3	353 (1) 358 (1) 576 (1)	0%	176. 5	-	-	-	-	288
K-40 by gamma	Bq/kg	3	10	100%	86	-	-	-	-	96
La-140 by gamma	Bq/kg	3	23 (1) 27 (1) 46 (1)	0%	11.5	-	-	-	-	23
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	6.0	-	-	-	-	10.0
Pu-238 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Pu-239 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Pu-240 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2 (2) 3 (1)	0%	1.0	-	-	-	-	1.5
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Technicium-99 by ICPMS	Bq/kg	3	100	0%	50	-	-	-	-	50
Tritium	Bq/kg	3	15	0%	7.5	-	-	-	-	7.5
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-47: Concentrations of Radiological Constituents in Mussels at Surface Water Location 10 (Offshore New Build – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	1	27	0%	13.50	-	-	-	-	13.50
Be-7 by gamma	Bq/kg	1	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	1	100	100%	285	-	-	-	-	285
Ce-141 by gamma	Bq/kg	1	1.2	0%	0.6	-	-	-	-	0.6
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	1	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	1	108.2	0%	54.1	-	-	-	-	54.1
K-40 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
La-140 by gamma	Bq/kg	1	6.7	0%	3.35	-	-	-	-	3.35
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	1	1	100%	3.0	-	-	-	-	3.0
Ru-103 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	1	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	1	1	100%	8.3	-	-	-	-	8.3
Tritium	Bq/kg	1	7	0%	3.5	-	-	-	-	3.5
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	1	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-48: Concentrations of Radiological Constituents in Mussels at Surface Water Location 8 (Offshore Existing Diffuser – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	3	18.9 (1) 21.2 (1) 26.8 (1)	0%	9.45	-	-	-	-	13.40
Be-7 by gamma	Bq/kg	3	10	67%	5.0	-	-	-	-	17.0
Carbon-14	Bq/kg-C	3	100	100%	265	-	-	-	-	316
Ce-141 by gamma	Bq/kg	3	1 (2) 1.3 (1)	0%	0.5	-	-	-	-	0.7
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	3	65.3 (1) 77.3 (1) 104.3 (1)	0%	32.65	-	-	-	-	52.15
K-40 by gamma	Bq/kg	3	10	33%	5	-	-	-	-	11
La-140 by gamma	Bq/kg	3	5.7 (1) 6.9 (1) 9.2 (1)	0%	2.85	-	-	-	-	4.6
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	3.0	-	-	-	-	32.0
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	100%	13.1	-	-	-	-	22.3
Tritium	Bq/kg	3	7	33%	3.5	-	-	-	-	10.0
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-49: Concentrations of Radiological Constituents in Round White Fish at Surface Water Location 8 (Offshore Existing Diffuser – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Am-241 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Ba-140 by gamma	Bq/kg	2	6 (1) 7 (1)	0%	3.00	-	-	-	-	3.50
Be-7 by gamma	Bq/kg	2	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C		N/A	N/A	N/A					N/A
Ce-141 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	2	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	2	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	2	6 (1) 8 (1)	0%	3.0	-	-	-	-	4.0
K-40 by gamma	Bq/kg	2	10	100%	111	-	-	-	-	120
La-140 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Pu-238 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Pu-239+Pu240	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Ru-103 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	2	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Technicium-99 by ICPMS	Bq/kg	2	100	0%	50	-	-	-	-	50
Tritium	Bq/kg		N/A	N/A	N/A					N/A
Zn-65 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.
N/A – not analyzed

Table B.3.5-50: Concentrations of Radiological Constituents in Alewife at Surface Water Location 4 (Offshore – Port Darlington – Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	5	5	0%	2.50	-	-	-	-	2.50
Be-7 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	5	100	100%	202	250	41	247	299	306
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
K-40 by gamma	Bq/kg	5	10	100%	92	106.8	12.4	106.2	119.6	120
La-140 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	4.0	5.00	0.71	4.96	5.80	6.0
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	5	7	20%	3.5	4.6	2.5	4.2	7.9	9.0
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-51: Concentrations of Radiological Constituents in Alewife at Surface Water Location 6 (Offshore Darlington Provincial Park – Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	5	5	0%	2.50	-	-	-	-	2.50
Be-7 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	5	100	100%	248	261	16	260	282	287
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
K-40 by gamma	Bq/kg	5	10	100%	90	100.4	7.7	100.2	108.6	109
La-140 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	4.0	4.60	0.89	4.54	5.80	6.0
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	5	7	20%	3.5	5.2	3.8	4.5	10.3	12.0
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-52: Concentrations of Radiological Constituents in Alewife at Surface Water Location 8 (Offshore Existing Diffuser – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	5	8 (1) 9 (2) 10 (2)	0%	4.00	-	-	-	-	5.0
Be-7 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	5	100	100%	212	241	29	240	278	284
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	5	9 (1) 10 (1) 11 (1) 12 (1) 13 (1)	0%	4.5	-	-	-	-	6.5
K-40 by gamma	Bq/kg	5	10	100%	90	98.0	6.9	97.8	106.2	107
La-140 by gamma	Bq/kg	5	3 (4) 4 (1)	0%	1.5	-	-	-	-	2
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	4.0	5.40	1.14	5.30	6.80	7.0
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	5	7	100%	14.0	17.4	3.6	17.1	22.2	23.0
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-53: Concentrations of Radiological Constituents in Alewife at Surface Water Location 10 (Offshore New Build – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	5	5 (1) 6 (1) 7 (2) 10 (1)	0%	2.50	-	-	-	-	5.0
Be-7 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	5	100	100%	228	241	12	241	255	257
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	5	2 (1) 7 (1) 8 (1) 9 (1) 10 (1)	0%	1.0	-	-	-	-	5.0
K-40 by gamma	Bq/kg	5	10	100%	91	97.8	4.3	97.7	102.2	103
La-140 by gamma	Bq/kg	5	2 (3) 3 (1) 4 (1)	0%	1	-	-	-	-	2
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	5.0	6.00	1.22	5.91	7.60	8.0
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	5	7	60%	3.5	10.4	6.5	8.4	16.6	17.0
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-54: Concentrations of Radiological Constituents in Alewife at Surface Water Location 11 (Offshore Existing Intake – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	3	5	0%	2.50	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	5	100	100%	236	265	25	264	291	292
Ce-141 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
K-40 by gamma	Bq/kg	5	10	100%	89	99.6	8.7	99.3	109.2	110
La-140 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	5.0	6.52	0.93	6.46	7.24	7.30
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	5	7	40%	3.5	5.5	2.8	5.0	8.8	9.0
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-55: Concentrations of Radiological Constituents in Lake Trout at Surface Water Location 4 (Offshore Port Darlington – Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Am-241 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Ba-140 by gamma	Bq/kg	5	42 (1) 51 (1) 56 (1) 90 (1) 213 (1)	0%	21.0	-	-	-	-	106.5
Be-7 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	6	100	100%	213	250	31	249	287	290
Ce-141 by gamma	Bq/kg	5	1 (2) 2 (3)	0%	0.5	-	-	-	-	1.0
Ce-144 by gamma	Bq/kg	5	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	5	10 (1) 11 (1) 13 (1) 18 (1) 33 (1)	0%	5.0	-	-	-	-	16.5
Cs-134 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Gross Beta	Bq/kg	2	2	100%	75	-	-	-	-	83
I-131 by gamma	Bq/kg	5	105 (1) 131 (1) 141 (1) 196 (1) 586 (1)	0%	52.5	-	-	-	-	293
K-40 by gamma	Bq/kg	5	10	100%	71	84.0	11.9	83.4	99.4	103
La-140 by gamma	Bq/kg	5	11 (1) 12 (1) 13 (1) 20 (1) 41 (1)	0%	5.5	-	-	-	-	20.5
Mn-54 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	5	1	100%	2.0	2.80	0.84	2.70	3.80	4.0
Pu-238 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Pu-239 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Pu-240 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Ru-103 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	5	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg	2	2	0%	1.0	-	-	-	-	1.0
Strontium-90	Bq/kg	5	1	0%	0.5	-	-	-	-	0.5
Technicium-99 by ICPMS	Bq/kg	1	100	0%	50	-	-	-	-	50
Tritium	Bq/kg	5	15	0%	7.5	-	-	-	-	7.5
Zn-65 by gamma	Bq/kg	5	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	5	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-56: Concentrations of Radiological Constituents in Walleye at Surface Water Location 8 (Offshore Existing Diffuser – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Am-241 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Ba-140 by gamma	Bq/kg	3	6 (1) 10 (1) 10.2 (1)	0%	3.00	-	-	-	-	5.1
Be-7 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C		N/A	N/A	N/A					N/A
Ce-141 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	3	11.2 (1) 22.4 (1) 23.9 (1) 26.1 (1)	0%	5.6	-	-	-	-	13.1
K-40 by gamma	Bq/kg	3	10	100%	117	-	-	-	-	152
La-140 by gamma	Bq/kg	3	2 (1) 2.7 (1) 2.9 (1)	0%	1.0	-	-	-	-	1.45
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Pu-238	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Pu-239+Pu240	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg		N/A	N/A	N/A					N/A
Strontium-90	Bq/kg		N/A	N/A	N/A					N/A
Technicium-99 by ICPMS	Bq/kg		N/A	N/A	N/A					N/A
Tritium	Bq/kg		N/A	N/A	N/A					N/A
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.
N/A – not analyzed

Table B.3.5-57: Concentrations of Radiological Constituents in REMP Round White Fish

Radionuclide	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Am-241 alpha spec	Bq/kg	1	10 (3)	0%	0.05	-	-	-	-	0.05
Ce-144 by gamma	Bq/kg	1	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-134 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	1	10	100%	121	-	-	-	-	121
Mn-54 by gamma	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Pu-238 alpha spec	Bq/kg	1	0.1	0%	0.05	-	-	-	-	0.05
Pu-239+Pu240	Bq/kg	1	0.1	0%	0.05	-	-	-	-	0.05
Ru-106 by gamma	Bq/kg	1	10	0%	5	-	-	-	-	5
Sb-125 by gamma	Bq/kg	1	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	1	4	0%	2	-	-	-	-	2
Strontium-90	Bq/kg	1	1	0%	0.5	-	-	-	-	0.5
Technicium-99 by ICPMS	Bq/kg	1	100	0%	50	-	-	-	-	50
Zn-65 by gamma	Bq/kg	1	3	0%	1.5	-	-	-	-	1.5

Note: all units on a wet weight basis.
REMP only analyses for the above radionuclides.

Table B.3.5-58: Concentrations of Radiological Constituents in REMP White Sucker

Radionuclide	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Am-241 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Ce-144 by gamma	Bq/kg	2	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cs-134 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	2	10	100%	115	-	-	-	-	120
Mn-54 by gamma	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Pu-238 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Pu-238 alpha spec	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Pu-239+Pu240	Bq/kg	2	0.1	0%	0.05	-	-	-	-	0.05
Ru-106 by gamma	Bq/kg	2	10	0%	5	-	-	-	-	5
Sb-125 by gamma	Bq/kg	2	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	2	4	0%	2	-	-	-	-	2
Strontium-90	Bq/kg	2	1	0%	0.5	-	-	-	-	0.5
Technicium-99 by ICPMS	Bq/kg	2	100	0%	50	-	-	-	-	50
Zn-65 by gamma	Bq/kg	2	3	0%	1.5	-	-	-	-	1.5

Note: all units on a wet weight basis.
REMP only analyses for the above radionuclides.

Table B.3.5-59: Concentrations of Radiological Constituents in White Sucker at Surface Water Location 8 (Offshore Existing Diffuser - Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Am-241 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Ba-140 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	3	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C		N/A	N/A	N/A					N/A
Ce-141 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
I-131 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
K-40 by gamma	Bq/kg	3	10	100%	75	-	-	-	-	91
La-140 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Pu-238 alpha spec	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Pu-239+Pu240	Bq/kg	3	0.1	0%	0.05	-	-	-	-	0.05
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-89	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Technicium-99 by ICPMS	Bq/kg	3	100	0%	50	-	-	-	-	50
Tritium	Bq/kg		N/A	N/A	N/A					N/A
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1

Note: all units on a wet weight basis.
N/A – not analyzed

Table B.3.5-60: Concentrations of Radiological Constituents in Round Goby at Surface Water Location 4 (Offshore Port Darlington – Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	3	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	3	100	100%	255	-	-	-	-	273
Ce-141 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
K-40 by gamma	Bq/kg	3	10	100%	99	-	-	-	-	111
La-140 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	4.0	-	-	-	-	5.0
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	3	7	0%	3.5	-	-	-	-	3.5
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-61: Concentrations of Radiological Constituents in Round Goby at Surface Water Location 6 (Offshore Darlington Provincial Park – Local)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Ba-140 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Be-7 by gamma	Bq/kg	3	10	0%	5	-	-	-	-	5
Carbon-14	Bq/kg-C	3	100	100%	204	-	-	-	-	238
Ce-141 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10	0%	5	-	-	-	-	5
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Fe-59 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
K-40 by gamma	Bq/kg	3	10	100%	96	-	-	-	-	102
I-131 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
La-140 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	3	-	-	-	-	8
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5	-	-	-	-	5
Sb-124 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Sb-125 by gamma	Bq/kg	3	2	0%	1	-	-	-	-	1
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	3	7	0%	3.5	-	-	-	-	3.5
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-62: Concentrations of Radiological Constituents in Round Goby at Surface Water Location 8 (Offshore Existing Diffuser – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	3	5 (2) 10 (1)	0%	2.50	-	-	-	-	5.00
Be-7 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	3	100	100%	230	-	-	-	-	274
Ce-141 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	3	2 (2) 11 (1)	0%	1.0	-	-	-	-	5.5
K-40 by gamma	Bq/kg	3	10	100%	89	-	-	-	-	120
La-140 by gamma	Bq/kg	3	2 (2) 3 (1)	0%	1.0	-	-	-	-	1.5
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	6.0	-	-	-	-	9.0
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	3	7	0%	3.5	-	-	-	-	3.5
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

Table B.3.5-63: Concentrations of Radiological Constituents in Round Goby at Surface Water Location 10 (Offshore New Build – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Be-7 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	3	100	100%	228	-	-	-	-	300
Ce-141 by gamma	Bq/kg	3	1.8 (1) 2.3 (1) 4.8 (1)	0%	0.9	-	-	-	-	2.4
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10 (1) 12 (1) 53 (1)	0%	5.0	-	-	-	-	26.5
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2 (2) 2.8 (1)	0%	1.0	-	-	-	-	1.4
I-131 by gamma	Bq/kg	N/A	N/A	N/A	N/A	-	-	-	-	N/A
K-40 by gamma	Bq/kg	3	10	100%	85	-	-	-	-	95
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	3.3	-	-	-	-	4.0
Ru-103 by gamma	Bq/kg	3	1 (2) 1.5 (1)	0%	0.5	-	-	-	-	0.75
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	3	7	33%	3.5	-	-	-	-	9.0
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.
N/A – Not analyzed

Table B.3.5-64: Concentrations of Radiological Constituents in Round Goby at Surface Water Location 11 (Offshore Existing Intake – Site)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Be-7 by gamma	Bq/kg	3	10 (2) 12 (1)	0%	5.0	-	-	-	-	6.0
Carbon-14	Bq/kg-C	3	100	100%	241	-	-	-	-	272
Ce-141 by gamma	Bq/kg	3	1.4 (1) 1.6 (1) 11 (1)	0%	0.7	-	-	-	-	5.5
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10 (1) 11 (1) 94 (1)	0%	5.0	-	-	-	-	47.0
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2 (2) 5.2 (1)	0%	1.0	-	-	-	-	2.6
I-131 by gamma	Bq/kg	N/A	N/A	N/A	N/A	-	-	-	-	N/A
K-40 by gamma	Bq/kg	3	10	100%	103	-	-	-	-	111
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	3.9	-	-	-	-	5.30
Ru-103 by gamma	Bq/kg	3	1 (2) 2.5 (1)	0%	0.5	-	-	-	-	1.25
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	3	7	33%	3.5	-	-	-	-	8.0
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.
N/A – Not analyzed

Table B.3.5-65: Concentrations of Radiological Constituents in Round Goby at Surface Water Location 2 (Cobourg Off-Shore – Regional)

Constituent	Units	N	MDL	% above MDL	Min	Mean	Std Dev	Geometric Mean	95th Percentile	Max
Ag-110m by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Ba-140 by gamma	Bq/kg	3	5	0%	2.50	-	-	-	-	2.50
Be-7 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Carbon-14	Bq/kg-C	3	100	100%	219	-	-	-	-	233
Ce-141 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ce-144 by gamma	Bq/kg	3	5	0%	2.5	-	-	-	-	2.5
Co-57 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-58 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Co-60 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cr-51 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Cs-134 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Cs-137 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Eu-154 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Eu-155 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Fe-59 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
I-131 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
K-40 by gamma	Bq/kg	3	10	100%	95	-	-	-	-	104
La-140 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Mn-54 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Nb-95 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Organic Bound Tritium	Bq/kg	3	1	100%	3.0	-	-	-	-	4.0
Ru-103 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Ru-106 by gamma	Bq/kg	3	10	0%	5.0	-	-	-	-	5.0
Sb-124 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Sb-125 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0
Se-75 by gamma	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Strontium-90	Bq/kg	3	1	0%	0.5	-	-	-	-	0.5
Tritium	Bq/kg	3	7	100%	17.0	-	-	-	-	52.0
Zn-65 by gamma	Bq/kg	3	3	0%	1.5	-	-	-	-	1.5
Zr-95 by gamma	Bq/kg	3	2	0%	1.0	-	-	-	-	1.0

Note: all units on a wet weight basis.

B.3.6 Passive Tritium Data Tables

Table B.3.6-1: Maximum Concentrations of Tritium in Passive Tritium Air Samplers

Location	Units	N	Min	Number above MDL
T1	Bq/m^3	3	<0.84	0
T2	Bq/m^3	3	2.02	2
T3	Bq/m^3	3	<0.84	0
T4	Bq/m^3	3	<0.84	0
T5	Bq/m^3	3	<0.84	0

APPENDIX C
ECOLOGICAL RECEPTORS

C.1 SELECTION OF ECOLOGICAL RECEPTORS

C.2 ECOLOGICAL PROFILES

C.1 SELECTION OF ECOLOGICAL RECEPTORS

C.1.1 Preliminary Selection of Ecological Receptors

In order to compile a preliminary list of ecological receptors for the Darlington Nuclear Generating Station (DNGS) Site Environmental Assessment (EA), previous DN assessment reports were reviewed (ESG and ECOMATTERS 2001, SENES 2005, OPG 2002). The ecological receptors selected in these previous reports were compiled for consideration in the current ERA and are summarized in Table C-1.

TABLE C-1
ECOLOGICAL RECEPTORS SELECTED BASED ON PREVIOUS DN REPORTS

Ecological Receptors	EER (ESG and ECOMATTERS 2001)	Drainage Ditch SSRA (SENES 2005)	DUFDS EA (OPG 2002)[(c)]
Aquatic Organisms			
Aquatic Plants (i.e.Giant Bur-reed/Greenfruit Bur-reed[a])	✓	--[*]	✓
Benthic Invertebrates	✓	--[*]	✓
Emerald Shiner			✓
Round Whitefish	✓	--[*]	
Spottail Shiner	✓	--[*]	
White Sucker			✓
Birds and Mammals			
Bank Swallow	✓		✓
Mallard			✓
Pied-billed Grebe	✓		
Red-eyed Vireo			✓
Song Sparrow			✓
Yellow Warbler		✓	✓
Deer Mouse	✓	✓	✓
Eastern Cottontail		✓	
Meadow Vole		✓	✓
Raccoon		✓	
Red Fox		✓	
White-tailed Deer	✓	✓	
Insects and Invertebrates			
Butterflies	✓		
Dragonflies	✓		
Earthworms		✓	
Amphibians and Reptiles			
Green Frog			✓
Northern Leopard Frog	✓	✓	
Midland Painted Turtle	✓		✓
Terrestrial Vegetation			
Canada Bluejoint (grass)		✓[(b)]	
Sugar Maple	✓		✓

Note:
* - assessment of a drainage ditch thus aquatic receptors not applicable for this assessment
(a) - emergent wetland/fen plant species
(b) - representative of terrestrial vegetation
(c) - in addition to the ecological receptors listed in this table, the DUFDS EA also identified broader receptors such as "Old Field Meadows and Thickets" and "Shoreline Bluff and Valley Seepage Area" that have not been added to the table.

C.1.2 Secondary Selection of Ecological Receptors

Based on the information contained in both the Terrestrial and Aquatic Environment Technical Support Documents (TSDs), the list of ecological receptors as presented in Table C-1 was expanded to include other species that were found to frequent the DNGS Site. The species that were selected based on the TSDs are provided in Tables C-2 and C-3, along with the original list of species from Table C-1. It should be noted that the TSD documents were not used to rationalize exclusion of species from the original list.

TABLE C-2
SECONDARY SELECTION OF TERRESTRIAL AND RIPARIAN ECOLOGICAL RECEPTORS

Group	Ecological Receptor	Listed in Table C-1?	Additional Comments/Notes from TSD
Birds and Mammals	American Crow	N	Found throughout the Site.
	American Robin	N	Found throughout the Site.
	Bank Swallow	Y	Burrows found all along parts of the shoreline of the Site, >30% of which are within the area most likely to be affected by the Project (BE, 2008). Also a species of conservation concern.
	Bufflehead	N	Found at Coot's Pond and inshore environment; represents a diving duck.
	Mallard	Y	Found at Coot's Pond and inshore environment; represents a dabbling duck.
	Pied-billed Grebe	Y	Present for two consecutive years at Coots Pond; represents a diving duck.
	Red-eyed Vireo	Y	Present in treed areas of the Site
	Song Sparrow	Y	Present throughout the Site, except for forested and marshy areas.
	Yellow Warbler		Present throughout thickets and meadows; common insectivore.
	Deer Mouse	Y	Found throughout the Site in woody areas (containing shrubs and/or trees).
	Meadow Vole	Y	Found throughout the Site, are active year round and are one of the most important prey items for a wide range of predators.
	Eastern Cottontail	Y	Winter tracks show low level of activity at Site for a species commonly active in the winter.
	Muskrat	N	Found mostly at Coot's Pond and is the only common aquatic mammal on Site
	Raccoon	Y	Common at Site; mostly found south of railway.
	Red Fox	Y	Regular at the Site (winter tracks show a low level of activity for a species commonly active in winter); one den at the side of the security fence and one in the area of the information centre.
	White-tailed Deer	Y	Winter tracks show a low level of activity for a species commonly active in the winter. Present all year.
Insects and Invertebrates	Butterflies	Y	Site is a known butterfly stopover area.
	Dragonflies	Y	Man species have been attracted to the constructed and enhanced wetlands.
	Earthworms	Y	Found at any location with soil; important species in the food chain.
Amphibians and Reptiles	Green Frog	Y	Found in all ponds on the Site; important component of the wetland ecosystems of the Site.
	Northern Leopard Frog	Y	Found at Coot's Pond because of nearby extensive Cultural Meadow.
	Midland Painted Turtle	Y	Found at Coot's Pond but have also been seen recently at Treefrog Pond; has been successfully breeding in Coot's Pond.
Vegetation	Canada Bluejoint Grass	Y	Not assessed in TSD.
	Reed Canary Grass	N	Mostly in wet meadows.
	Sugar Maple	Y	One of the dominant species in the area; typical deciduous tree species and is an important element in woodland ecosystems of the Site.

TABLE C-3
SECONDARY SELECTION OF AQUATIC ECOLOGICAL RECEPTORS

Group	Ecological Receptor	Listed in Table C-1?	Additional Comments/Notes from TSD
Vegetation	Various (i.e. .Giant Bur-reed/Greenfruit Bur-reed)	Y	Only found in Coot's Pond; important component of the aquatic food chain
Insects and Invertebrates	Various	Y	Found in aquatic environments throughout Site; some benthos will be entrained; some habitat will be lost or altered; important component of the aquatic food chain.
Forage or Benthivorous Fish	Alewife	N	Dominant member of sparsely-populated Lake Ontario nearshore fish community; has been the basis of the Lake Ontario fish forage community for decades; typically one of the most impinged fish species.
	Emerald Shiner	Y	Found in forebay and Lake Ontario; numerically important nearshore schooling forage species; will be subject to mortality and habitat loss/alteration.
	Lake Sturgeon	N	Found in Lake Ontario and adjacent tributary mouths; species of conservation concern that is subject to recovery efforts in Lake Ontario.
	Northern Redbelly Dace	N	Found in large congregations in Coot's Pond; well adapted to beaver activity and are typical occupants of beaver ponds;
	Round Goby	N	Found in Lake Ontario; relevant for ecological food chains (consumes zebra mussels, is consumed by walleye)
	Round Whitefish	N	Potential thermal effects on nearshore spawning shoals; concern surrounding entrainment of eggs and larvae.
	Spottail Shiner	Y	Found in forebay and Lake Ontario; not assessed in TSD.
	White Sucker	Y	Dominant and important member of sparsely-populated Lake Ontario nearshore fish community; prominent species in impingement records at some stations; potentially affected by loss/alteration of nearshore habitat.
Predator Fish	Lake Trout	N	Most frequently captured salmonia in monitoring studies at the station; potential for spawning in the area; potential thermal effects (attraction to area leading to impingement/entrainment)

C.1.3 Final Selection of Ecological Receptors

The secondary list of ecological receptors (Tables C-2 and C-3) was refined to produce the final list of ecological receptors selected for analysis at the DN Site, as summarized in Table C-4. Transfer factors and toxicological reference values (TRVs) do not exist for many of the individual species presented in the preceding sections. In these instances, the individual species were grouped together and analyzed as one broad ecological receptor (i.e. all terrestrial trees and grasses are defined as 'terrestrial vegetation').

TABLE C-4
FINAL ECOLOGICAL RECEPTORS SELECTED FOR DNGS

Environmental Subcomponent	Ecological Receptor
Terrestrial Vegetation	Terrestrial Vegetation (various)[a]
Insects and Terrestrial Invertebrates	Earthworm, Insects (various) [b]
Birds and Waterfowl	American Crow
	American Robin
	Bank Swallow
	Bufflehead
	Mallard
	Pied-billed Grebe
	Red-eyed Vireo
	Song Sparrow
	Yellow Warbler
Mammals	Deer Mouse
	Eastern Cottontail
	Meadow Vole
	Muskrat
	Raccoon
	Red Fox
	Short-tailed Weasel
	White-tailed Deer
Amphibians and Reptiles	Amphibians and Reptiles (various)[c]
Benthic Invertebrates	Benthic Invertebrates (various)[d]
Aquatic Vegetation	Aquatic Plants (various)[e]
Fish	Forage Fish [f]
	Predator Fish [f]

Note:

a - TRVs and transfer factors are not available for individual species (i.e. Sugar Maple and Canada Bluejoint and Canary Reed Grasses) and so these ecological receptors are analyzed as 'Terrestrial Vegetation'.

b - The earthworm is selected as the representative invertebrate, while the broad category 'Insects' is used to represent all other insects on Site.

c - TRVs and transfer factors are not available for individual species (i.e. Green Frog and Northern Leopard Frog, Midland Painted Turtle) and so these ecological receptors are analyzed as 'Amphibians and Reptiles'.

d - TRVs and transfer factors are not available for individual species and so benthic invertebrates are analyzed as 'Benthic Invertebrates'.

e - TRVs and transfer factors are not available for individual species and so these ecological receptors are analyzed as 'Aquatic Plants' (i.e. Pond weed).

f - Individual fish species are analyzed as 'forage fish' or 'predator fish' as transfer factors and ecological receptors are not available for individual species. See Table C-3 for examples of fish species common to the Site.

C.2 ECOLOGICAL PROFILES

This section presents the ecological profiles for the ecological receptors presented in Section C.1.3, Table C-4, as selected for numerical analysis. Profiles are not presented for all species identified at the site if the species were grouped together as one broad ecological receptor category (i.e. individual fish species are grouped as either 'forage fish' or 'predator fish').

In the following sections, the following abbreviations are commonly used:
IR = inhalation rate
FIR = food ingestion rate
SIR = soil ingestion rate or sediment ingestion rate
WIR = water ingestion rate
Wt = body weight (in g or kg)

The following ecological profiles are presented in this section:

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C.2.1 Ecological Profile – Terrestrial Vegetation

As discussed in Section C.1, 'Terrestrial Vegetation' is a broad category which is used to represent all possible trees, plants and grasses present on the Site. This is because individual transfer factors and toxicological reference values may not be available for all species of vegetation. In the case of the DNGS, the ecological receptors represented by the Terrestrial Vegetation category are the Sugar maple (*Acer saccharum*), Reed canary grass (*Phalaris arundinacea*) and Canada blue-joint grass (*Calamagrostis canadensis*). Information pertaining to some of these species is presented below.

SUGAR MAPLE

The Sugar maple is native only to northeast North America including Ontario, Quebec and the Maritime Provinces, the New England States and westward through Ohio and Michigan. This slow growing tree can live to be many hundreds of years old. Sugar maple is soil-site specific in southerly regions but abundant on a wide variety of soils in the northern Lake States. Flowers appear between late March and mid-May, depending on the geographic location.

White tailed deer, moose, and snowshoe hare commonly browse sugar maple. Red squirrel, gray squirrel, and flying squirrels feed on the seeds, buds, twigs, and leaves. Songbirds, woodpeckers, and cavity nesters nest in sugar maple. Although the flowers appear to be wind-pollinated, the early-produced pollen may be important to the biology of bees and other pollen-dependent insects because many insects, especially bees, visit the flowers (USDA 2007).

REED CANARY GRASS

Reed canary grass is a vigorous, productive, long-lived, perennial, sod- forming grass. It is a widespread species native to North America, Europe, and Asia. The seed has a short storage life, up to five years. Reed canary grass has excellent frost tolerance and is well suited to wet soils that are poorly drained or subject to flooding. It also has good drought tolerance. Growth begins in early spring and continues through the growing season. Regrowth following mowing or grazing is rapid on fertile sites. This grass provides excellent nesting and escape cover and the shattered seeds are readily eaten by many species of birds (USDA 2007).

The wind-pollinated flowers attract few insects. Some insects and the caterpillars of the butterfly Northern Pearly Eye (*Enodia anthedon)* feed on the foliage of this grass. Muskrats feed on the foliage, rhizomes, and seedheads to a limited extent; young foliage is also palatable to cattle.

REFERENCES

United States Department of Agriculture (USDA). 2007. Natural Resources Conservation Services (NRCS). *Plant Guide: Jack Pine*. Retrieved from http://plants.usda.gov/plantguide/doc/pg_piba2.doc. Accessed on 24/9/2007.

C.2.2 Ecological Profile – Earthworm

A screening index is not calculated for the Earthworm. This ecological receptor is considered in the assessment only as a means to evaluate the intake of a chemical by other ecological receptors which subsist on insects as part of their diet (i.e. raccoons, various bird species).

GENERAL DESCRIPTION

The glacial ice sheets that covered nearly all of Canada about 15,000 years ago wiped out virtually all of the native North American earthworm species that may have lived here. The current earthworm population (approximately 20 species) was brought here by early Europeans. Earthworms can have positive effects on soil structure and fertility in agricultural and garden ecosystems, but they may not be beneficial in hardwood forests (Fox 2004, NRRI 2006).

Three major ecological groups of earthworm have been identified based on the feeding and burrowing behaviours of the different species (NRRI 2006):

- Epigeic: small (1-7 cm), feeds and lives in litter, does not burrow. Species found in the Great Lakes area include *Dendrobaena octaedra* and *Lumbricus rubellus*.
- Endogeic: small (2-12 cm), rich soil feeder, lives in top soil layer, extensive branching horizontal burrows. Species found in the Great Lakes area include *Aporrectodea caliginosa*, *Aporrectodea rosea* and *Octolasion tyrtaeum*.
- Anecic: large (adults are usually 12-20 cm), feeds in soil and litter, has extensive permanent vertical burrows up to 2m deep. In the Great Lakes region, there is only one anecic species of earthworm, the common night crawler (*Lumbricus terrestris*).

HABITAT

Earthworms live in the soil, but the types of soil they inhabit vary widely. As indicated above, some worm species occupy their place in the soil by moving vertically along permanent burrows (e.g. dew worm or night crawler). Other species such as *Aporrectodea* (garden worms) occupy the top soil layer and move horizontally. Fraser (2001) did not identify appreciable burrowing activity below 20 cm depth among three common earthworm species (epigeic and endogeic species). Other species such as the manure worm (*Eisenia foetida*) require soil with high carbon content (muck soils) or manures to survive (Tomlin 2006).

FEEDING HABITS

Earthworms derive their nutrition from many forms of organic matter in soil, such as decaying roots and leaves, and living organisms such as nematodes, protozoans, rotifers, bacteria and fungi. They also feed on the decomposing remains of other animals. In just one day they can consume up to one third of their own body weight. Earthworms respire through their skin, and therefore require humid conditions to prevent drying out. Like all invertebrates their body processes (i.e. metabolism) slow down with falling temperatures. They hibernate at near freezing temperature. They react to advancing colder winter weather by burrowing deep; most earthworms do not survive being frozen (Fox 2004). Cocoons generally survive through the winter.

REFERENCES

Fox, C. 2004. *FAQ – Earthworms.* Agriculture and Agri-Food Canada. Accessed September 24, 2007. Available at: http://res2.agr.ca/london/faq/earth-terre_e.htm#GENERAL_INFORMATION

Fraser, P.M. 2001. *Characteristics of Three Common Earthworm Species.* Australian Journal of Soil Research. Accessed September 24, 2007. Available at: http://www.wormdigest.org/index2.php?option=com_content&do_pdf=1&id=163

Natural Resources Research Institute (NRRI 2006). *Great Lakes Worm Watch.* University of Minnesota. Accessed September 24, 2007. Available at: http://www.nrri.umn.edu/worms/default.htm

Tomlin, A.D. 2006. *Earthworm Biology.* Pest Management Research Center. Agriculture & Agri-Food Canada. Accessed September 24, 2007. Available at: http://www.wormdigest.org/content/view/200/2/

C.2.3 Ecological Profile – Insects

As discussed in Section C.1, ‘Insects’ is a broad category which is used to represent all insects present on the Site (not the earthworm). A screening index is not calculated for insects; the measured concentrations in this ecological receptor are used to evaluate the intake of a chemical by other ecological receptors which subsist on insects as part of their diet (i.e. deer mouse, various bird species).

GENERAL DESCRIPTION

Insects such as grasshoppers, cicadas and crickets are a principal source of food for many birds. This family includes most of the brown or greyish grasshoppers that are so common in meadows and along roadsides from mid summer until fall. They are plant feeders, and can be destructive to vegetation. Most species pass the winter in the egg stage, the eggs being laid in the ground. There are six species of grasshoppers in northwestern Ontario, with one of the most common being the band winged grasshopper.

REFERENCES

Faculty of Forest and the Forest Environment. 2007. *Order Orthoptera*. Accessed from http://www.borealforest.org/insects/insects5.htm.

C.2.4 Ecological Profile – American Crow

GENERAL DESCRIPTION

The American crow (*Corvus brachyrhynchos*) is a black bird. The American crow prefers open areas with nearby trees. Agricultural and grassland areas are ideal habitat for crows to forage for their food. The American crow also uses nearby woodlots and forest edges for breeding and roosting. Nests are usually placed high in trees. Breeding populations north of southern Canada move south for winter (Parr 2005, NatureServe 2007, Cornell 2003).

SIZE

Reported average weights:

- 450 g (Parr 2005)
- 458 g (NatureServe 2007)
- 316 to 620 g (Cornell 2003)

Based on the above information a typical crow is expected to weigh approximately 450 g.

HOME RANGE

Spring-summer home range averages approximately 2.6 sq km (NatureServe 2007).

FEEDING HABITS

American crows are omnivorous and opportunistic; they will eat almost anything. During the breeding season, American crows consume insects, worms, fruits, grains, and nuts. They can prey on small animals such as frogs, mice, and young rabbits, although they more likely to scavenge carrion such as roadkill. However, carrion is only a very small part of its diet. They also are significant nest predators, preying on the eggs and nestlings of smaller birds. In the fall and winter they eat more nuts, such as walnuts and acorns. They forage mostly on the ground, pecking at the ground surface and digging through litter (Parr 2005, Cornell 2003).

Based on the available information the crow is assumed to consume terrestrial vegetation, worms and birds. Worms are used as a surrogate species for all insects. Terrestrial vegetation is used as a surrogate for seeds, fruits nuts and is assumed to represent 50% of the diet, while worms and birds represent 40% and 10%, respectively.

INTAKE RATES

Food
For the American crow, the FIR is described by the allometric equation for birds (U.S. EPA 1993):

$$FIR = 0.648\ Wt^{0.651}$$

Based on this equation and a body weight (Wt) of 450 g, the FIR is calculated to be 35 g (dw)/d, or 115 g (ww)/d, assuming a moisture content of 70%

Soil
A species-specific SIR was not available. Beyer *et al.* (1994) provides a percent composition of the total diet of 10.4% for the woodcock and 9.3% for the wild turkey. The average of these values, 9.9%, was used in lieu of species-specific data. Based on a dry weight FIR of 35 g/d, the SIR is 3.4 g/d.

Water
For the American crow, the WIR is described by the allometric equation for birds (U.S. EPA 1993):

$$WIR = 0.059\ Wt^{0.67}$$

Based on this equation and a body weight of 0.45 kg the WIR is 0.03 L/d.

Inhalation
For the American crow, the IR is described by the allometric equation for birds (U.S. EPA 1993):

$$IR = 0.4089\ Wt^{0.77}$$

Based on this equation and a body weight of 0.45 kg the IR is 0.2 m^3/d

Summary Table

Exposure Characteristics		
Body Weight (kg)	0.45	Parr 2005
Food Intake Rate (g (ww)/d)	115	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	3.4 0.03	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.03	U.S. EPA 1993 (allometric scaling)
Inhalation Rate (m^3/d)	0.2	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.5	Assumed (migratory)
Fractional Composition of Diet		
Terrestrial Vegetation	0.5	Parr 2005 and Cornell 2003
Worms	0.4	
Birds	0.1	

References

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife.* Journal of Wildlife Management 58:375-382.

Cornell 2003. *All About Birds. Bird Guide.* Cornell Lab of Ornithology. Accessed September 18, 2007 http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/

NatureServe. 2007. *NatureServe Explorer: An online encyclopedia of life*. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. 8 June (Accessed: September 17, 2007).

Parr, C. 2005. *Corvus brachyrhynchos* (On-line), Animal Diversity Web. Accessed September 17, 2007 at http://animaldiversity.ummz.umich.edu/site/accounts/information/Corvus_brachyrhynchos.html.

United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook.* EPA/600/R-93/187.

C.2.5 Ecological Profile – American Robin

GENERAL DESCRIPTION

The American robin (*Turdus migratorius*) is one of the best-known birds in North America. The American robin is in fact a thrush, not a robin, and is the largest thrush in North America. The American robin was originally a forest species, but it has adapted well to other areas. There are very few habitats, with the exception of marshes, in which the American robin will not nest. Access to fresh water, protected nesting sites, and productive foraging areas are important requirements for breeding robins. The American robin is located throughout most of the continental United States and Canada during the breeding season. Northern populations migrate, wintering in the southern half of the United States, Mexico and Central America (CWS 2005, U.S. EPA 1993, Dewey and Middlebrook 2001, Cornell 2003).

SIZE

Reported average weights:

- Approximately 77 g (CWS 2005)
- 77 g (Dewey and Middlebrook 2001, NatureServe 2007, Cornell 2003)
- Range of 77.3 to 86.2 g for adults from 3 studies; average is 80 g (U.S. EPA 1993)

Based on the above information a typical robin is expected to weigh approximately 77 g.

HOME RANGE

The territory size ranges from 0.11 to 0.42 ha with a foraging range of 0.15 to 0.81 during the summer (U.S. EPA 1993).

FEEDING HABITS

In general, earthworms and other invertebrates and insects (i.e. beetles, caterpillars) account for approximately 40% of the robin's diet, with the remainder of the diet comprising fruit. Chokecherries, barberries, and rowan berries are preferred, but the robin will also eat cherries, wine grapes, and tomatoes. In the months preceding and during the breeding season, robins feed mainly (greater than 90 percent volume) on invertebrates, while for the remainder of the year their diet consists primarily (over 80 to 99 percent by volume) of fruits. Young birds in the nest are fed mostly earthworms and beetle grubs (CWS 2005, U.S. EPA 1993, Dewey and Middlebrook 2001, Cornell 2003).

Based on the available information the robin is assumed to consume berries and worms (used as a surrogate for all insects). Berries are assumed to represent 60% of the diet and worms 40%.

INTAKE RATES

<u>*Food*</u>

The U.S. EPA (1993) provides a FIR range of 0.89 to 1.52 g (ww)/d/g body weight (average is 1.2 g (ww)/(g d)). Based on a body weight of 77 g the FIR is 93 g (ww)/d, or 19 g (dw)/d assuming a moisture content of 80% for earthworms and berries.

Alternatively, the FIR can be described by the allometric equation for birds (U.S. EPA 1993):

$$FIR = 0.648\ Wt^{0.651}$$

Based on this equation and a body weight (Wt) of 77g, the FIR is calculated to be 11g (dw)/d, or 55 g (ww)/d.

As a conservative estimate, the food consumption rate was taken to be 93 g (ww)/d.

Soil
A species-specific SIR was not available. Beyer *et al.* (1994) provides a percent composition of the total diet of 10.4% for the woodcock and 9.3% for the wild turkey. The average of these values, 9.9%, was used in lieu of species-specific data. Based on a dry weight-based FIR of 19 g/d, the SIR was calculated to be 1.9 g/d.

Water
The U.S. EPA (1993) provides a WIR of 0.14 g/d/g body weight. Based on a body weight of 77 g the WIR is 11 g/d, or 0.01 L/d.

Alternatively, the WIR is described by the allometric equation for birds (U.S. EPA 1993):

$$WIR = 0.059\ Wt^{0.67}$$

Based on this equation and a body weight 0.077 kg, the WIR is calculated to be 0.01 L/d.

Inhalation
For the American robin, the IR is described by the allometric equation for birds (U.S. EPA 1993):

$$IR = 0.4089\ Wt^{0.77}$$

Based on this equation and a body weight of 0.077 kg, the IR is calculated to be 0.06 m^3/d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.077	CWS 2005, Dewey and Middlebrook 2001, Cornell 2003
Food Intake Rate (g (ww)/d)	93	U.S. EPA 1993
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 1.9 0.02	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.01	U.S. EPA 1993
Inhalation Rate (m^3/d)	0.06	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.5	Assumed (migratory)
FRACTIONAL COMPOSITION OF DIET		
Berries (Terrestrial Vegetation)	0.6	CWS 2005, U.S. EPA 1993, Dewey and Middlebrook. 2001, Cornell 2003
Worms	0.4	

REFERENCES

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife.* Journal of Wildlife Management 58:375-382.

Canadian Wildlife Service (CWS) 2005. *Hinterland Who's Who. Bird Fact Sheet: American Robin.* Available at: http://www.ffdp.ca/hww2.asp?id=25

Cornell 2003. *All About Birds. Bird Guide.* Cornell Lab of Ornithology. Accessed September 24, 2007 http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/

Dewey, T. and C. Middlebrook. 2001. *Turdus migratorius* (On-line), Animal Diversity Web. Accessed September 24, 2007 at http://animaldiversity.ummz.umich.edu/site/accounts/information/Turdus_migratorius.html.

NatureServe. 2007. *NatureServe Explorer: An online encyclopedia of life*. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. 8 June (Accessed: September 24, 2007).

United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook.* EPA/600/R-93/187.

C.2.6 Ecological Profile – Bank Swallow

GENERAL DESCRIPTION

Bank swallows (*Riparia riparia*) spend most of their time at steep banks, lakeshore, bluffs and open areas, such as gravel pits. The best sites to find it are shorelines of Lake Erie, Lake Ontario Lake Huron and Detroit, St Lawrence and Ottawa rivers. It is a common migrant and breeder from May to September (Bezener 2000). Bank swallows nest in colonies in streamside banks across much of North America (Garrison 1999). Bank swallows prey exclusively on flying insects.

SIZE

Reported average weights:

- 15 g (NatureServe 2007)
- 10-19 g (Garrison 1999)

Based on the above information a typical Bank Swallow is expected to weigh approximately 15 g.

HOME RANGE

The majority of foraging flights are within 0.8 kilometres of the colony (NatureServe 2007).

FEEDING HABITS

The Bank swallow is an aerial invertivore, eating flying insects (e.g. beetles, mosquitoes and flies) (Cornell 2003, NatureServe 2007).

INTAKE RATES

Food

The FIR for the Bank swallow is described by the allometric equation for birds (U.S. EPA 1993):

$$FIR = 0.648\ Wt^{0.651}$$

Based on this equation and a body weight (Wt) of 15 g the FIR is calculated to be 3.8 g (dw)/d, or 12.6 g (ww)/d assuming a moisture content of ingested food of 70%.

Based on the above information the FIR was taken to be 12.6 g (ww)/d.

Soil

There is no specific information available regarding the soil ingestion by the Bank swallow or any other similar bird. Beyer *et al.* (1994) assumed an overall average soil intake of 5% of the diet for non soil/sediment dwelling birds. This is likely a conservative estimate for the Bank swallow when their feeding habits are considered.

Based on a dry weight consumption rate of 3.8 g/d, the SIR is calculated to be 0.2 g (dw)/d.

Water

The WIR for the Bank swallow is described by the allometric equation for birds (U.S. EPA 1993):

$$WIR = 0.059\ Wt^{0.67}$$

Based on this equation and a body weight of 0.015 kg, the WIR is calculated to be 0.004 L/d.

Inhalation

The IR for the Bank swallow is described by the allometric equation for birds (U.S. EPA 1993):

$$IR = 0.4089\ Wt^{0.77}$$

Based on this equation and a body weight of 0.015 kg, the IR is 0.02 m^3/d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.015	NatureServe 2007
Food Intake Rate (g (ww)/d)	13	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 0.2 0.015	Beyer *et al*. 1994
Water Intake Rate (L/d)	0.004	U.S. EPA 1993 (allometric scaling)
Inhalation Rate (m^3/d)	0.02	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.5	Assumed (migratory)
FRACTIONAL COMPOSITION OF DIET		
Insects	1	NatureServe 2007

REFERENCES

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

Bezener, A. 2000. *Birds of Ontario.* Lone Pine Publishing.

Cornell 2003. *All About Birds. Bird Guide.* Cornell Lab of Ornithology. Accessed September 24, 2007 http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/

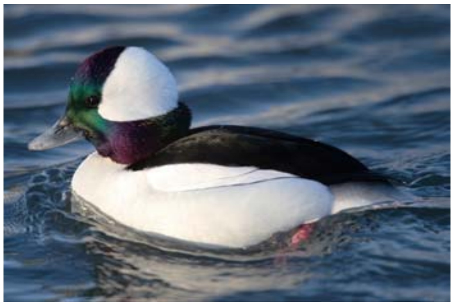
Garrison, B.A. 1998. Bank Swallow (*Riparia riparia*). In The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight.

Garrison, B. A. 1999. Bank Swallow (*Riparia riparia*). In The Birds of North America, No. 414 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA (As cited by Cornell 2003).

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life. Version 6.3. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. 29 October, Accessed: February, 2008.

United States Environmental Protection Agency (U.S. EPA) 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187.

C.2.7 Ecological Profile – Bufflehead



GENERAL DESCRIPTION

The Bufflehead *(Bucephala albeola*) is the smallest diving duck in North America. It breeds in ponds and small lakes in the boreal forest/taiga in northern North America, and winters in much of southern Canada and the United States. It nests in tree cavities.

SIZE

Reported average weights:

- 272-635 g (Cornell 2003)
- 473 g (NatureServe 2007)

Based on the above information, a typical Bufflehead is expected to weigh approximately 473 g (NatureServe 2007).

HOME RANGE:

No information is available on the home range of the Bufflehead.

FEEDING HABITS:

Buffleheads are herbivores and invertivores. In fresh water they feed on aquatic insects, snails, amphipods, small fishes, and some aquatic plants. They have also been known to feed on some seeds (Cornell 2003, NatureServe 2007).

Based on the available information for the Bufflehead, it has been assumed that the diet consists of benthic invertebrates (90%) and aquatic plants (10%).

INTAKE RATES

<u>*Food*</u>

To calculate the FIR of the Bufflehead, the allometric equation for birds (U.S. EPA 1993) can be used:

$$FIR = 0.648\ Wt^{0.651}$$

Based on this equation and a body weight (Wt) of 473 g, the FIR is calculated to be 36 g (dw)/d, or 179 g (ww)/d assuming a moisture content of 80%.

<u>*Sediment*</u>

Data on sediment ingestion by Bufflehead were not found. However, Beyer *et al.* (1994) provides an overall average intake of 11% of the diet for all bird species (including those with significant exposure to soil and sediment), which was used in this assessment. Based on a dry weight consumption rate of 36 g/d, the SIR is calculated to be approximately 3.9 g/d.

<u>*Water*</u>

The water ingestion rate for the Bufflehead can be calculated using the allometric equation for birds (U.S. EPA 1993):

$$WIR = 0.059\ Wt^{0.67}$$

Based on this equation and a body weight of 0.473 kg, the WIR is 0.04 L/d.

Inhalation

The inhalation rate for the Bufflehead can be calculated using the allometric equation for birds (U.S. EPA 1993):

$$IR = 0.4089\ Wt^{0.77}$$

Based on this equation and a body weight of 0.473 kg, the IR is 0.23 m^3/d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.473	Cornell 2003, NatureServe 2007
Food Intake Rate (g (ww)/d)	179	U.S. EPA 1993 (allometric scaling)
Sediment Ingestion Rate (g/d) Fraction of ww diet	 3.9 0.02	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.04	U.S. EPA 1993 (allometric scaling)
Inhalation Rate (m^3/d)	0.23	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.5	Assumed (migratory)
FRACTIONAL COMPOSITION OF DIET		
Benthic Invertebrates	0.9	NatureServe 2007, Cornell 2003
Aquatic Plants	0.1	

REFERENCES

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife*. Journal of Wildlife Management 58:375-382.

Cornell 2003. *All About Birds. Bird Guide*. Cornell Lab of Ornithology. Accessed January 11, 2008 http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/

NatureServe. 2007. *NatureServe Explorer: An online encyclopedia of life*. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. 8 June (Accessed: January 14, 2008).

United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook.* EPA/600/R-93/187.

C.2.8 Ecological Profile – Mallard

GENERAL DESCRIPTION

One of the most familiar of ducks, the mallard (*Anas platyrhynchos)* is found throughout North America. The mallard is a surface-feeding duck, known as a dabbling duck. It is generally found near shallow waters such as ponds and wetlands. Nests are established on the ground and may be located away from the waterbody. The mallard is the most extensively hunted duck in Canada, representing over 50% of all ducks killed (CWS 1996, Cornell 2003, Rogers 2001, NatureServe 2007)

SIZE

Reported average weights:

- Average adult is 1.24 kg (CWS 1996)
- Average adult is 1.082 kg (Rogers 2001)
- 1.0-1.3 kg (Cornell 2003)
- Ranges from 1.043 to 1.246 kg, average of 1.166 kg (U.S. EPA 1993)
- Average adult is 1.082 kg (CCME 1998)

Based on the above information, a typical mallard is expected to weigh approximately 1.082 kg (NatureServe 2007, CCME 1998).

HOME RANGE

Mallards have a breeding range of 111 ha with a total home range of approximately 524 ha (U.S. EPA 1993). In Manitoba, the nesting home range size averaged 283 hectares. The average breeding home range of radio-tagged birds in Minnesota was 210 to 240 hectares, with a range of 66 hectares to 760 hectares (NatureServe 2007).

FEEDING HABITS

The mallard feeds mostly on aquatic plants, seeds, and aquatic invertebrates. In winter, mallards feed primarily on seeds but also on invertebrates. In spring, there is a shift from a largely herbivorous diet to a diet of mainly invertebrates (U.S. EPA 1993, NatureServe 2007, Rogers 2001, Cornell 2003).

Since the diet of the mallard varies with the changing seasons, to characterize the diet of the mallard it was assumed that they frequent the Site more often in the summer months. Considering this point and the above-noted diet shift, it was assumed that the mallard diet is 75% benthic invertebrates and 25% aquatic vegetation.

INTAKE RATES

Food

The daily food consumption rate is 0.25 kg (ww)/d (CCME 1998; allometric calculation). The dry weight value can be taken as 50 g (dw)/d using a moisture content of 80%.

Alternatively, the FIR can be calculated using the allometric equation for birds (U.S. EPA 1993):

$$FIR = 0.648\ Wt^{0.651}$$

Based on the above equation and a body weight (Wt) of 1082 g the FIR can be calculated to be 61 g (dw)/d, or 306 g (ww)/d assuming a moisture content of 80%.

For this assessment the FIR was taken to be 250 g (ww)/d (50 g (dw)/d).

<u>Sediment</u>
Beyer *et al.* (1994) provides a sediment intake of 3.3% of the diet for the Mallard. It was noted that samples from most Mallards contained little or no sediment, but that 10% of the mallards consumed an estimated 26% sediment in their diet. Using the value of 3.3% and a dry weight FIR of 50 g/d, the SIR can be estimated at 1.7 g/d.

<u>Water</u>
The WIR for the Mallard can be calculated using the allometric equation for birds (U.S. EPA 1993):

$$WIR= 0.059\ Wt^{0.67}$$

Based on this equation and a body weight of 1.082 kg the WIR is 0.06 L/d.

<u>Inhalation</u>
The allometric equation for birds (U.S. EPA 1993) can be used to calculate the inhalation rate:

$$IR = 0.4089\ Wt^{0.77}$$

Using a body weight of 1.082 kg the IR is 0.43 m^3/d

<u>Summary Table</u>

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	1.082	NatureServe 2007, CCME 1998
Food Intake Rate (g (ww)/d)	250	CCME 1998
Sediment Ingestion Rate (g (dw)/d) Fraction of ww diet	 1.7 0.006	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.06	U.S. EPA 1993 (allometric scaling)
Inhalation rate (m^3/d)	0.43	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.5	Assumed (migratory)
FRACTIONAL COMPOSITION OF DIET		
Benthic Invertebrates	0.75	Based on information from U.S. EPA 1993, NatureServe 2007 and Cornell 2003
Aquatic Plants	0.25	

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C.2.9 Ecological Profile – Pied-billed Grebe

GENERAL DESCRIPTION

The Pied-billed grebe (*Podilymbus podiceps*) can be found near ponds, marshes and backwaters. It is considered to be a common migrant. The home range during the breeding season is usually quite small; with each pair of grebes defending up to about 114 metres of shoreline and associated waters (Palmer 1962). The average home range is 1.3 hectares (a circle with a diameter of approximately 130 metres) (NatureServe 2007). The grebe makes shallow dives and gleans the surface for aquatic invertebrates, small fish, adult amphibians and aquatic plants (Bezener 2000).

SIZE

Reported average weights:

- 253-568 g (Cornell 2003)450 g
- 253-568 g, average 460 g (Smith 2003)
- 442 g (NatureServe 2007)

Based on the above information, a typical Pied-billed grebe is expected to weigh 450g.

HOME RANGE

Home ranges during the breeding season are usually quite small, with each pair of grebes defending up to approximately 114 meters of shoreline and associated waters, where all activities take place (Palmer 1962). The average home range of the Pied-billed grebe is 1.3 hectares (a circle with a diameter of about 130 metres (NatureServe 2007).

FEEDING HABITS

The Pied-billed grebe is both an invertivore and a piscivore, eating mainly fishes, crustaceans, insects and invertebrates, as well as amphibians and some plant material (NatureServe, 2007). It makes shallow dives and gleans the surface for aquatic invertebrates, small fish, adult amphibians and aquatic plants (Bezener 2000). It has been assumed that the diet of the grebe is 50% fish and 50% invertebrates.

INTAKE RATES

Food

The allometric equation for birds (U.S. EPA 1993) can be used to calculate the food ingestion rate:

$$FIR = 0.648\ Wt^{0.651}$$

Based on this equation and a body weight (Wt) of 450 g the FIR is 35 g (dw)/d, or 173 g (ww)/d assuming a moisture content of 80%.

Sediment

Data on sediment ingestion by Pied-billed grebe were not found in the open literature. However, Beyer *et al.* (1994) provides a value of 2% of the diet for the ring-necked duck and blue winged teal. Since the dietary characteristics of these waterfowl are similar, this sediment intake was used to calculate a SIR of 0.7 g/d (based on a dry weight consumption rate of 35 g/d).

Water
The allometric equation for birds (U.S. EPA 1993) is used to calculate the water ingestion rate:

$$WIR = 0.059\ Wt^{0.67}$$

Based on a body weight of 0.450 kg the WIR is 0.03 L/d.

Inhalation
The allometric equation for birds (U.S. EPA 1993) is used to calculate the inhalation rate:

$$IR = 0.4089\ Wt^{0.77}$$

Based on this equation and a body weight of 0.450 kg the IR is 0.2 m^3/d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.450	Smith 2003
Food Intake Rate (g (ww)/d)	173	U.S. EPA 1993 (allometric scaling)
Sediment Ingestion Rate (g (dw)/d) Fraction of ww diet	 0.7 0.004	Beyer *et al*. 1994
Water Intake Rate (L/d)	0.03	U.S. EPA 1993 (allometric scaling)
Inhalation Rate (m^3/d)	0.2	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.5	Assumed (migratory)
FRACTIONAL COMPOSITION OF DIET		
Fish	0.5	Assumed based on NatureServe 2007 and Bezener 2000
Benthic Invertebrates	0.5	

REFERENCES

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Bezener, A. 2000. *Birds of Ontario.* Lone Pine Publishing.

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C.2.10 Ecological Profile – Red-eyed Vireo

GENERAL DESCRIPTION

The Red-eyed vireo (*Vireo olivaceus*) is one of the most common birds of the eastern forests of North America. It breeds in deciduous and mixed deciduous forests, and is more abundant in forest interior. It searches for prey while moving along branches, and then flies to search in new areas. The vireo kills larger prey by crushing or beating it against a branch. It holds its food with its foot while eating. Insects make up 85 percent of its summer diet (Cornell 2003). Red-eyed vireo can be found in urban areas and parks with large trees, in open deciduous (less frequently coniferous) forest (especially in those with sapling undergrowth), mixed forests with deciduous understory, second-growth woodland, scrub, thickets, gardens and mangroves (NatureServe 2007).

SIZE

Reported average weights:

- 12-26 g (Cornell 2003)
- 17 g (NatureServe 2007)

Based on the above information a typical Red-eyed vireo is expected to weigh 17g (NatureServe 2007).

HOME RANGE

The Red-eyed vireo most commonly remains in forest tracts of at least 15-20 ha, but may also remain in smaller patches of only a few hectares (NatureServe 2007).

FEEDING HABITS

The Red-eyed vireo is a mainly an insectivore, with a summer diet that is 85-90% insects, but it also eats small fruits and seeds. It forages in the tree canopy, gleaning insects from tall deciduous trees (Cornell 2003, NatureServe 2007).

Based on this information the Red-eyed vireo is assumed to consume 90% insects and 10% fruits.

INTAKE RATES

<u>Food</u>
For the vireo, the FIR is described by the allometric equation for birds (U.S. EPA 1993):

$$FIR = 0.648\ Wt^{0.651}$$

Based on this equation and a body weight (Wt) of 17 g, the FIR is calculated to be 4 g (dw)/d, or 14 g (ww)/d, assuming a moisture content of 70%.

<u>Soil</u>
There is no specific information available regarding soil ingestion by the vireo or any other similar birds. Beyer *et al.* (1994) assumed an overall average soil intake of 5% of the diet for non soil/sediment dwelling birds. This is likely a conservative estimate for the Red-eyed vireo considering its feeding habits.

Based on a dry weight consumption rate of 4 g/d, the SIR is calculated to be approximately 0.2 g (dw)/d.

Water

For the vireo, the WIR is described by the allometric equation for birds (U.S. EPA 1993):

$$WIR = 0.059\ Wt^{0.67}$$

Based on this equation and a body weight of 0.017 kg the WIR is 0.004 L/d.

Inhalation

For the vireo, the WIR is described by the allometric equation for birds (U.S. EPA 1993):

$$WIR = 0.059\ Wt^{0.67}$$

Based on this equation and a body weight of 0.017 kg the WIR is 0.02 m^3d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.017	NatureServe 2007
Food Intake Rate (g (ww)/d)	14	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 0.2 0.015	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.004	U.S. EPA 1993 (allometric scaling)
Inhalation Rate (m^3/d)	0.02	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.5	Assumed (migratory)
FRACTIONAL COMPOSITION OF DIET		
Insects	0.9	NatureServe 2007
Fruits (Terrestrial Vegetation)	0.1	

REFERENCES

Cornell 2003. *All About Birds. Bird Guide.* Cornell Lab of Ornithology. Accessed September 24, 2007 http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/

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United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook.* EPA/600/R-93/187.

C.2.11 Ecological Profile – Song Sparrow

GENERAL DESCRIPTION

The Song sparrow (*Melospiza melodia*), occurs throughout most of North America, with the highest population density in the midwestern Great Lakes region. This is one of the most common sparrows in North America and is highly variable geographically, with 39 recognized subspecies in North America and Mexico. Song sparrows are referred to as partially migratory. Permanent and summer residents inhabit breeding grounds. Song sparrows are usually found in open brushy habitats, mostly along the borders of ponds or streams, abandoned pastures, thickets or woodland edge. In winter you can find them in marshes, tall weedy fields, moist ravines and brush piles (Gomez 2000).

SIZE

Reported average weights:

- 12-53 g (Cornell 2003)
- 21 g (NatureServe 2007)
- 19.1 g (Gomez 2000)

Based on the above information the Song sparrow is assumed to have a body weight of 21g.

HOME RANGE

The breeding territory is usually less than 0.4 ha (NatureServe 2007).

FEEDING HABITS

Song sparrows are primarily herbivores and granivores, with their diet consisting mainly of seeds, grains, grass, berries and, on some occasions, insects. Especially during yolk formation, the female Song sparrow may consume insects or other invertebrates to supplement her diet (Cornell 2003, Gough *et al.* 1998, Gomez 2000).

Based on the above information, it was assumed that the Song sparrow eats grains/seeds (90%) and insects (10%).

INTAKE RATES

<u>*Food*</u>

The FIR of the Song sparrow can be described by the allometric equation for birds (U.S. EPA 1993):

$$FIR = 0.648\ Wt^{0.651}$$

Based on this equation and a body weight (Wt) of 21 g, the FIR is calculated to be 5 g (dw)/d, or 16 g (ww)/d assuming a moisture content of 70%.

<u>*Soil*</u>

There is no specific information available regarding soil ingestion by the Song sparrow or any other similar bird. Beyer *et al.* (1994) assumed an overall average soil intake of 5% of the diet for non soil/sediment dwelling birds. This is likely a conservative estimate for the Song sparrow considering its feeding habits.

Based on a dry weight consumption rate of 5 g/d, the SIR is calculated to be approximately 0.2 g (dw)/d.

Water
The WIR for the Song sparrow can be described by the allometric equation for birds (U.S. EPA 1993):

$$WIR = 0.059\ Wt^{0.67}$$

Based on this equation and a body weight of 0.021 kg, the WIR is calculated to be 0.004 L/d

Inhalation:
The inhalation rate for the Song sparrow can be described by the allometric equation for birds (U.S. EPA 1993):

$$IR = 0.4089\ Wt^{0.77}$$

Based on this equation and a body weight of 0.021 kg, the IR is calculated to be 0.02 m^3/d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.021	NatureServe 2007
Food Intake Rate (g (ww)/d)	16	U.S. EPA 1993
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 0.2 0.015	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.004	U.S. EPA 1993 (allometric scaling)
Inhalation Rate (m^3/d)	0.02	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.8	Assumed to be present April to October inclusive
FRACTIONAL COMPOSITION OF DIET		
Seeds (Terrestrial Vegetation)	0.9	NatureServe 2007, assumed
Insects	0.1	

REFERENCES

Cornell 2003. *All About Birds. Bird Guide.* Cornell Lab of Ornithology. Accessed September 24, 2007 http://www.birds.cornell.edu/AllAboutBirds/BirdGuide/

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C.2.12 Ecological Profile – Yellow Warbler

GENERAL DESCRIPTION

Yellow warblers (*Dendroica petechia*) are found throughout much of North America, including Alaska, northern Canada, and the northern two thirds of the United States. This songbird prefers moist habitats with high insect abundance. They seem to prefer areas of scattered trees, dense shrubbery, and any other moist, shady areas. The warbler is first and foremost an insect feeder but occasionally supplements the diet with some berries (Bachynski and Kadlec 2003). It is a migratory species.

SIZE

Reported average weights:

- 7-25 g (average 16 g) (Bachynski and Kadlec 2003)
- 10 g (NatureServe 2007)
- 9-11 g (Cornell 2003)

Based on the above information, the typical Yellow warbler is expected to weigh 10 g (Cornell 2003, NatureServe 2007).

HOME RANGE

Breeding territories of the Yellow warbler are as small as 0.16 ha (NatureServe 2007).

FEEDING HABITS

The Yellow warbler is largely an insectivore, feeding mainly on insects and arthropods but occasionally supplementing its diet with berries. It prefers small insect larvae and caterpillars (Bachynski and Kadlec 2003, Cornell 2003). Based on the above information it has been assumed to eat insects (90%) and berries (10%).

INTAKE RATES

Food

The allometric equation for birds (U.S. EPA 1993) can be used to calculate the FIR of the Yellow warbler:

$$FIR = 0.648\ Wt^{0.651}$$

Based on this equation and a body weight (Wt) of 10 g, the FIR is calculated to be 2.9 g (dw)/d, or 10 g (ww)/d assuming a moisture content of 70%.

Soil

There is no specific information available regarding soil ingestion by the Yellow warbler or any other similar bird. Beyer *et al.* (1994) assumed an overall average soil intake of 5% of the diet for non soil/sediment dwelling birds. This is likely a conservative estimate for the Warbler considering their feeding habits.

Based on a dry weight consumption rate of 2.9 g/d, the SIR is approximately 0.15 g (dw)/d.

Water
The water ingestion rate for the Yellow warbler can be calculated using the allometric equation for birds (U.S. EPA 1993):

$$WIR = 0.059\ Wt^{0.67}$$

Based on this equation and a body weight of 0.01 kg the WIR is 0.003 L/d.

Inhalation
The inhalation rate for the Yellow warbler can be calculated using the allometric equation for birds (U.S. EPA 1993):

$$IR = 0.4089\ Wt^{0.77}$$

Based on this equation and a body weight of 0.010 kg, the IR is 0.012 m^3/d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.010	Bachynski and Kadlec 2003, NatureServe 2007
Food Intake Rate (g (ww)/d)	10	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 0.15 0.015	Beyer *et al*. 1994
Water Intake Rate (L/d)	0.003	U.S. EPA 1993 (allometric scaling)
Inhalation Rate (m^3/d)	0. 012	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	0.5	Assumed (migratory)
FRACTIONAL COMPOSITION OF DIET		
Insects	0.9	Bachynski and Kadlec 2003, Cornell 2003 (assumed)
Berries (Terrestrial Vegetation)	0.1	

REFERENCES

Bachynski, K. and M. Kadlec. 2003. *Dendroica petechia* (On-line), Animal Diversity Web. Accessed at March 24, 2008, http://animaldiversity.ummz.umich.edu/site/accounts/information/Dendroica_petechia.html.

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United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook*. EPA/600/R-93/187.

C.2.13 Ecological Profile – Deer Mouse

GENERAL DESCRIPTION

The deer mouse (*Peromyscus maniculatus*) is primarily granivorous and has the widest geographic distribution of any *Peromyscus* species. It is common in nearly every dry-land habitat within its range, including alpine tundra, coniferous and deciduous forests, and grasslands as well as deserts. Deer mice inhabit nearly all types of dry-land habitats within their range, such as short-grass prairies, grass-sage communities, coastal sage scrub, sand dunes, wet prairies, upland mixed and cedar forests, deciduous forests, ponderosa pine and other coniferous forests, mixed deciduous-evergreen forests, juniper/piñon forests, and other habitats (U.S. EPA 1993).

SIZE

Reported average weights:

- Range of 14.8-22.3 g (average 19.6) from four studies (U.S. EPA, 1993):
    - 22 g and 20 g (average 21 g)
    - 15.7 g and 14.8 g (average 15.25 g)
    - 22.3 g and 21.1 g (average 21.7 g)
    - 19.6 g
- Range of 10-24 g (Bunker 2001)

Based on the above information, the average deer mouse is expected to weight 19.4 g (U.S. EPA, 1993).

HOME RANGE

The deer mouse remains in a territory of 242 to 3000 m^2 (Bunker 2001), with a range of 1 ha or less (NatureServe 2007).

FEEDING HABITS

Deer mice are omnivorous and highly opportunistic, which leads to substantial regional and seasonal variation in their diet. They eat principally seeds, insects and arthropods, some green vegetation, roots, fruits, and fungi as available (U.S. EPA 1993, Bunker 2001).

Based on the available information the deer mouse is assumed to consume terrestrial vegetation and seeds (50%) and insects (50%). It has been assumed that worms are a surrogate for insects.

INTAKE RATES

<u>*Food*</u>
The U.S. EPA (1993) provides 3 studies with mean food intake rates of non-breeding adults ranging from 0.18 to 0.22 g (ww)/g-d. Using an average of 0.19 g (ww)/g-d and a body weight of 19.4g, the FIR can be calculated as 3.7 g (ww)/d, or 1.1 g (dw)/d assuming a moisture content of 70%.

Alternatively, the allometric equation for mammals (U.S. EPA, 1993) can be used:

$$FIR = 0.235\ Wt^{0.822}$$

Based on a body weight (Wt) of 19.4 g, the FIR is calculated to be 2.7 g (dw)/d.

Based on the above information the food consumption rate was taken to be 3.7 g (ww)/d (U.S. EPA, 1993); however it is noted that this FIR from the specific feeding studies is lower than that calculated allometrically.

Soil
Beyer *et al.* (1994) estimated that the diet of the white-footed mouse is 2% soil. This value is appropriate for use for the deer mouse. Based on a dry weight consumption rate of 1.1 g/d, the SIR is approximately 0.02 g (dw)/d.

Water
A consumption rate of 0.19 g/d water ingestion per g body weight is provided by the U.S. EPA (1993). Using a body weight of 19.4 g, the estimated water intake is 0.004 L/d.

Inhalation
The deer mouse inhalation rate is provided by the U.S. EPA as 0.024 (m^3/day) (1993).

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.019	U.S. EPA, 1993.
Food Intake Rate (g (ww)/d)	3.7	U.S. EPA 1993
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 0.02 0.006	Beyer *et al*. 1994
Water Intake Rate (L/d)	0.004	U.S. EPA 1993
Inhalation Rate (m^3/d)	0.024	U.S. EPA 1993
Fraction of Time in Area	1	Assumed
FRACTIONAL COMPOSITION OF DIET		
Terrestrial Vegetation	0.5	U.S. EPA 1993
Worms	0.5	

REFERENCES

Beyer, W. N., E. Connor, and S. Gerould. 1994. *Survey of Soil Ingestion by Wildlife.* Journal of Wildlife Management 58:375-382.

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NatureServe. 2007. NatureServe *Explorer: An online encyclopedia of life*. Version 6.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. 8 June (Accessed: September 19, 2007).

United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook.* EPA/600/R-93/187.

C.2.14 Ecological Profile – Eastern Cottontail

General Description

The Eastern cottontail (*Sylvilagus floridanus*) is unique to the genus because of the large variety of habitats that it occupies, including glades and woodlands, deserts, swamps, prairies, hardwood forests, rain forests, and boreal forests. Open grassy areas generally are used for foraging at night, whereas dense, heavily covered areas are typically used for shelter during the day. During winter, cottontails rely more on woody vegetation for adequate cover (U.S. EPA 1993). The eastern cottontail is an herbivore, with the majority of its diet made up of complex carbohydrates and cellulose. The cottontail must reingest fecal pellets to reabsorb nutrients from its digested food. Their diet fluctuates with the seasons due to availability of food. In the summer, green plants are favoured. About 50% of the cottontail's intake is grasses, including bluegrass and wild rye. In the winter, the cottontail subsists on woody plant parts, including the twigs, bark and buds of oak, dogwood, sumac, maple and birch. As the snow accumulates, cottontails have access to the higher trunk and branches (Mikita 1999).

Size

Reported average weights:

- Mean ranges from 1,134 to 1,286 g from three studies (U.S. EPA, 1993):
  - 1,134 g and 1,244 g (average 1,189 g)
  - 1,176 g, 1,286 g, 1,197 g and 1,255 g (average 1,229 g)
  - 1,231 g
- Range of 0.80-1.53 kg (Mikita 1999)

Based on the above, the typical Eastern cottontail is assumed to weigh 1,216 g.

Home Range

Their home range is dependent on terrain and food supply. It is ranges from 5 to 8 acres, but increases during the breeding season (Mikita 1999). Three studies have provided home ranges (U.S. EPA 1993):

- 3.05 ha, 2.99 ha (average 3.02 ha)
- Male (3.2 ha, 7.2 ha, 7.8 ha, 3.1 ha); female (2.1 ha, 2.8 ha, 2.4 ha, 1.5 ha) (average 6 ha)
- Male (2.8 ha, 4.0 ha, 1.5 ha); female (1.7 ha, 0.8 ha) (average 2 ha)

Based on the above information the Cottontail's home range is 3.7 ha (U.S. EPA 1993).

Feeding Habits

The eastern cottontail is an herbivore. During the growing season, cottontails eat herbaceous plants (e.g., grasses, clover, alfalfa). During the winter in areas where herbaceous plants are not available, they consume woody vines, shrubs, and trees (e.g., birch, maple, apple) (U.S. EPA 1993). In general, this corresponds to 50% grass and 50% maple.

Intake Rates

<u>*Food*</u>

The allometric equation for mammals (U.S. EPA 1993) is used to calculate the FIR:

$$FIR = 0.235\ Wt^{0.822}$$

Based on a body weight (Wt) of 1,216 g the FIR is 81 g (dw)/d, or 269 g (ww)/d assuming a moisture content of 70%.

Soil
The U.S. EPA (1993) provides a soil intake of 6.3% of the diet. In lieu of more specific information, this value was used. Based on a dry weight consumption rate of 81 g/d this corresponds to a SIR of approximately 5 g/d.

Water
The Eastern cottontail water consumption rate is 0.0097 g/d/ g body weight (U.S. EPA 1993). Using a body weight of 1,216 g; the calculated WIR is 0.12 L/d.

Inhalation
The Eastern cottontail inhalation rate is given as 0.63 m^3/d (U.S. EPA 1993).

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	1.22	NatureServe 2007, U.S. EPA 1993, Mikita, K. 1999
Food Intake Rate (g (ww)/d)	269	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 5 0.019	U.S. EPA 1993
Water Intake Rate (L/d)	0.12	U.S. EPA 1993
Inhalation Rate (m^3/d)	0.63	U.S. EPA 1993
Fraction of Time in Area	1	Assumed
FRACTIONAL COMPOSITION OF DIET		
Terrestrial Vegetation	1	U.S. EPA 1993, assumed

REFERENCES

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C.2.15 Ecological Profile – Meadow Vole

GENERAL DESCRIPTION

Meadow vole (*Microtus pennsylvanicus*) can be found mainly in meadows, lowland fields, grassy marshes, and along rivers and lakes. They are also occasionally found in flooded marshes, high grasslands near water, and orchards or open woodland if grassy. Meadow voles feed mainly on the fresh grass, sedges, and herbs that are found locally within their range. Many predator species rely on voles to make up a significant portion of their diet, especially owls, small hawks and falcons. In addition, meadow voles consume large quantities of grass and recycle the nutrients held in the grass through their droppings. They also help to aerate and turn the soil through their digging activities (Neuburger 1999, NatureServe 2007).

SIZE

Reported average weights:

- 70 g (NatureServe 2007)
- 33g to 65 g (average 43.67 g) (Neuburger 1999)
- 24.3 g to 40 g from three studies (U.S. EPA 1993):
    - 24.3 g
    - 40 g to 33.4 g
    - 35.5 g to 39.0 g

Based on the above information, the typical meadow vole is assumed to weight 40 g.

HOME RANGE

The home range seldom exceeds 0.25 acres. Successful homing of 11 of 848 voles displaced 1.2 km indicates that dispersal distance is likely more than 1 km (NatureServe 2007).

FEEDING HABITS

The Meadow vole is an herbivore, with the diet consisting mainly of vegetable matter such as grasses, roots, dicot shoots and seeds. Meadow voles feed mainly on the fresh grass, sedges, and herbs that are found locally within their range. They will also eat a variety of seeds and grains (Neuburger 1999, U.S. EPA 1993).

Based on the available information the Meadow vole is assumed to consume terrestrial vegetation. In general, this corresponds to 100% grass.

INTAKE RATES

<u>*Food*</u>
A food consumption rate of 0.3-0.35 g (ww)/d/g body weight is provided by the U.S. EPA (1993). Using a body weight of 40 g, the total calculated food intake is 13 g (ww)/d, or 4 g (dw)/d using a moisture content of 70%.

<u>*Soil*</u>
Beyer *et al.* (1994) assumed the Meadow vole to have 2.4% of soil/sediment in its diet.
Based on a dry weight consumption rate of 4 g/d this corresponds to approximately 0.09 g (dw)/d.

Water
Meadow vole consume water at an average rate of 0.18 g/d/g body weight, with a range of 0.14 to 0.21 g/d/g body weight (U.S. EPA 1993). Using a body weight of 38 g the calculated WIR is 0.007 L/d.

Inhalation
Meadow vole inhale at a rate ranging from 0.044 to 0.052 m^3/d, with an average IR of 0.048 m^3/d (U.S. EPA 1993).

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.04	NatureServe 2007, U.S. EPA 1993, Neuburger 1999
Food Intake Rate (g (ww)/d)	13	U.S. EPA 1993
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 0.09 0.007	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.007	U.S. EPA 1993
Inhalation Rate (m^3/d)	0.048	U.S. EPA 1993
Fraction of Time in Area	1	Assumed
FRACTIONAL COMPOSITION OF DIET		
Terrestrial Vegetation	1	U.S. EPA 1993, assumed

REFERENCES

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C.2.16 Ecological Profile – Muskrat

GENERAL DESCRIPTION

The muskrat (*Ondatra zibethicus*) is a fairly large rodent commonly found in the wetlands and waterways of North America. They prefer fresh or brackish marshes, lakes, ponds, swamps, and other bodies of slow-moving water and are most abundant in areas with cattails. The water must be deep enough so that it will not freeze to the bottom during the winter, but shallow enough to permit growth of aquatic vegetation – generally between 1 and 2 m. In response to local conditions animals build either lodges or bank (CWS 1987, Newell 2000, NatureServe 2007, U.S. EPA 1993).

SIZE

Reported average weights:

- 1 kg, but this varies considerably in various parts of North America (CWS 1987)
- 680 to 1,800 g (average 1135.8 g) (Newell 2000)
- 1,816 g (NatureServe 2007)
- 1,174 g (range of 837 g (female) to 1,480 g (male) from four studies) (U.S. EPA 1993)

Based on the above information a typical muskrat is expected to weigh approximately 1.2 kg (U.S. EPA 1993).

HOME RANGE

The home range is relatively small. Seasonal home range varies from less than 0.1 ha to several hectares along linear waterways (NatureServe 2007). Muskrats have relatively small home ranges that vary in configuration depending on the aquatic habitat (U.S. EPA 1993).

FEEDING HABITS

The diet mainly consists of aquatic plants, particularly cattails, cordgrass, and bulrush. The muskrat may also eat crustaceans, molluscs and a large number of mussels in some areas. Muskrats build rooted feeding platforms. The roots and basal portions of aquatic plants make up most of the muskrat's diet, although shoots, bulbs, tubers, stems, and leaves also are eaten (CWS 1987, NatureServe 2007, Newell 2000, U.S. EPA 1993).

Based on the available information the muskrat is assumed to consume aquatic vegetation and benthic invertebrates (e.g. molluscs). The U.S. EPA (1993) summarizes three studies that show a breakdown of the diet; aquatic vegetation is the primary food source with other sources representing between 1 and 3% of the diet.

INTAKE RATES

<u>*Food*</u>

Muskrats consume about one-third of their body weight in food every day (Newell 2000). The U.S. EPA (1993) provides a food intake rate range from 0.26 to 0.34 g (ww)/d/g body weight, with an average of 0.3 g (ww)/(g d). Using a body weight of 1,200g, the FIR is 360 g (ww)/d, or 72 g (dw)/d assuming a moisture content of 80%.

Alternatively, the FIR can be calculated using the allometric equation for mammals (U.S. EPA 1993):

$$FIR = 0.235\ Wt^{0.822}$$

Based on a body weight (Wt) of 1,200 g the FIR is 80 g (dw)/d or 400 g (ww)/d.

Based on the above information the FIR was taken to be 360 g (ww)/d (72 g (dw)/d).

Sediment

Beyer *et al.* (1994) does not provide a value for muskrat therefore the value of 3.3% for mallard duck was used due to the similar diet pattern. Based on a dry weight consumption rate of 72 g/d, the SIR is approximately 2.4 g/d.

Water

The allometric equation for mammals (U.S. EPA 1993) can be used to calculate the WIR:

$$WIR = 0.099\ Wt^{0.9}$$

Based on the above equation and a body weight of 1.2 kg the WIR is 0.12 L/d.

Inhalation

The U.S. EPA (1993) provides an average inhalation rate of 0.59 m^3/d.

Alternatively, the allometric equation for mammals (U.S. EPA 1993) can be used:

$$IR = 0.5458\ Wt^{0.8}$$

Based on a body weight of 1.2 kg the IR is 0.6 m^3/d.

Based on the above information the inhalation rate was taken to be 0.6 m^3/d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	1.2	U.S. EPA 1993
Food Intake Rate (g (ww)/d)	360	U.S. EPA 1993
Sediment Ingestion Rate (g (dw)/d) Fraction of ww diet	 2.4 0.007	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.12	U.S. EPA 1993
Inhalation Rate (m^3/d)	0.6	U.S. EPA 1993
Fraction of Time in Area	1	Assumed
FRACTIONAL COMPOSITION OF DIET		
Aquatic Plants	0.98	U.S. EPA 1993
Benthic Invertebrates	0.02	

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C.2.17 Ecological Profile – Raccoon

GENERAL DESCRIPTION

The raccoon (*Procyon lotor*) is omnivorous and opportunistic. It is extremely adaptable, being found in many kinds of habitats. It lives easily near humans. They require ready access to water. Raccoons prefer to live in moist woodland areas. However, they can also be found in farmlands, suburban, and urban areas. Raccoons prefer to build dens in trees, but may also use woodchuck burrows, caves, mines, deserted buildings, barns, garages, rain sewers, or houses. Raccoons can live in a wide variety of habitats from warm, tropical areas to cold grasslands (Dewey and Fox 2001).

SIZE

Reported average weights:

- 3.7 kg to 6.8 kg from three studies (U.S. EPA 1993):
  - 7.6 kg, 6.4 kg, 6.0 kg, 5.1 kg, 4.8 kg (average 5.98 kg)
  - 6.76 kg, 5.74 kg (average 6.25 kg)
  - 4.31 kg, 3.67 kg (average 3.99 kg)
- 1.8 kg to 10.4 kg (average 6 kg) (Dewey and Fox 2001)

Based on the above information the typical raccoon is assumed to weigh 5.7 kg.

HOME RANGE

The reported home range for the raccoon varies from a few hectares to more than a few thousand hectares, although home ranges of a few hundred hectares appear to be most common. In rural agricultural areas of eastern North America, home ranges between 1 and 4 km^2 are common, whereas in prairie habitats, raccoons have used areas as large as 50 km^2 (Dewey and Fox 2001).

FEEDING HABITS

The raccoon is an omnivorous and opportunistic feeder. Raccoons feed primarily on fleshy fruits, nuts, acorns, and corn (U.S. EPA 1993) but also eat grains, insects, frogs, crayfish, eggs, and virtually any animal and vegetable matter. The U.S. EPA (1993) summarizes few studies that show a breakdown of their diet; Hamilton (1951) was the most representative study (only summer reported), with a diet breakdown of 15% fruit and berries, 10% mammals, 25% vegetation, 40% insects and 10% aquatic biota (which were taken to be benthic invertebrates).

INTAKE RATES

Food

The allometric equation for mammals (U.S. EPA 1993) can be used to calculate the FIR:

$$FIR = 0.235\ Wt^{0.822}$$

Based on this equation and a body weight (Wt) of 5,700 g the FIR is 287 g (dw)/d, or 958 g (ww)/d assuming an overall moisture content of 70%.

Soil
Beyer *et al.* (1994) estimate that the Raccoon ingests 9.4% soil. Based on a dry weight consumption rate of 287 g/d, the SIR is approximately 27 g/d.

Water
The Raccoon consumes water at a rate of 0.083 g/d/g body weight (U.S. EPA, 1993). Using a body weight of 5,700g, the calculated WIR is 0.47 L/d.

Inhalation
The Raccoon IR ranges from 2.17 to 2.47 m^3/d, with an average value of 2.32 m^3/d (U.S. EPA 1993).

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	5.7	U.S. EPA 1993
Food Intake Rate (g (ww)/d)	958	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 27 0.028	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.47	U.S. EPA 1993
Inhalation Rate (m^3/d)	2.32	U.S. EPA 1993
Fraction of Time in Area	1	Assumed
FRACTIONAL COMPOSITION OF DIET		
Insects	0.4	U.S. EPA 1993, assumed (Hamilton 1951)
Mammals (Mouse/Vole)	0.1	
Terrestrial Vegetation (including fruit)	0.4	
Benthic Invertebrates	0.1	

REFERENCES

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C.2.18 Ecological Profile – Red Fox

GENERAL DESCRIPTION

Red foxes (*Vulpes vulpes*) are present throughout the United States and Canada except in the southeast, extreme southwest, and parts of the central states. Red fox prey extensively on mice and voles but also feed on other small mammals, insects, game birds, poultry, and occasionally seeds, berries, and fruits. Each fox or family has a main underground den and one or more other burrows within the home range. Most dens are abandoned burrows of other species (e.g., woodchucks, badgers). Tunnels are up to 10 m in length and lead to a chamber 1 to 3 m below the surface. Pup-rearing dens are the focal point of fox activity during spring and early summer. Twelve subspecies are recognized in North America (U.S. EPA 1993).

SIZE

Reported average weights:

- 3 to 7 kg (Voigt 1987)
- 3.6 to 6.8 kg (Eder 2002)
- 6.8 kg (NatureServe 2007)
- 5.25 kg (male in spring), 4.13 kg (female in spring) (U.S. EPA 1993)

Based on the above information a typical red fox is expected to weigh 4.54 kg (U.S. EPA 1993).

HOME RANGE

The home range of individual adults range in size depending on the quality of the habitat. In areas of good habitat, the home range can be between 5 to 12 km^2. In areas of poorer habitat, the range can be between 20 and 50 km^2 (Animal Diversity Web 2009).

FEEDING HABITS

Foxes are primarily carnivorous, preying predominantly on small mammals, but they may also eat insects, fruits, berries, seeds, and nuts. Meadow voles are a major food in most areas of North America. Other common prey includes mice and rabbits (U.S. EPA 1993). Game birds (e.g., ring-necked pheasant and ruffed grouse) and waterfowl are seasonally important prey in some areas (U.S. EPA 1993). Plant material is most common in the diet in summer and fall when fruits, berries, and nuts become available.

Based on the available information the fox is assumed to consume birds (20%), small mammals (i.e. rabbit) (40%), rodents (25%) and plants (15%) (U.S. EPA 1993).

INTAKE RATES

<u>Food</u>

The Red fox consumes food at a rate of 0.069 g (ww)/d/g body weight (Sargeant 1978). Using a body weight of 4.54 kg, the total calculated FIR is 313 g (ww)/d (calculated from U.S. EPA 1993). Using a moisture content of 70%, this corresponds to an intake of 94 g (dw)/d.

<u>Soil</u>

Beyer *et al.* (1994) provides soil intake values of 2.8% of the diet for the Red fox. Based on a dry weight consumption rate of 94 g (dw)/d, this corresponds to 2.6 g (dw)/d.

Water

The allometric equation for mammals (U.S. EPA 1993) is used to calculate the WIR:

$$WIR = 0.099\ Wt^{0.9}$$

Based on a body weight of 4.54 kg the WIR is 0.4 L/d.

Inhalation

The allometric equation for mammals (U.S. EPA 1993) is used to calculate the inhalation rate:

$$IR = 0.5458\ Wt^{0.8}$$

Based on a body weight of 4.54 kg the IR is 1.8 m^3/d.

Summary Table

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	4.54	U.S. EPA, 1993
Food Intake Rate (g (ww)/d)	313	U.S. EPA 1993
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 2.6 0.008	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.4	U.S. EPA 1993 (allometric scaling)
Inhalation Rate (m^3/d)	1.8	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	1	Assumed
FRACTIONAL COMPOSITION OF DIET		
Birds	0.2	U.S. EPA 1993
Small Mammals (Rabbit)	0.4	
Rodents (Mouse/Vole)	0.25	
Terrestrial Vegetation	0.15	

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C.2.19 Ecological Profile – Short-tailed Weasel

GENERAL DESCRIPTION

Short-tailed weasel or ermine (*Mustela erminea*) are found in the north temperate regions of Eurasia and North America. Ermine prefer riparian woodlands, marshes, shrubby fencerows, and open areas adjacent to forests or shrub borders. Although ermine are primarily terrestrial, they climb trees and swim well. Tree roots, hollow logs, stone walls, and rodent burrows are used as dens. Dens are usually around 300 mm below ground. Ermine line their nests with dry vegetation, and fur and feathers from prey. Side cavities of burrows are used as food caches and latrines (Loso 1999).

SIZE

Reported average weights:

- 25 g to 116 g (Lose 1999)
- 182 g (NatureServe 2007)

Based on the above, the typical Weasel is expected to weight 182 g (NatureServe 2007).

HOME RANGE

Home range averaged 20-25 ha for males, smaller for females (1 to 7 ha) (NatureServe 2007).

FEEDING HABITS

Short-tailed weasel are carnivores and they eat mainly small mammals, and occasionally other small vertebrates and insects (NatureServe 2007). They are specialist predators of small, warm-blooded vertebrates, preferably mammals of rabbit size and smaller. When mammalian prey is scarce, they eat birds, eggs, frogs, fish, and insects (Loso1999).

Based on the available information the Short-tailed weasel is assumed to consume 100% small mammals.

INTAKE RATES

Food
The allometric equation for mammals (U.S. EPA 1993) can be used:

$$FIR = 0.235\ Wt^{0.822}$$

Based on a body weight (Wt) of 182 g the FIR is 17 g (dw)/d, or 56 g (ww)/d using a moisture content of 70%.

Soil
Beyer *et al.* (1994) does not provide a value for Short-tailed weasel therefore an average value for small mammals of 5% was used. Based on a dry weight FIR of 17 g/d, the SIR is approximately 0.8 g (dw)/d.

<u>Water</u>
The allometric equation for mammals (U.S. EPA 1993) can be used:

$$WIR = 0.099\ Wt^{0.9}$$

Based on this equation and a body weight of 0.18 kg the WIR is 0.02 L/d.

<u>Inhalation</u>
The allometric equation for mammals (U.S. EPA 1993) can be used:

$$IR = 0.5458\ Wt^{0.8}$$

Based on a body weight of 0.18 kg the IR is 0.14 m^3/d.

<u>Summary Table</u>

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	0.18	NatureServe 2007, U.S. EPA 1993, Neuburger 1999
Food Intake Rate (g (ww)/d)	56	U.S. EPA 1993
Soil Ingestion Rate (g (dw)/d) Fraction of ww diet	 0.8 0.007	Beyer *et al.* 1994
Water Intake Rate (L/d)	0.02	U.S. EPA 1993
Inhalation Rate (m^3/d)	0.14	U.S. EPA 1993
Fraction of Time in Area	1	Assumed
FRACTIONAL COMPOSITION OF DIET		
Small Mammals (Mouse/Vole)	1	NatureServe 2007, assumed

REFERENCES

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United States Environmental Protection Agency (U.S. EPA) 1993. *Wildlife Exposure Factors Handbook.* EPA/600/R-93/187.

C.2.20 Ecological Profile – White-tailed Deer

GENERAL DESCRIPTION

The White-tailed deer (*Odocoileus virginianus*) is common through most of North America. Almost any forested or bushy area provides suitable habitat for White-tailed deer during the summer, but in northern areas as snow deepens the deer concentrate in "deer yards," or areas that provide food and shelter from storms and deep snow. The White tailed deer is a ruminant. The antlers of the mature male consist of a forward curving main beam from which single points project upward and often slightly inward (CWS 1990).

SIZE

Full grown male deer frequently exceed 1 m at shoulder height and 110 kg in weight, with exceptional individuals weighing up to 200 kg in the northern part of their range (CWS 1990).

Reported average weights:

- 68 to 141 kg (males), 41 to 96 kg (females) (eNature 2005)
- 57 to 137 kg (Dewey 2003)
- 135 kg (NatureServe 2007)

Based on the above information a typical deer is expected to weigh 110 kg (CWS 1990).

HOME RANGE

Sometimes the move from summer to winter range requires travelling many kilometres (CWS 1990). Their home ranges are generally small, often a square kilometre or less (Dewey 2003). Typically the home range of 16 to 120 ha varies with conditions, and is smallest in summer. Annual home range of sedentary population averages 59 to 520 ha (NatureServe 2007).

FEEDING HABITS

White-tailed deer feed on a variety of vegetation, depending on what is available in their habitat. In northern areas, during the spring and summer the White-tailed deer's diet consists of leafy material from a variety of woody plants, grasses, herbs, and forbs. They also consume mushrooms and berries. Even in winter White-tailed deer consume green forage where available. In colder weather, the deer depend largely on the twigs and buds that are within their reach. Even in areas with relatively high food concentrations for winter have a limited food supply. When snow is deeper than 40 cm, deer find it increasingly difficult to move about freely (CWS 1990, NatureServe 2007, Dewey 2003).

Based on the available information the deer is assumed to consume terrestrial vegetation (100%). This is likely to comprise primarily browse in the winter and primarily forage in the summer.

INTAKE RATES

<u>*Food*</u>

The White-tailed deer eats 5 to 9 pounds (2.25 to 4 kg) of food per day (eNature 2005).

The food ingestion rate can be calculated using the allometric equation for mammals (U.S. EPA 1993):

$$FIR = 0.235\ Wt^{0.822}$$

Based on a body weight (Wt) of 110 kg the FIR is 3,270 g (dw)/d, or 10,900 g (ww)/d using a moisture content of 70%.

Based on the above information the FIR rate was taken to be 10.9 kg (ww)/d.

<u>*Soil*</u>
Beyer *et al.* (1994) provides a soil intake value of less than 2% of the diet for the White tailed deer. Based on a dry weight FIR of 3,270 g/d the SIR is approximately 66 g/d.

<u>*Water*</u>
The allometric equation for mammals (U.S. EPA 1993) can be used:

$$WIR = 0.099\ Wt^{0.9}$$

Based on a body weight of 110 kg the WIR is 6.8 L/d.

<u>*Inhalation*</u>
The allometric equation for mammals (U.S. EPA 1993) can be used:

$$IR = 0.5458\ Wt^{0.8}$$

Based on a body weight of 110 kg the IR is 23 m^3/d.

<u>*Summary Table*</u>

EXPOSURE CHARACTERISTICS		
Body Weight (kg)	110	CWS 1990
Food Intake Rate (g (ww)/d)	10900	U.S. EPA 1993 (allometric scaling)
Water Intake Rate (L/d)	6.8	U.S. EPA 1993 (allometric scaling)
Soil Ingestion Rate (g (dw)/d) Fraction of ww Diet	 66 0.006	Beyer *et al.* 1994
Inhalation Rate (m^3/d)	23	U.S. EPA 1993 (allometric scaling)
Fraction of Time in Area	1	Assumed
FRACTIONAL COMPOSITION OF DIET		
Terrestrial Vegetation	1	CWS 1990

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C.2.21 Ecological Profile – Amphibians and Reptiles

As discussed in Section C.1, 'Amphibians and Reptiles' is a broad category which is used to represent all possible frogs, snakes, turtles, etc. that are expected to be present on the Site. This is because individual transfer factors and toxicological reference values may not be available for all VECs. In the case of the DNGS, the VECs represented by the Terrestrial Vegetation category are the Green frog (*Rana clamitans*), the Northern leopard frog (*Rana pipiens*) and the Midland painted turtle (*Chrysemys picta*). Information pertaining to some of these species is presented below.

GREEN FROG

Green frogs are native only to the Nearctic region. They are found in the United States and Canada from Maine and the Maritime provinces of Canada through the Great Lakes region and into western Ontario and Oklahoma, south to eastern Texas, east into northern Florida and extending up the entire east coast of the United States. A typical body weight of the frog is 47 g (U.S. EPA 1993). Green frogs are primarily insectivores, eating a wide variety of insects and other invertebrates from both land and water. They also eat other vertebrates, such as small snakes and frogs (Gillilland 2000).

NORTHERN LEOPARD FROG

The Northern leopard frog is a medium-sized green or brown frog with distinctive dark spots ringed with paler "halos." The frogs have large hind legs with dark bars, pale underparts, and prominent dorsolateral ridges that are paler than the back. This species was once quite common through parts of western Canada until declines started occurring during the 1970s. Many populations of Northern leopard frogs have not yet recovered from these declines (BC MOE 2007). Leopard frogs are usually found in moist habitats along the edges of streams, springs, ponds and lakes. They like clear clean water in open or lightly wooded areas and rarely occur in dense forest (ASRD 2002). They feed primarily on insects and invertebrates, and the adults will often eat other small frogs.

MIDLAND PAINTED TURTLE

The Painted turtle is largely aquatic, living in shallow-water (U.S. EPA 1993). They are one of the most common turtles in North America. Painted turtles prefer living in freshwater that is quiet, shallow, and has a thick layer of mud. Painted turtles bask in large groups on logs, fallen trees, and other objects. In many areas turtles hibernate during the winter months by burrowing into the mud and allowing their bodies to become very cold. Painted turtles feed mainly on plants, small animals, such as fish, crustaceans, aquatic insects, and some carrion (Knipper 2002).

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C.2.22 Ecological Profile – Benthic Invertebrates

As discussed in Section C.1, 'Benthic Invertebrates' is a broad category which is used to represent all insects and invertebrates which may be present in and around the water environments throughout and around the Site. This is because individual transfer factors and toxicological reference values may not be available for all VECs.

GENERAL DESCRIPTION

Freshwater benthic invertebrates, or "benthos", are animal without a spinal column. The benthos include crustaceans such as crayfish, molluscs such as clams and snails, aquatic worms and the immature forms of aquatic insects such as stonefly and mayfly nymphs. These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life.

Many species of benthos are able to move around and expand their distribution by drifting with currents to a new location during the aquatic phase of their life or by flying to a new stream during their terrestrial phase. Most benthic species can be found throughout the year, but the largest numbers occur in the spring just before the reproductive period. In colder months, many species burrow deep within the mud or remain inactive on rock surfaces.

FEEDING HABITS

Many invertebrates feed on algae and bacteria. Some shred and eat leaves and other organic matter that enters the water. Benthos are an important part of the food chain, especially for fish.

REFERENCES

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C.2.23 Ecological Profile – Aquatic Plants (Pond Weed)

As discussed in Section C.1, 'Aquatic Vegetation' is a broad category which is used to represent all possible plants which may be present in the various water environments throughout and around the Site. This is because individual transfer factors and toxicological reference values may not be available for all VECs. The Pond weed is used to represent all aquatic vegetation for the DNGS.

GENERAL DESCRIPTION

Pond weed (*Elodea canadensis*) is a common underwater perennial plant, which sometimes occurs as tangled masses in lakes, ponds, and ditches. Individual plants within each species vary in appearance depending on growing conditions. Some are bushy and robust, while others have few leaves and weak stems (Aquatic Weed Control LLC 2007). The pond weed is an underwater plant, with the exception of small white flowers which bloom at the surface and are attached to the plant by delicate stalks. Silty sediments and water rich in nutrients favour the growth of pond weed in nutrient-rich lakes. However, the plant will grow in a wide range of conditions, from very shallow to deep water, and in many sediment types. It can even continue to grow unrooted, as floating fragments. It is found throughout temperate North America, where it is one of the most common aquatic plants (Wikipedia 2007).

FAUNAL ASSOCIATIONS

Pond weed provides food and habitat for fish, waterfowl and other wildlife (e.g. American beaver and muskrat). It is also used in cool water aquariums (Aquatic Weed Control LLC. 2007).

REFERENCES

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C.2.24 Ecological Profile – Forage and Benthivorous Fish

As discussed in Section C.1, 'Forage and Benthivorous Fish' is a broad category which is used to represent all fish which feed on insects, invertebrates and aquatic plants, that are expected to be present in the various water environments in and around the Site. This is because individual transfer factors and toxicological reference values may not be available for all VECs. In the case of the DNGS, the VECs represented by the Forage Fish category are the Spottail shiner (*Notropis umbratilis*), Emerald Shiner (*Notropis atherinoides*), Round goby (*Neogobius melanostomus*), Northern redbelly dace (*Chrosomuseos Cope*), Alewife (*Alosa pseudoharengus*), White sucker (*Catostomus commersonii*), Lake sturgeon (*Acipenser fulvescens*), Round Whitefish (*Prosopium cylindraceum*) and Walleye (*Sander vitreus*). Information pertaining to some of these species is presented below.

NORTHERN REDBELLY DACE

Northern redbelly dace is a freshwater fish in the minnow (Cyprinidae) family. This fish are typically black olive to dark brown in colour, with a "belly" below is midlateral band that could be silvery, cream, yellow or brilliant red, depending on gender and proximity to spawning. In Canada, it has been observed in the Atlantic provinces (Nova Scotia, New Brunswick and Prince Edward Island), throughout Quebec and Ontario, parts of the Prairies and British Columbia and in the Northwest Territories. It is typically found in small boggy lakes, creeks (or quiet, pool-like expansions of streams), bog ponds and beaver ponds (Scott and Crossman 1998). The Northern redbelly dace is most abundant in slightly-acidic, tea-coloured waters in Eastern Canada. Spawning typically takes place in the spring or early summer (Scott and Crossman 1998). Northern redbelly dace are mainly herbivorous. The diet of this fish consists mainly of algae (such as diatoms and filamentous algae) and also includes zooplankton and aquatic insects. Northern redbelly dace are considered forage fish; likely predators include trout, other fishes, kingfishers and mergansers (Scott and Crossman 1998).

ROUND WHITEFISH

Round whitefish is a freshwater species of fish that is found in all the Great Lakes but Lake Erie (University of Wisconsin 2002). They are cigar-shaped with a strongly forked tail, short head, small mouth devoid of teeth, and a laterally "pinched" snout which projects beyond the lower jaw. Large, easily loosened scales cover their dark brown olive-green above and silvery below bodies (Environment Yukon 2007). They inhabit shallow areas of lakes and clear streams, rarely entering brackish water, also in rivers with swift current and stony bottom. Migration is limited to movements associated with spawning (Froese and Pauly 2007). They are pelagic and bottom feeders, feeding mostly on invertebrates such as crustaceans and insect larvae, as well as fish eggs (Froese and Pauly 2007).

WHITE SUCKER

The white sucker is a torpedo-shaped fish distinguished by its sucker-like mouth. During spawning, the darkness on the back intensifies and the body becomes more golden in colour (Nova Scotia Fisheries and Aquaculture 2007). The White sucker is a North American species found in freshwater lakes and streams from Labrador south to Georgia, west to Colorado and north through Alberta and British Columbia to the MacKenzie River delta (Nova Scotia Fisheries and Aquaculture 2007). It inhabits a wide range of habitats, from rocky pools and riffles of headwaters to large lakes (Froese 2007). The white sucker is a bottom feeding fish and spends most of its time in shallow, warm waters. In bays, estuaries and tributary rivers, it makes its home in holes and areas around windfalls or other underwater obstructions (Michigan Department of Natural Resources 2007). Fry (1.2 cm in length) feed on plankton and other small invertebrates; bottom feeding commences upon reaching a length of 1.6-1.8 cm. Preyed upon by birds, fishes, lamprey, and mammals. Flesh is white, flaky, and sweet (Froese 2007).

REFERENCES

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C.2.25 Ecological Profile – Predator Fish

As discussed in Section C.1, 'Predator Fish' is a broad category which is used to represent all fish which feed on insects, invertebrates, aquatic plants and other fish, that are expected to be present in the various water environments in and around the Site. This is because individual transfer factors and toxicological reference values may not be available for all VECs. In the case of the DN site, the only VEC represented by the Predator Fish category is the Lake trout.

The Lake trout (*Salvelinus namaycush*) is a freshwater char with a deeply forked tail. It is found mainly in deep lakes in northern North America, requiring cold, oxygen-rich water for survival such as Lake Ontario, Lake Huron, Lake Superior, and across the deep cold lakes of the Canadian Shield. When in lakes which undergo a period of summer stratification (period of abundant aquatic vegetation growth), the Lake trout are more planktivorous and feed mostly on the aquatic plants. During cooler months, or in lakes which do not contain deep water forage, the Trout become more piscivorous.

APPENDIX D

SCREENING FOR CONSTITUENTS OF POTENTIAL CONCERN

LIST OF TABLES

Page No.

D.1 PRELIMINARY SELECTION OF COPC

The Constituents of Potential Concern (COPC) identified in previous studies are summarized in Table D.1-1. These were considered in the development of the COPC for the NND in the existing environment. However, a screening process was used to select the COPC for the Ecological Risk Assessment as detailed in the following sections.

Table D.1-1 COPC Considered in Available DN Reports

Constituent	EER (ESG and ECOMATTERS 2001)		DUFDS EA (OPG 2002)	Drainage Ditch SSRA (SENES 2005)
Atmospheric				
Non-Radionuclides				
NOx	Combustion Turbine Units	✓		
SO_2	Combustion Turbine Units	✓		
CO_2	Combustion Turbine Units	✓		
Ammonia	Power house stacks	✓		
Hydrazine	Power house stacks	✓		
Ozone-depleting substances	Power house stacks	✓		
Sulphur hexafluoride	Reactor stacks	✓		
Helium	Reactor stacks	✓		
Hydrogen	Reactor stacks	✓		
Carbon dioxide	Reactor stacks	✓		
Nitrogen	Reactor stacks	✓		
Oxygen	Reactor stacks	✓		
Radionuclides				
Gaseous C-14	Reactor stacks	✓		
Tritium oxide	Reactor stacks	✓	✓	
Tritium (elemental)	Reactor stacks	✓		
Noble gases	Reactor stacks	✓		
Iodine-131	Reactor stacks	✓		
Particulates	Reactor stacks	✓	✓	
External Gamma Rate			✓	
Kr-85 (b)			✓(b)	
Cs-137				
Aquatic				
Non-Radionuclides				
Hydrazine	CCW	✓		
Ammonia and ammonium	STP	✓		
BOD	STP	✓		
Chlorine	CCW	✓		
Iron	Storm water runoff (various)	✓		
Oil and grease	Oil water separator, STP, storm water runoff (various)	✓		
Phosphorus	STP	✓		
TSS	STP, landfill pond, stormwater runoff (various)	✓		

Table D.1-1 COPC Considered in Available DN Reports

Constituent	**EER (ESG and ECOMATTERS 2001)**		**DUFDS EA (OPG 2002)**	**Drainage Ditch SSRA (SENES 2005)**
Road Salt	Storm water runoff (2 locations)	✓		
Boron				✓
Zinc				✓
Chromium				
Total Metals in Water (by ICPMS)				✓
Radionuclides				
C-14	CCW	✓		
Tritium oxide	CCW	✓		
Tritium			✓	
Gross Beta/Gamma	CCW	✓		
Cs-134			✓	
Cs-137			✓	
Co-60			✓	
K-40			✓	
Precipitation				
Radionuclides				
Tritium			✓	
Sediment				
Radionuclides				
Cs-134			✓	
Cs-137			✓	
Co-60			✓	
K-40			✓	
Tritium			✓	
Fish				
Radionuclides				
Tritium			✓	
C-14			✓	
Cs-134			✓	
Cs-137			✓	
K-40			✓	
Vegetation				
Non-Radionuclides				
Boron				✓
Zinc				✓
Radionuclides				
Tritium in free water			✓(a)	
Small Mammals				
Radionuclides				
Tritium in free water			✓	
OBT			✓	
Gamma (incl. Cs-137, Co-60, K-40)			✓	
C-14			✓	
Groundwater				

Table D.1-1 COPC Considered in Available DN Reports

Constituent	EER (ESG and ECOMATTERS 2001)		DUFDS EA (OPG 2002)	Drainage Ditch SSRA (SENES 2005)
Radionuclides				
Tritium			✓	
Co-60			✓	
Cs-134			✓	
Cs-137			✓	
C-14			✓	
Soil				
Non-Radionuclides				
Boron				✓
Zinc				✓
Total Metals in Soil (by ICP)				✓
Radionuclides				
Co-60			✓	
Cs-134			✓	
Cs-137			✓	

Notes:

(a) Measured in DUFDS EA, because the tritium concentration in free water in vegetation is expected to reflect the tritium concentration of water in air or precipitation.

(b) Released during a postulated accident related to dry storage container.

D.2 SELECTION OF COPC

The primary media considered in the development of the COPC list for the NND were the surface water, sediment and soil monitoring data collected during the baseline monitoring programs (data summarized in Appendix B) for the NND. The results of the analysis conducted in the ESG 2001 assessment, and the new monitoring data collected for the NND Project were consolidated and used in the COPC selection process.

Seven radionuclides were selected to be used in the risk assessment due to their prevalence in the environment, historical concerns regarding environmental concentrations and relevance to nuclear power generation. These radionuclides were C-14, H-3, Sr-90, Co-60, Cs-134, Cs-137 and I-131.

Figure 4.1-1 of the main document illustrates the COPC screening process for non-radionuclides. In short, the screening process involves the following steps:

1. Comparison to available regulatory criteria; and
2. Comparison to background.

If the reasonable maximum constituent concentration is below criteria and background, the constituent is not considered further. Constituents selected as COPC either exceed criteria or do not have any criteria and exceed background. For the constituents that not have criteria an additional step was undertaken to check for toxicity data since a quantitative evaluation cannot be carried out in the absence of toxicity data.

Tables D.2-1 though D.2-3 provide the criteria used to screen the non-radiological constituents for surface water, sediment and soil, respectively. Surface water criteria were obtained from the Canadian Council of the Ministers of the Environment (CCME) Environmental Quality Guidelines (CCME 2007, 2008) and the Ontario Ministry of the Environment (MOE) Provincial Water Quality Objectives (MOEE 2004). Sediment criteria were obtained from the CCME Sediment Quality Guidelines (CCME 2002) and the MOE Sediment Guidelines (MOE 2008). The Interim Sediment Quality Guidelines were selected from the CCME and the Lowest Effects Level (LEL) was selected from the MOE Sediment Guidelines. For soils, the CCME Environmental Quality Guidelines (CCME 2007) and the MOE Soil Standards (MOE 2004) were used. When more than one criterion existed for a given constituent, the lowest criterion was selected. This ensures that no COPC is missed.

Tables D.2-4 and D.2-5 provide the results of the surface water screen, Tables D.2-6 and D.2-7 the sediment screening, and Table D.2-8 the and soil screening for COPC. A discussion of the selection COPC follows the tables.

TABLE D.2-1:
SURFACE WATER CRITERIA

		Protection of Aquatic Life				Drinking Water		
Constituent	**Type**	**MOEE PWQO [a] (µg/L unless otherwise noted)**	**Note**	**CCME [b] (µg/L unless otherwise noted)**	**Note**	**CCME Health-based Guideline[c] (µg/L unless otherwise noted)**	**Note [d]**	**Selected Criteria (µg/L)**
Aluminum	Metals	-		100	for pH ≥6.5; not specified if filtered or not	100	OG (Conventional Treatment Plants)	100
Aluminum (Filtered)	Metals	75	Interim; for pH >6.5-9 in clay-free samples	-				75
Ammonia (Total)	Nutrients	-		1.54	for T = 5°C, pH 8; if pH=8.5, value is 0.502 µg/L			
Ammonia (unionised)	Nutrients	20		19				20
Antimony	Metals	20	Interim	-		6	IMAC	20
Arsenic	Metals	100		5		10		5
Barium	Metals	-		-		1000		1000
Benzene	PetroHydocarbon	100	Interim	370	Interim	5		100
Beryllium	Metals	1100	Average hardness >75mg/L $CaCO_3$	-				1100
Bismuth	Metals	-		-				
Boron	Metals	200	Interim	-		5000	IMAC	200
Bromodichloromethane	THMs	200	Interim	-	Insufficient data	16		200
Bromoform	THMs	60	Interim	-	Insufficient data			60
Cadmium	Metals	0.2 0.5	 Interim (revised); for hardness >100 mg/L $CaCO_3$	0.017	Interim; value = 10*exp[0.86*log(hardness)-3.2]	5		0.017
Calcium	Metals	-		-		-		
Cesium	Metals	-		-		-		
Chloroform	THMs	-		1.8	Interim	-		1.8
Chromium	Metals	-		-		50		50
Chromium (Hexavalent)	Metals	1		1		-		1
Chromium (Trivalent)	Metals	8.9		8.9	Interim	-		8.9
Cobalt	Metals	0.9		-		-		0.9
Copper	Metals	5	Interim (revised); for water hardness >20mg/L $CaCO_3$	2	For hardness of 0-120 mg/L $CaCO_3$; above 120 mg/L value is 3 µg/L	≤1000	AO	3
Dibromochloromethane	THMs	40	Interim	-	Insufficient data	-		
Ethylbenzene	PetroHydocarbon	8	Interim	90	Interim	≤2.4	AO	8
Petroleum Hydrocarbons F1	PetroHydocarbon	-		-				
Petroleum Hydrocarbons F2	PetroHydocarbon	-		-		-		
Petroleum Hydrocarbons F3	PetroHydocarbon	-		-		-		
Petroleum Hydrocarbons F4	PetroHydocarbon	-		-		-		
Total Residual Chlorine (In-Situ)	General Chemistry	2	Not specified if in-situ	0.5	Reported as Reactive Chlorine	-		
Hydrazine	Special	-		-		-		
Iron	Metals	0.0003		300		≤300	AO	300
Lead	Metals	5	For alkalinity as $CaCO_3$ < 20 mg/L	2	For hardness of 60-120 mg/L $CaCO_3$; for hardness of 120-180mg/L value is	10		4

TABLE D.2-1: SURFACE WATER CRITERIA

		Protection of Aquatic Life				Drinking Water		
Constituent	**Type**	**MOEE PWQO [a] (µg/L unless otherwise noted)**	**Note**	**CCME [b] (µg/L unless otherwise noted)**	**Note**	**CCME Health-based Guideline[c] (µg/L unless otherwise noted)**	**Note [d]**	**Selected Criteria (µg/L)**
		5	Interim; for water hardness of >80mg/L $CaCO_3$		4 µg/L			
Lithium	Metals	-		-		-		
Magnesium	Metals	-		-		-		
Manganese	Metals	-		-		≤50	AO	
Mercury	Metals-Special	0.2	In a filtered sample	0.026	Inorganic (methylmercury is 0.004 µg/L)	1		0.026
Molybdenum	Metals	40	Interim	73	Interim	-		40
Morpholine	Special	4	Interim	-		-		4
Nickel	Metals	25		65	For hardness of 60-120 mg/L $CaCO_3$; for hardness of 120-180mg/L value is 110 µg/L	-		25
PCBs (Total)	PCB	0.001		-	Original value of 0.001 µg/L withdrawn; exposure not predominantly via water			0.001
pH	General Chemistry	6.5-8.5	Unitless	-		6.5-8.5	AO	
Potassium	Metals	-		-		-		
Selenium	Metals	100		1		10		1
Silver	Metals	0.1		0.1		-		0.1
Sodium	Metals	-		-		≤200,000	AO	200,000
Strontium	Metals	-		-		-		
Thallium	Metals	0.3	Interim	0.8		-		0.3
Thorium	Metals	-		-		-		
Tin	Metals	-		-		-		
Titanium	Metals	-		-		-		
Toluene	PetroHydocarbon	0.8	Interim	2	Interim	≤24	AO	0.8
Hardness	General Chemistry	-		-				
Tungsten	Metals	30	Interim	-				30
Uranium	Metals	5	Interim	-		20	IMAC	5
Vanadium	Metals	6	Interim	-				6
Zinc	Metals	30		30		≤5000	AO	
		20	Interim (revised)					20
Zirconium	Metals	4	Interim	-				4

a - from Ministry of the Environment and Energy (MOEE). 2004. Water Management: *Policies, Guidelines, Provincial Water Quality Objectives*. ISBN 0-7778-8473-9 rev
b - from Canadian Council of Ministers of the Environment (CCME). 2007. *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. Update 7.1
c - Federal-Provincial-Territorial (FTP) Committee on Drinking Water of the FFTP Committee on Health and the Environment. 2008. *Canadian Guidelines Drinking Water Quality Summary Table*.May.
d - IMAC = Interim Maximum Acceptable Concentration; AO = aesthetic objective; OG = operational guideline

TABLE D.2-2:
SEDIMENT CRITERIA

Constituent	Type	Selected Criteria for ERA Screening (mg/kg)	MOE LEL [a,c] (mg/kg dry weight unless otherwise noted)	Note [d]	CCME Interim Sediment Quality Guidelines [b,e] (mg/kg unless otherwise noted)	Note [f]	Thompson et al. 2005 (LEL) (ug/g dry weight) or (Bq/g dry weight) (closest observation method)	Thompson et al. 2005 (LEL) (ug/g dry weight) or (Bq/g dry weight) (weighted method)	Selected Criteria
Aluminum	Metals								
Antimony	Metals								
Arsenic	Metals	5.9	6	SEL = 33 mg/kg	5.9	PEL = 17 mg/kg	9.3	9.8	5.9
Barium	Metals								
Beryllium	Metals								
Bismuth	Metals								
Boron	Metals								
Boron (Hot Water Extractable)	Metals-Special								
Cadmium	Metals	0.6	0.6	SEL = 10 mg/kg	0.6	PEL = 3.5 mg/kg			0.6
Calcium	Metals								
Cesium	Metals								
Chromium	Metals	26	26	SEL = 110 mg/kg	37.3	PEL = 90 mg/kg	36.7	47.6	26
Cobalt	Metals	50	50	Carried over from Open Water Disposal Guidelines (1992)					50
Copper	Metals	16	16	SEL=110 mg/kg	35.7	PEL = 197 mg/kg	12	22.2	16
Iron	Metals	20000	20000	SEL = 40000					20000
Lead	Metals	31	31	SEL = 250 mg/kg	35	PEL = 91.3 mg/kg			31
Lithium	Metals								
Magnesium	Metals								
Manganese	Metals	460	460	SEL = 1100 mg/kg					460
Mercury	Metals-Special	0.17	0.2	SEL = 2 mg/kg	0.17	PEL = 0.486 mg/kg			0.17
Molybdenum	Metals	13.8					8.3	13.8	13.8
Nickel	Metals	16	16	SEV = 75 mg/kg			21	23.4	16
PCBs (Total)	PCB	0.0341	0.07	NEL = 0.01 mg/kg; SEL = 530 mg/kg TOC (multiply by % TOC)	0.0341	PEL = 0.277 mg/kg			0.0341
Petroleum Hydrocarbons F1	PetroHydocarbon								
Petroleum Hydrocarbons F2	PetroHydocarbon								
Petroleum Hydrocarbons F3	PetroHydocarbon								
Petroleum Hydrocarbons F4	PetroHydocarbon								
Phosphorus	Nutrients	600	600	SEL=4800 mg/kg					600
Potassium	Metals								
Selenium	Metals	1.9					0.9	1.9	1.9
Silver	Metals	0.5	0.5	Carried over from Open Water Disposal Guidelines (1992)					0.5
Sodium	Metals								
Strontium	Metals								
Thallium	Metals								
Thorium	Metals								
Tin	Metals								
Titanium	Metals								

TABLE D.2-2: SEDIMENT CRITERIA

Constituent	Type	Selected Criteria for ERA Screening (mg/kg)	MOE LEL [a,c] (mg/kg dry weight unless otherwise noted)	Note [d]	CCME Interim Sediment Quality Guidelines [b,e] (mg/kg unless otherwise noted)	Note [f]	Thompson et al. 2005 (LEL) (ug/g dry weight) or (Bq/g dry weight) (closest observation method)	Thompson et al. 2005 (LEL) (ug/g dry weight) or (Bq/g dry weight) (weighted method)	Selected Criteria
Tungsten	Metals								
Uranium	Metals	104.4					32	104.4	104.4
Vanadium	Metals	35.2					27.3	35.2	35.2
Water (105C)	General Chemistry								
Zinc	Metals	120	120		123	PEL = 315 mg/kg			120
Zirconium	Metals								

NOTE:
- Indicates no guideline value available
a - Ministry of the Environment (MOE). 1993. Guidelines for the Protection of Aquatic Sediment Quality in Ontario. ISBN 0-7729-9248-7.
b - from Canadian Council of Ministers of the Environment (CCME). 2002. *Canadian Sediment Quality Guidelines for the Protection of Aquatic Life*.
c - LEL = Lowest Effect Level; potential to affect some sensitive water uses (sediment is clean to marginally polluted)
d - SEL = Severe Effect Level; will significantly affect use of sediment by benthic organisms (sediment is grossly polluted)

TABLE D.2-3:
SOIL CRITERIA

Constituent	Type	MOE Soil (Residential/ Parkland/ Institutional) (mg/kg) (Table 3)[a]	MOE Soil (Industrial/ Commercial/ Community) (mg/kg) (Table 3)[a]	CCME Soil Residential / Parkland (mg/kg)[b]	CCME Note	CCME Soil Guidelines - Ecological (mg/kg)[b]	CCME Soil Commercial (mg/kg)[b]	CCME Soil Industrial (mg/kg)[b]	MOE Soil (Residential/ Parkland/ Institutional) (ug/g) (Table 2)[a]	MOE Soil (Industrial/ Commercial/ Community) (ug/g) (Table 2)[a]	Selected Criteria for ERA Screening (mg/kg)
Aluminum	Metals										
Antimony	Metals			20	Interim						
Arsenic	Metals	20	40	12		17	12	12	20	40	12
Barium	Metals			500			2000	2000			2000
Beryllium	Metals			4	Interim						4
Bismuth	Metals										
Boron	Metals										
Boron (Hot Water Extractable)	Metals-Sp			2	Interim						2
Cadmium	Metals	12	12	10		10	22	22	12	12	10
Calcium	Metals										
Cesium	Metals										
Chromium	Metals	750	750	64		64	87	87	750	750	64
Chromium (VI)	Metals	8	8	0.4			1.4	1.4	8	8	0.4
Cobalt	Metals	40	80	50	Interim				40	80	10
Copper	Metals	225	225	63		63	91	91	225	225	63
Iron	Metals										
Lead	Metals	200	1000	140		300	260	600	200	1000	200
Lithium	Metals										
Magnesium	Metals										
Manganese	Metals										
Mercury	Metals-Sp	10	10	6.6		12	24	50	10	10	6.6
Molybdenum	Metals	40	40	10	Interim				40	40	10
Nickel	Metals	150	150	50		50	50	50	150	150	20
PCBs (Total)	PCB	5	25	1.3			33	33	5	25	
Phosphorus	Nutrients										
Potassium	Metals										
Selenium	Metals	10	10	1		1	2.9	2.9	10	10	1
Silver	Metals	20	40	20	Interim				20	40	20
Sodium	Metals										
Strontium	Metals										
Thallium	Metals	4.1	32	1		1.4	1	1	4.1	32	1
Thorium	Metals										
Tin	Metals			50	Interim						50
Titanium	Metals										
Tungsten	Metals										
Uranium	Metals			23			33	300			23
Vanadium	Metals	200	200	130		130	130	130	200	200	130
Zinc	Metals	600	600	200		200	360	360	600	600	200
Zirconium	Metals										

a - Ontario Ministry of the Environment (MOE). 2004. Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act. March 9th.
b - Canadian Council of Ministers of the Environment (CCME) 2007. Canadian Environmental Quality Guidelines and Supporting Factsheets. Prepared by the Task Force on Water Quality Guidelines of the Canadian Council of Ministers of the Environment. Includes updates to the Original 1999 Version.

TABLE D.2-4:
SCREENING FOR COPC IN SURFACE WATER IN LAKE ONTARIO

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean> Criteria	Toxicity Data (water)	95% UCL of Background Mean	Mean >95% UCL of Background Mean	COPC?
Aluminum	ppm	140	0.0001	100%	0.1	3.52	0.09	0.13	No	Yes	-	Yes	Yes	0.246	No	No
Aluminum (Filtered)	ppm	140	0.0001	100%	0.075	0.0147	0.0064	0.0068	No	Yes	-	No	Yes	0.0079	No	No
Ammonia (unionised)	ppm	140		100%	0.02	0.0027	0.0005	0.0006	No	Yes	-	No	Yes	0.00116	No	No
Antimony	ppm	140	0.001	1%	0.02	0.00179	0.00051	0.00052	Yes	Yes	No	-	Yes	0.00050	Yes	No
Arsenic	ppm	140	0.001 (130); 0.004 (10)	1%	0.005	0.00200	0.00061	0.00067	Yes	Yes	No	-	Yes	0.00073	No	No
Barium	ppm	140	0.0001	100%	1000	0.644	0.040	0.051	No	Yes	-	No	Yes	0.046	No	No
Benzene	ppb	35	0.1	0%	100	0.05	-	-	Yes	Yes	No	-	Yes	0.050	No	No
Beryllium	ppm	140	0.001	0%	1.1	0.0005	-	-	Yes	Yes	No	-	Yes	0.00050	No	No
Bismuth	ppm	140	0.001	0%		0.0005	-	-	Yes	No	NA	-	No	0.00058	No	No
Boron	ppm	140	0.0001	100%	0.2	6.864	0.130	0.216	No	Yes	-	Yes	Yes	0.140	No	No
Bromodichloromethane	ppb	14	0.1	0%	200	0.05	-	-	Yes	Yes	No	-	No	0.050	No	No
Bromoform	ppb	14	0.1	0%	60	0.05	-	-	Yes	Yes	No	-	Yes	0.050	No	No
Cadmium	ppm	140	0.0001	0%	0.000017	0.00005	0.00005	0.00005	Yes	Yes	Yes	-	Yes	0.00005	No	No
Calcium	ppm	140	0.0001	100%		41.1	35.3	35.7	No	No	-	NA	No	36.8	No	No
Cesium	ppm	140	0.0001	1%		0.00021	0.00005	0.00005	Yes	No	NA	-	No	0.00005	No	No
Chloroform	ppb	14	0.1	0%	1.8	0.05	-	-	Yes	Yes	No	-	Yes	0.050	No	No
Chromium	ppm	140	0.0001	61%	0.05	0.0017	0.0006	0.0007	No	Yes	-	No	Yes	0.0011	No	No
Chromium (Trivalent)	ppm	35	0.005	0%	0.0089	0.0017	-	-	Yes	Yes	No	-	Yes	0.0015	No	No
Chromium (Hexavalent)	ppm	35	0.0001	43%	0.001	0.0025	0.0025	0.0025	No	Yes	Yes	-	Yes	0.0025	No	No
Cobalt	ppm	140	0.0001	62%	0.0009	0.0023	0.0004	0.0005	No	Yes	-	No	Yes	0.0005	No	No
Copper	ppm	140	0.0001	100%	0.003	0.0037	0.0011	0.0012	No	Yes	-	No	Yes	0.0021	No	No
Dibromochloromethane	ppb	14	0.1	0%		0.05	-	-	Yes	No	NA	-	No	0.050	No	No
Ethylbenzene	ppb	35	0.1	0%	8	0.05	-	-	Yes	Yes	No	-	Yes	0.050	No	No
Hydrazine	ppm	56	0.005	0%		0.0025	-	-	Yes	No	NA	-	Yes	0.0025	No	No
Iron	ppm	140	0.001	100%	0.3	0.129	0.0281	0.031	No	Yes	-	No	Yes	0.0287	No	No
Lead	ppm	140	0.0001	34%	0.004	0.00363	0.00014	0.00019	No	Yes	-	No	Yes	0.00027	No	No
Lithium	ppm	140	0.0001	100%		0.0045	0.0029	0.0030	No	No	-	NA	No	0.0033	No	No
Magnesium	ppm	140	0.0001	100%		11.05	9.58	9.73	No	No	-	NA	No	9.73	No	No
Manganese	ppm	140	0.0001	100%		0.0048	0.0014	0.0015	No	No	-	NA	Yes	0.0015	No	No
Mercury	ppm	56	0.0001	0%	0.000026	0.00005	-	-	Yes	Yes	Yes	-	Yes	0.00005	No	No
Molybdenum	ppm	140	0.0001	100%	0.04	0.0020	0.00136	0.0014	No	Yes	-	No	Yes	0.00136	Yes	No
Morpholine	ppm	84	0.001	2%	0.004	0.0020	0.00053	0.0006	Yes	Yes	No	-	Yes	0.00052	Yes	No
Nickel	ppm	140	0.0001	100%	0.025	0.00119	0.00072	0.00074	No	Yes	-	No	Yes	0.00077	No	No
PCBs (Total)	ppb	56	0.05	0%	0.001	0.025	0.025	0.025	Yes	Yes	Yes	-	Yes	0.0250	No	No
Petroleum Hydrocarbons F1	ppb	56	100	0%		50	-	-	Yes	No	NA	-	Yes	50.0	No	No
Petroleum Hydrocarbons F2	ppb	56	100	0%		50	-	-	Yes	No	NA	-	No	50.0	No	No
Petroleum Hydrocarbons F3	ppb	56	100	0%		50	-	-	Yes	No	NA	-	No	56.5	No	No
Petroleum Hydrocarbons F4	ppb	56	100	0%		50	-	-	Yes	No	NA	-	No	50.0	No	No
Potassium	ppm	140	0.001	100%		3.54	1.79	1.82	No	No	-	NA	Yes	1.76	Yes	**Yes**
Selenium	ppm	140	0.001	1%	0.001	0.0010	0.0005	0.0005	Yes	Yes	Yes	-	Yes	0.00054	No	No
Silver	ppm	140	0.0001	0%	0.0001	0.00005	-	-	Yes	Yes	No	-	Yes	0.00005	No	No
Sodium	ppm	140	0.0001	100%	200	20.7	15.2	15.5	No	Yes	-	No	Yes	15.6	No	No
Strontium	ppm	140	0.0001	100%		0.22	0.20	0.20	No	No	-	NA	Yes	0.201	No	No
Thallium	ppm	140	0.0001	0%	0.0003	0.00005	-	-	Yes	Yes	No	-	Yes	0.00005	No	No

TABLE D.2-4:
SCREENING FOR COPC IN SURFACE WATER IN LAKE ONTARIO

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean> Criteria	Toxicity Data (water)	95% UCL of Background Mean	Mean >95% UCL of Background Mean	COPC?
Thorium	ppm	140	0.0001	4%		0.00062	0.00006	0.00006	Yes	No	NA	-	No	0.00005	Yes	No
Tin	ppm	140	0.0001	8%		0.00156	0.00007	0.00009	Yes	No	NA	-	Yes	0.00016	No	No
Titanium	ppm	140	0.0001	100%		0.01594	0.00222	0.00251	No	No	-	NA	No	0.00229	No	No
Toluene	ppb	35	0.1	3%	0.8	0.100	0.051	0.054	Yes	Yes	No	-	Yes	0.072	No	No
Tungsten	ppm	140	0.0001	34%	0.03	0.00032	0.00008	0.00008	No	Yes	-	No	No	0.0001	No	No
Uranium	ppm	140	0.0001	100%	0.005	0.00058	0.00038	0.00038	No	Yes	-	No	Yes	0.00042	No	No
Vanadium	ppm	140	0.0001	56%	0.006	0.00100	0.00032	0.00036	No	Yes	-	No	Yes	0.00035	No	No
Zinc	ppm	140	0.0001	99%	0.02	0.01122	0.00245	0.00275	No	Yes	-	No	Yes	0.0037	No	No
Zirconium	ppm	140	0.0001	15%	0.004	0.05685	0.00095	0.00167	No	Yes	-	No	Yes	0.0010	No	No

Note: 95% UCL of Mean (for a one-sided UCLM) = Mean+TINV(0.1,N-1)*StDev/SQRT(N)
The maximum was set to ½ MDL if all measurements <MDL

TABLE D.2-5:
SCREENING FOR COPC IN SURFACE WATER IN COOTS POND

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean> Criteria	Toxicity Data (Water)	95% UCL of Background Mean	Mean >95% UCL of Background Mean	COPC?
Aluminum	ppm	20	0.0001	100%	0.1	2.936	0.729	1.160	No	Yes	-	Yes	Yes	0.246	Yes	**Yes**
Aluminum (filtered)	ppm	20	0.0001	100%	0.075	0.189	0.042	0.065	No	Yes	-	No	Yes	0.0079	Yes	No
Ammonia (unionised)	ppm	20		100%	0.02	0.0485	0.0130	0.02	No	Yes	-	No	Yes	0.0012	Yes	No
Antimony	ppm	20	0.001	5%	0.02	0.0011	0.00053	0.00058	Yes	Yes	No	-	Yes	0.0005	Yes	No
Arsenic	ppm	20	0.001 (15); 0.004 (5)	0%	0.005	0.002	-	-	Yes	Yes	No	-	Yes	0.00073	Yes	No
Barium	ppm	20	0.0001	100%	1000	0.102	0.050	0.062	No	Yes	-	No	Yes	0.046	Yes	No
Benzene	ppb	5	0.1	0%	100	0.05	-	-	Yes	Yes	No	-	Yes	0.050	Yes	No
Beryllium	ppm	20	0.001	0%	1.1	0.0005	-	-	Yes	Yes	No	-	Yes	0.0005	Yes	No
Bismuth	ppm	20	0.001	0%		0.0005	-	-	Yes	No	NA	-	No	0.00058	Yes	No
Boron	ppm	20	0.0001	100%	0.2	0.53	0.35	0.39	No	Yes	-	Yes	Yes	0.140	Yes	**Yes**
Bromodichloromethane	ppb	2	0.1	0%	200	0.05	-	-	Yes	Yes	No	-	No	0.050	Yes	No
Bromoform	ppb	2	0.1	0%	60	0.05	-	-	Yes	Yes	No	-	Yes	0.050	Yes	No
Cadmium	ppm	20	0.0001	0%	0.000017	0.00005	-	-	Yes	Yes	Yes	-	Yes	0.000052	Yes	No
Calcium	ppm	20	0.0001	100%		85.9	49.2	58.9	No	No	-	NA	No	36.77	Yes	No
Cesium	ppm	20	0.0001	25%		0.00016	0.00008	0.00009	No	No	NA	-	No	0.000051	Yes	No
Chloroform	ppb	2	0.1	50%	1.8	0.1	-	-	No	Yes	No	-	Yes	0.050	Yes	No
Chromium	ppm	20	0.0001	75%	0.05	0.0044	0.0014	0.0018	No	Yes	No	-	Yes	0.0011	Yes	No
Chromium (Trivalent)	ppm	5	0.0001	100%	0.0089	0.0044	0.0017	0.0032	No	Yes	No	-	Yes	0.0015	Yes	No
Chromium (Hexavalent)	ppm	5	0.005	0%	0.001	0.0025	-	-	Yes	Yes	Yes	-	Yes	0.0025	Yes	No
Cobalt	ppm	20	0.0001	100%	0.0009	0.0036	0.0011	0.0017	No	Yes	-	Yes	Yes	0.0005	Yes	**Yes**
Copper	ppm	20	0.0001	100%	0.003	0.0015	0.0011	0.0012	No	Yes	-	No	Yes	0.0021	Yes	No
Dibromochloromethane	ppb	2	0.1	0%		0.05	-	-	Yes	No	NA	-	No	0.050	Yes	No
Ethylbenzene	ppb	5	0.1	0%	8	0.05	-	-	Yes	Yes	No	-	Yes	0.050	Yes	No
Hydrazine	ppm	8	0.005	0%		0.0025	-	-	Yes	No	NA	-	Yes	0.0025	Yes	No
Iron	ppm	20	0.001	100%	0.3	1.308	0.377	0.562	No	Yes	-	Yes	Yes	0.029	Yes	**Yes**
Lead	ppm	20	0.0001	80%	0.004	0.00116	0.00032	0.00045	No	Yes	No	-	Yes	0.00027	Yes	No

TABLE D.2-5:
SCREENING FOR COPC IN SURFACE WATER IN COOTS POND

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean> Criteria	Toxicity Data (Water)	95% UCL of Background Mean	Mean >95% UCL of Background Mean	COPC?
Lithium	ppm	20	0.0001	100%		0.0116	0.0087	0.0096	No	No	-	NA	No	0.0033	Yes	No
Magnesium	ppm	20	0.0001	100%		38.7	32.3	33.9	No	No	-	NA	No	9.727	Yes	No
Manganese	ppm	20	0.0001	100%		0.068	0.041	0.048	No	No	-	NA	Yes	0.0015	Yes	**Yes**
Mercury	ppm	8	0.0001	0%	0.000026	0.00005	-	-	Yes	Yes	Yes	-	Yes	0.00005	Yes	No
Molybdenum	ppm	20	0.0001	100%	0.04	0.0015	0.0007	0.0009	No	Yes	-	No	Yes	0.0014	Yes	No
Morpholine	ppm	12	0.001	0%	0.004	0.0005	-	-	Yes	Yes	No	-	Yes	0.00052	Yes	No
Nickel	ppm	20	0.0001	100%	0.025	0.00190	0.00110657	0.00130	No	Yes	-	No	Yes	0.00077	Yes	No
PCBs (Total)	ppb	8	0.05	0%	0.001	0.025	0.025	0.025	Yes	Yes	Yes	-	Yes	0.025	Yes	No
Petroleum Hydrocarbons F1	ppb	8	100	0%		50	-	-	Yes	No	NA	-	Yes	50.0	Yes	No
Petroleum Hydrocarbons F2	ppb	8	100	0%		50	-	-	Yes	No	NA	-	No	50.0	Yes	No
Petroleum Hydrocarbons F3	ppb	8	100	0%		50	-	-	Yes	No	NA	-	No	56.5	Yes	No
Petroleum Hydrocarbons F4	ppb	8	100	0%		50	-	-	Yes	No	NA	-	No	50.0	Yes	No
Potassium	ppm	20	0.001	100%		11.99	7.66	8.73	No	No	-	NA	Yes	1.76	Yes	**Yes**
Selenium	ppm	20	0.001	0%	0.001	0.0005	-	-	Yes	Yes	No	-	Yes	0.00054	Yes	No
Silver	ppm	20	0.0001	0%	0.0001	0.00005	-	-	Yes	Yes	No	-	Yes	0.00005	Yes	No
Sodium	ppm	20	0.0001	100%	200	43.8	38.0	40.4	No	Yes	-	No	Yes	15.6	Yes	No
Strontium	ppm	20	0.0001	100%		0.73	0.51	0.58	No	No	-	NA	Yes	0.201	Yes	**Yes**
Thallium	ppm	20	0.0001	0%	0.0003	0.00005	-	-	Yes	Yes	No	-	Yes	0.00005	Yes	No
Thorium	ppm	20	0.0001	25%		0.00037	0.00012	0.00017	No	No	NA	-	No	0.00005	Yes	No
Tin	ppm	20	0.0001	0%		0.00005	-	-	Yes	No	NA	-	Yes	0.00016	Yes	No
Titanium	ppm	20	0.0001	100%		0.0919	0.0271	0.0397	No	No	-	NA	No	0.0023	Yes	No
Toluene	ppb	5	0.1	0%	0.8	0.05	-	-	Yes	Yes	No	-	Yes	0.072	Yes	No
Tungsten	ppm	20	0.0001	25%	0.03	0.00013	0.00007	0.00008	No	Yes	No	-	No	0.00010	Yes	No
Uranium	ppm	20	0.0001	100%	0.005	0.00196	0.00089	0.00113	No	Yes	-	No	Yes	0.00042	Yes	No
Vanadium	ppm	20	0.0001	75%	0.006	0.0017	0.0007	0.0010	No	Yes	No	-	Yes	0.00035	Yes	No
Zinc	ppm	20	0.0001	100%	0.02	0.0136	0.0041	0.0055	No	Yes	-	No	Yes	0.0037	Yes	No
Zirconium	ppm	20	0.0001	65%	0.004	0.0022	0.0006	0.0009	No	Yes	No	-	Yes	0.0010	Yes	No

Note: 95% UCL of Mean (for a one-sided UCLM) = Mean+TINV(0.1,N-1)*StDev/SQRT(N)
The maximum was set to ½ MDL if all measurements <MDL

TABLE D.2-6:
SCREENING FOR COPC IN SEDIMENT IN LAKE ONTARIO

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean > Criteria	Toxicity Data	95% UCL of Background Mean	Mean>95% UCL of Background Mean	COPC?
Aluminum	ppm	16	1	100%		34862.6	7801.9	11559.4	No	No	NA	-	No	6338	Yes	No
Antimony	ppm	16	0.05	100%		0.93	0.16	0.3	No	No	NA	-	No	0.25	No	No
Arsenic	ppm	16	0.05	100%	5.9	8.63	2.32	3.1	No	Yes	Yes	-	Yes	2.95	No	No
Barium	ppm	16	0.5	100%		415.1	261.8	300.6	No	No	NA	-	No	242	Yes	No
Beryllium	ppm	16	0.5	100%		1.62	1.18	1.3	No	No	NA	-	No	1.05	Yes	No
Bismuth	ppm	16	0.05	100%		0.74	0.23	0.3	No	No	NA	-	No	0.25	No	No
Boron	ppm	16	0.05	100%		55.1	16.3	21.0	No	No	NA	-	No	6.63	Yes	No
Boron-hot water	ppm	16	0.05 (15);	6%		2.30	0.17	0.4	Yes	No	NA	-	No	n.d.	Yes	No

TABLE D.2-6: SCREENING FOR COPC IN SEDIMENT IN LAKE ONTARIO

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean > Criteria	Toxicity Data	95% UCL of Background Mean	Mean>95% UCL of Background Mean	COPC?
			0.02 (1)													
Cadmium	ppm	16	0.05	100%	0.6	1.30	0.20	0.3	No	Yes	Yes	-	Yes	0.137	Yes	No[1]
Calcium	ppm	16	1	100%		148826	77083	87963.2	No	No	NA	-	No	96388	No	No
Cesium	ppm	16	0.05	100%		2.66	0.43	0.7	No	No	NA	-	No	0.199	Yes	No
Chromium	ppm	16	1	100%	26	49.3	28.5	33.4	No	Yes	Yes	-	Yes	36.2	No	No
Cobalt	ppm	16	0.05	100%	50	12.39	7.56	8.8	No	Yes	No	-	Yes	11.26	No	No
Copper	ppm	16	1	100%	16	44.6	5.4	10.0	No	Yes	Yes	-	Yes	3.90	Yes	**Yes**
Iron	ppm	16	0.5	100%	20000	48742	24519	30265.4	No	Yes	Yes	-	Yes	32516	No	No
Lead	ppm	16	0.05	100%	31	39.2	12.3	15.8	No	Yes	Yes	-	Yes	9.94	Yes	**Yes**
Lithium	ppm	16	0.005	100%		26.2	8.1	10.3	No	No	NA	-	No	6.48	Yes	No
Magnesium	ppm	16	0.5	100%		12500	6358	7403.5	No	No	NA	-	No	8960	No	No
Manganese	ppm	16	1	100%	460	876	545	635.6	No	Yes	Yes	-	Yes	781	No	No
Mercury	ppm	16	0.01 (15); 0.05 (1)	6%	0.17	0.150	0.014	0.0	Yes	Yes	No	-	Yes	n.d.	Yes	No
Molybdenum	ppm	16	0.05	100%	13.8	1.05	0.50	0.6	No	Yes	No	-	Yes	0.851	No	No
Nickel	ppm	16	1	100%	16	29.6	7.9	10.6	No	Yes	Yes	-	Yes	8.318	No	No
PCBs (Total)	ppm	16	0.05	0%	0.0341	0.025	0.025	0.0	Yes	Yes	No	-	Yes	0.025	No	No
Petroleum Hydrocarbons F1	ppm	16	10	0%		5	-	-	Yes	No	NA	-	No	5	No	No
Petroleum Hydrocarbons F2	ppm	16	10	0%		5	-	-	Yes	No	NA	-	No	5	No	No
Petroleum Hydrocarbons F3	ppm	16	10	19%		244	24	50.2	No	No	NA	-	No	5	Yes	No
Petroleum Hydrocarbons F4	ppm	16	10	13%		135	14	27.9	No	No	NA	-	No	5	Yes	No
Phosphorus	ppm	16	0.5	100%	600	1251	562	699.7	No	Yes	Yes	-	Yes	1081	No	No
Potassium	ppm	16	1	100%		15887	8149	9342.3	No	No	NA	-	No	7852	Yes	No
Selenium	ppm	16	0.05	100%	1.9	2.04	1.12	1.4	No	Yes	Yes	-	Yes	0.638	Yes	**Yes**
Silver	ppm	16	0.05	6%	0.5	0.730	0.069	0.1	Yes	Yes	Yes	-	Yes	0.382	No	No
Sodium	ppm	16	5	100%		10811	7877	8668.3	No	No	NA	-	No	8887	No	No
Strontium	ppm	16	1	100%		377	267	288.1	No	No	NA	-	No	258	Yes	No
Thallium	ppm	16	0.05	100%		0.56	0.21	0.3	No	No	NA	-	No	0.152	Yes	No
Thorium	ppm	16	0.05	100%		6.41	2.91	3.6	No	No	NA	-	No	3.35	No	No
Tin	ppm	16	0.05	100%		5.15	1.99	2.5	No	No	NA	-	No	2.44	No	No
Titanium	ppm	16	0.5	100%		3069	1686	2043.6	No	No	NA	-	No	2961	No	No
Tungsten	ppm	16	0.005	100%		1.08	0.22	0.3	No	No	NA	-	No	0.431	No	No
Uranium	ppm	16	0.01	100%	104.4	3.21	2.13	2.5	No	Yes	No	-	Yes	2.46	No	No
Vanadium	ppm	16	2.5	100%	35.2	107.7	59.2	71.4	No	Yes	Yes	-	Yes	74.7	No	No
Zinc	ppm	16	2	100%	120	124.1	37.4	48.0	No	Yes	Yes	-	Yes	41.0	No	No
Zirconium	ppm	16	1	100%		168.7	84.5	106.1	No	No	NA	-	No	94.4	No	No

Note: 95% UCL of Mean (for a one-sided UCLM) = Mean+TINV(0.1,N-1)*StDev/SQRT(N)
The maximum was set to ½ MDL if all measurements <MDL
n.d. – no data

[1] Not a COPC because at pH values between 5.5 and 9, there is very little aluminum that is in true solution and available for uptake by biological species. Given that the pH in the water in Coots Pond measures between 8.0 and 9.4 pH units, it is not expected that aluminium is in solution to exert a toxic effect. In addition, the dissolved form of aluminum measured in Coots Pond is below applicable criteria.

TABLE D.2-7:
SCREENING FOR COPC IN SEDIMENT IN COOTS POND

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean > Criteria	Toxicity Data	95% UCL of Background Mean	Mean>95% UCL of Background Mean	COPC?
Aluminum	ppm	5	1	100%		28715	26282	28118.3	No	No	NA	-	No	6338	Yes	No
Antimony	ppm	5	0.05	100%		0.41	0.35	0.4	No	No	NA	-	No	0.25	Yes	No
Arsenic	ppm	5	0.05	100%	5.9	3.35	2.80	3.2	No	Yes	No	-	Yes	3	No	No
Barium	ppm	5	0.5	100%		342	337	341.6	No	No	NA	-	No	242	Yes	No
Beryllium	ppm	5	0.5	100%		1.41	1.36	1.4	No	No	NA	-	No	1	Yes	No
Bismuth	ppm	5	0.05	100%		0.27	0.24	0.3	No	No	NA	-	No	n.d.	No	No
Boron	ppm	5	0.05	100%		55.1	48.4	58.4	No	No	NA	-	No	7	Yes	No
Boron-hot water	ppm	5	0.02	100%		12.24	5.16	9.5	No	No	NA	-	No	n.d.	Yes	No
Cadmium	ppm	5	0.05	100%	0.6	0.25	0.23	0.3	No	Yes	No	-	Yes	n.d.	Yes	No
Calcium	ppm	5	1	100%		201620	179021	203215.6	No	No	NA	-	No	96388	Yes	No
Cesium	ppm	5	0.05	100%		2.46	2.10	2.6	No	No	NA	-	No	n.d.	Yes	No
Chromium	ppm	5	1	100%	26	25.3	22.9	25.3	No	Yes	No	-	Yes	36	No	No
Cobalt	ppm	5	0.05	100%	50	9.9	9.3	10.2	No	Yes	No	-	Yes	11	No	No
Copper	ppm	5	1	100%	16	26.9	24.0	29.7	No	Yes	Yes	-	Yes	4	Yes	**Yes**
Iron	ppm	5	0.5	100%	20000	14387	13374	14504.0	No	Yes	No	-	Yes	32516	No	No
Lead	ppm	5	0.05	100%	31	19.0	16.7	18.7	No	Yes	No	-	Yes	10	Yes	No
Lithium	ppm	5	0.005	100%		29.2	25.4	30.7	No	No	NA	-	No	6	Yes	No
Magnesium	ppm	5	0.5	100%		10257	9849	10346.8	No	No	NA	-	No	8960	Yes	No
Manganese	ppm	5	1	100%	460	503	461	512.7	No	Yes	Yes	-	Yes	781	No	No
Mercury	ppm	5	0.05	100%	0.17	0.0334	0.0237	0.0	No	Yes	No	-	Yes	n.d.	Yes	No
Molybdenum	ppm	5	0.05	100%	13.8	1.41	1.16	1.5	No	Yes	No	-	Yes	1	Yes	No
Nickel	ppm	5	1	100%	16	12.7	11.3	12.9	No	Yes	No	-	Yes	8	Yes	No
PCBs (Total)	ppm	5	0.05	0%	0.0341	0.025	0.025	0.0	Yes	Yes	No	-	Yes	n.d.	No	No
Petroleum Hydrocarbons F1	ppm	5	10	0%		5	-	-	Yes	No	NA	-	No	5	No	No
Petroleum Hydrocarbons F2	ppm	5	10	0%		5	-	-	Yes	No	NA	-	No	5	No	No
Petroleum Hydrocarbons F3	ppm	5	10	100%		313.0	268.8	306.8	No	No	NA	-	No	5	Yes	No
Petroleum Hydrocarbons F4	ppm	5	10	100%		59.0	49.0	56.7	No	No	NA	-	No	5	Yes	No
Phosphorus	ppm	5	0.5	100%	600	673	651	681.8	No	Yes	Yes	-	Yes	1081	No	No
Potassium	ppm	5	1	100%		11959	11479	11955.9	No	No	NA	-	No	7852	Yes	No
Selenium	ppm	5	0.05	100%	1.9	1.06	0.77	1.1	No	Yes	No	-	Yes	1	Yes	No
Silver	ppm	5	0.05	0%	0.5	0.025	-	-	Yes	Yes	No	-	Yes	n.d.	No	No
Sodium	ppm	5	5	100%		8949	6313	7726.8	No	No	NA	-	No	8887	No	No
Strontium	ppm	5	1	100%		702	608	703.2	No	No	NA	-	No	258	Yes	No
Thallium	ppm	5	0.05	100%		0.40	0.37	0.4	No	No	NA	-	No	n.d.	Yes	No
Thorium	ppm	5	0.05	100%		5.99	5.36	6.2	No	No	NA	-	No	3	Yes	No
Tin	ppm	5	0.05	100%		2.17	1.78	2.1	No	No	NA	-	No	2	No	No
Titanium	ppm	5	0.5	100%		1103	940	1059.5	No	No	NA	-	No	2961	No	No
Tungsten	ppm	5	0.005	100%		0.74	0.55	0.7	No	No	NA	-	No	n.d.	Yes	No
Uranium	ppm	5	0.01	100%	104.4	2.62	2.21	2.6	No	Yes	No	-	Yes	2	No	No
Vanadium	ppm	5	2.5	100%	35.2	40.9	38.1	41.8	No	Yes	Yes	-	Yes	75	No	No

TABLE D.2-7:
SCREENING FOR COPC IN SEDIMENT IN COOTS POND

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean > Criteria	Toxicity Data	95% UCL of Background Mean	Mean>95% UCL of Background Mean	COPC?
Zinc	ppm	5	2	100%	120	82.8	70.7	86.0	No	Yes	No	-	Yes	41	Yes	No
Zirconium	ppm	5	1	100%		35.9	26.8	31.9	No	No	NA	-	No	94	No	No

Note: 95% UCL of Mean (for a one-sided UCLM) = Mean+TINV(0.1,N-1)*StDev/SQRT(N)
The maximum was set to ½ MDL if all measurements <MDL
n.d. – no data

TABLE D.2-8:
SCREENING FOR COPC IN SOIL IN THE SITE STUDY AREA

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	OTR(98)	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean > Criteria	Toxicity Data (Wildlife)	Mean >OTR(98)	COPC?
Aluminum	µg/g	39		100%		32700	18127	20356.4	27000	No	No	-	NA	Yes	No	No
Antimony	µg/g	39	0.025	100%		0.321	0.180	0.2	0.43	No	No	-	NA	Yes	No	No
Arsenic	µg/g	39	0.025	100%	12	12.32	4.23	4.9	17	No	Yes	-	No	Yes	No	No
Barium	µg/g	39		100%	2000	525.0	380.1	400.0	180	No	Yes	-	No	Yes	Yes	No
Beryllium	µg/g	39	0.1	100%	4	1.35	1.09	1.1	0.97	No	Yes	-	No	Yes	Yes	No
Bismuth	µg/g	39	0.025	100%		0.312	0.144	0.2		No	No	-	NA	No	Yes	No
Boron	µg/g	39		100%		45.85	24.92	27.2	30	No	No	-	NA	Yes	No	No
Boron-hot water	µg/g	39		100%	2	1.51	0.367	0.5		No	Yes	-	No	Yes	Yes	No
Cadmium	µg/g	39	0.025	100%	10	0.40	0.27	0.3	0.84	No	Yes	-	No	Yes	No	No
Calcium	µg/g	39		100%		69800	35218	40677.3	58000	No	No	-	NA	No	No	No
Cesium	µg/g	39	0.025	100%		2.05	1.10	1.2		No	No	-	NA	No	Yes	No
Chromium	µg/g	39	0.5	100%	64	53.0	35.0	36.6	62	No	Yes	-	No	Yes	No	No
Cobalt	µg/g	39	0.5	100%	10	10.40	7.28	7.6	17	No	Yes	-	No	Yes	No	No
Copper	µg/g	39	0.5	100%	63	23.70	10.86	11.9	65	No	Yes	-	No	Yes	No	No
Iron	µg/g	39		100%		26900	20072	20816.9	33000	No	No	-	NA	No	No	No
Lead	µg/g	39		100%	200	54.11	25.53	28.7	98	No	Yes	-	No	Yes	No	No
Lithium	µg/g	39		100%		29.06	16.20	17.5		No	No	-	NA	No	Yes	No
Magnesium	µg/g	39		100%		8580	5172	5582.4	16000	No	No	-	NA	No	No	No
Manganese	µg/g	39		100%		714	522	542.4	1300	No	No	-	NA	Yes	No	No
Mercury	µg/g	39	0.025	0%	6.6	0.013	-	-	0.18	Yes	Yes	-	No	Yes	No	No
Molybdenum	µg/g	39	0.025	100%	10	1.46	0.74	0.8	0.85	No	Yes	-	No	Yes	No	No
Nickel	µg/g	39	0.5	100%	20	25.2	15.1	16.0	32	No	Yes	-	No	Yes	No	No
Phosphorus	µg/g	39		100%		938	644	677.4	1200	No	No	-	NA	No	No	No
Potassium	µg/g	39		100%		20500	13803	14570.6	5000	No	No	-	NA	No	Yes	No
Selenium	µg/g	39	0.025	100%	1	0.706	0.322	0.4	1.3	No	Yes	-	No	Yes	No	No
Silver	µg/g	39	0.025	100%	20	0.281	0.200	0.2	0.33	No	Yes	-	No	Yes	No	No
Sodium	µg/g	39		100%		15200	9080	9831.6	910	No	No	-	NA	No	Yes	No
Strontium	µg/g	39		100%		304.0	179.3	192.6	78	No	No	-	NA	Yes	Yes	**Yes**
Thallium	µg/g	39	0.025	100%	1	0.64	0.39	0.4	0.77	No	Yes	-	No	Yes	No	No
Thorium	µg/g	39		100%		8.17	2.23	2.7		No	No	-	NA	No	Yes	No
Tin	µg/g	39	0.025	100%	50	15.41	4.70	5.7		No	Yes	-	No	Yes	Yes	No
Titanium	µg/g	39		100%		2540	1565	1638.1	4800	No	No	-	NA	No	No	No

TABLE D.2-8: SCREENING FOR COPC IN SOIL IN THE SITE STUDY AREA

Constituent	Units	N	MDL	% above MDL	Criteria	Maximum	Mean	95% UCL of Mean	OTR(98)	90% of Measured Sample <MDL?	Regulatory Criteria Available?	If N<20 is Maximum >Criteria	If N>20 is 95% UCL of Mean > Criteria	Toxicity Data (Wildlife)	Mean >OTR(98)	COPC?
Tungsten	µg/g	39	0.025	100%		2.735	0.420	0.5		No	No	-	NA	No	Yes	No
Uranium	µg/g	39		100%	23	2.70	1.34	1.5	1.9	No	Yes	-	No	Yes	No	No
Vanadium	µg/g	39	1.25	100%	130	73.7	54.3	56.4	71	No	Yes	-	No	Yes	No	No
Zinc	µg/g	39	1	100%	200	84.3	66.6	69.0	140	No	Yes	-	No	Yes	No	No
Zirconium	µg/g	39		100%		78.7	62.9	65.7		No	No	-	NA	Yes	Yes	**Yes**

Note: 95% UCL of Mean (for a one-sided UCLM) = Mean+TINV(0.1,N-1)*StDev/SQRT(N)
The maximum was set to ½ MDL if all measurements <MDL

D.2.1 Selection of COPC for Surface Water

Using the screening process identified in Figure 3.2-7, the surface water results of the baseline sampling program for non-radiological constituents were summarized and various summary statistics were calculated. The screening was done separately for Lake Ontario and Coots Pond. The Stormwater Management Pond was not considered in the selection of COPC because it is a waste management system and as such is expected to have high levels of some constituents which will not change due to the new facility. Darlington Creek was also not considered since only a small portion of the creek intersects the north portion of the site and thus there is very little interaction of the DN site on Darlington Creek. Treefrog pond was not considered in the screening because it is not a permanent water body. For constituents where there were less than 20 samples, the maximum concentrations were used in the screening. For constituents with greater than 20 samples, the 95th percentile Upper Confidence Level (UCL) of the mean was used to represent a reasonable maximum concentration for the screening process.

For Lake Ontario (Table D.2-4), it was first determined if the data was heavily censored (i.e. 90% of the measured samples were below the MDL). If the data was heavily censored, then the constituent was not considered to be a COPC. This eliminated 27 of the 53 potential COPC. The remaining constituents were then compared to regulatory criteria. Of the 26 potential COPC, 19 had regulatory criteria and all reasonable maximum concentrations were below criteria. This screening process resulted in no COPC being identified.

For the 7 samples where no regulatory criteria were available, 4 of the constituents did not have toxicity data. These constituents were calcium, lithium, magnesium and titanium and were not assessed further as potential COPC. Calcium and magnesium are considered part of the earth's crust and thus are not considered to be toxic. The three remaining constituents are manganese, potassium and strontium. These constituents have toxicity data, however, the measured mean concentrations of manganese and strontium are below the 95th percentile UCL of background and thus these concentrations are no different than background. Therefore, manganese and strontium are not considered as COPC. Potassium concentrations exceed background but potassium is considered to be ubiquitous and is also regulated in biological systems and is therefore not considered further.

Hydrazine concentrations were measured below a detection limit of 0.005 mg/L and thus were considered to be heavily censored and therefore dropped from further consideration. However, given that hydrazine is of concern in the aquatic environment, a further screening was done comparing to the No Observable Effects Level (NOEL) of 0.001 mg/L for fat head minnow eggs (WHO 1987). Therefore, hydrazine is considered to be a COPC in Lake Ontario.

The same screening process was used for Coots Pond, an on-site surface pond (Table D.2-5). In Coots Pond, 53 constituents have been measured. Of these 53 constituents, 24 were heavily censored leaving 29 constituents with measured concentrations. 15 of these constituents have criteria and, boron, cobalt and iron concentrations exceed criteria and are considered COPC. Manganese, potassium and strontium concentrations exceed background (95th percentile UCL) and have toxicity data, however potassium is dropped as a COPC due to its metabolic nature and natural presence in the environment. In summary, boron, cobalt, iron, manganese and strontium are considered to be COPC in Coots Pond. As for Lake Ontario, because the hydrazine detection limit was above the NOEL, it is considered to be a COPC in Coots Pond.

Table D.2-9 summarizes the COPC in surface water in the existing environment that were identified for this assessment.

TABLE D.2-9
COPC IN THE SURFACE WATER EXISTING ENVIRONMENT BY LOCATION

Location	COPC in the Existing Environment
Lake Ontario	Hydrazine
Coots Pond	boron, cobalt, hydrazine, iron, manganese, strontium

D.2.2 Selection of COPC for Sediment

The screening process in Figure 3.2-7 was used to identify any potential COPC in sediment in the existing environment in Lake Ontario and Coots Pond.

In Lake Ontario (Table D.2-6), most of the concentrations in the samples were above the MDL, only 6 of the 42 measured constituents were heavily censored. Of the remaining constituents, fifteen had available regulatory criteria and all had less than 20 samples taken. Therefore, the maximum site concentration was compared to the criteria value (in this case the lowest guideline value). It was determined that 12 of the constituents exceeded criteria; however, only four of these exceeded background (95^{th} percentile UCL) and are considered COPC. Cadmium, copper, lead and selenium were identified as COPC based on sediments in Lake Ontario.

The same screening process was used to determine the COPC in Coots Pond (Table D.2-7) and only copper was found to be a COPC in sediment in the existing environment.

Table D.2-10 summarizes the COPC in sediment in the existing environment that were identified for this assessment.

TABLE D.2-10
COPC IN THE SEDIMENT EXISTING ENVIRONMENT BY LOCATION

Location	COPC in the Existing Environment
Lake Ontario	cadmium, copper, lead, selenium
Coots Pond	copper

D.2.3 Selection of COPC for Soil

The screening process in Figure 3.2-7 was used to identify any potential COPC in soil in the existing environment. For soil (Table D.2-8), all of the site data were considered together in the screening process. As seen from Table D.2-8, only mercury had measured concentrations below the MDL. Therefore, the remaining constituents were advanced for further screening as potential COPC. In the case of the soil screening, background concentrations were obtained from the

Ontario Ministry of the Environment (MOE). These background concentrations are known as the Ontario Typical Range (OTR) and the MOE generally selects the 98th percentile of this range to represent background. This value was selected as the background for the soil screen. From Table D-10, it can be seen that all measured concentrations are below criteria (where available). For constituents without criteria, only strontium and zirconium have available toxicity data and therefore these two constituents are identified as COPC from the soil screening.

D.2.4 Air Quality

As noted in Table D.1-1, the ESG 2001 EER had identified several chemical releases to air as being potential COPC. There was no air quality monitoring data collected for the COPC identified in the ESG 2001, however the Atmospheric Environment Existing Environmental Conditions TSD (December 2008), provides updated air dispersion modelling for chemical releases from DNGS within the polygon areas defined for the ERA. These updated predicted concentrations were reviewed to determine whether any emissions to the air would be considered a COPC.

As noted in the 2001 EER, a number of substances released to the atmosphere have no benchmark concentrations as they are virtually non toxic upon mixing in air. These include helium, hydrogen, nitrogen, carbon dioxide and oxygen. Ozone depleting substances could not be quantified in a way that would allow for comparison to a benchmark value. Therefore, these substances were not considered further in the risk assessment. Sulphur hexafluoride (SF_6) emissions will not be affected by the NND project, therefore it is not considered further.

Concentrations of hydrazine, ammonia, nitrogen dioxides and sulphur dioxide were predicted at several locations across the DN site at locations where biota may be exposed. The maximum predicted air concentrations across the site are provided in Table D.2-11, along with available air quality criteria and the reference benchmarks used in the ESG 2001 report.

TABLE D.2-11
PREDICTED ANNUAL AVERAGE CONCENTRATIONS IN AIR (μg/m^3)

	Annual Average Concentration (μg/m^3)	MOE AAQC (μg/m^3)	Other Criteria (μg/m^3)	Air Based Benchmarks (ESG 2001)	
				Reference Benchmark (μg/m^3)	Reference
Ammonia	1.10		100[3]	5	Compensation point in plants (Sheppard, 1999)
Hydrazine	0.000495		0.01[4]	1[5]	MOE level of concern
NO_2	31.5[1]	100[6]		560	May reduce photosynthesis (Calow, 1998)
SO_2	3.3[2]	55		380	Injury in grass

MOE – Ontario Ministry of the Environment; AAQC – Ambient Air Quality Criteria
1 Includes upwind background concentration of 21 μg/m^3
2 Includes upwind background concentration of 3.0 μg/m^3
3 IRIS database (U.S. EPA 2007)
4 Texas Commission on Environmental Quality, 2008
5 ½ hour average concentration
6 Federal Maximum Acceptable Level

Table D.2-11 shows that the predicted air concentrations are well below available air quality criteria, and are therefore are not considered further. No screening was conducted for radiological constituents emitted from NND, as they were all retained for further analysis as discussed in Appendix F.

D.3 REFERENCES

Sheppard, S.C. 1999. *Effect of Atmospheric Ammonia on Terrestrial Plants – Derivation of Critical Toxicity Values*. Report for Environment Canada, in support of Priority Substances List 2. Edmonton, Alberta.

Calow, P. (ed). 1998. *Handbook of Ecotoxicology.* Blackwell Science Ltd. Oxford.

Gensmer, R.W. and R.C. Playle 1999. *The Bioavailability and Toxicity of Aluminum in Aquatic Environments*. Critical Reviews in Environmental Science and Technology, 29(4): 315-450.

APPENDIX E
NON-RADIOLOGICAL ERA RESULTS AND CALCULATIONS

E.1 BREAKDOWN OF INTAKE

E.2 SAMPLE CALCULATION

E.1 BREAKDOWN OF INTAKE

TABLE E.1-1. INTAKE BY PATHWAY FOR POLYGON AB – COPPER

Copper	**Mammal (mg/kg-d)**								**Bird (mg/kg-d)**								
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Muskrat**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Bufflehead**	**Pied-Billed Grebe**	**Red-Eyed Vireo**	**Mallard**	**Song Sparrow**	**Yellow Warbler**
Water	$1.5x10^{-4}$	$3.2x10^{-4}$	$2.6x10^{-4}$	$1.5x10^{-4}$	$1.2x10^{-4}$	$1.3x10^{-4}$	$1.7x10^{-4}$	$9.3x10^{-5}$	$5.0x10^{-5}$	$9.7x10^{-5}$	$2.0x10^{-4}$	$6.3x10^{-5}$	$5.0x10^{-5}$	$1.8x10^{-4}$	$4.2x10^{-5}$	$2.3x10^{-4}$	$2.3x10^{-4}$
Sediment	-	-	-	$5.4x10^{-2}$	-	-	-	-	-	-	-	$1.1x10^{-1}$	$2.1x10^{-2}$	-	$2.1x10^{-2}$	-	-
Soil	$9.7x10^{-2}$	$2.5x10^{-2}$	$5.3x10^{-2}$	-	$1.1x10^{-1}$	$1.4x10^{-2}$	$1.1x10^{-1}$	$1.4x10^{-2}$	$9.0x10^{-2}$	$2.9x10^{-1}$	$1.6x10^{-1}$	-	-	$1.4x10^{-1}$	-	$1.8x10^{-1}$	$1.8x10^{-1}$
Fish	-	-	-	-	-	-	-	-	-	-	-	-	$4.4x10^{-1}$	-	-	-	-
Benthic	-	-	-	$9.0x10^{-3}$	$2.5x10^{-2}$	-	-	-	-	-	-	$2.6x10^{-1}$	$1.4x10^{-1}$	-	$1.3x10^{-1}$	-	-
Aquatic Veg	-	-	-	$4.4x10^{-1}$	-	-	-	-	-	-	-	$2.8x10^{-2}$	-	-	$4.3x10^{-2}$	-	-
Terr Veg	$8.7x10^{-1}$	$3.8x10^{-1}$	1.3	-	$2.6x10^{-1}$	$4.1x10^{-2}$	-	$3.9x10^{-1}$	$2.5x10^{-1}$	1.4	-	-	-	$1.6x10^{-1}$	-	2.2	$2.0x10^{-1}$
Earthworms	-	$7.6x10^{-1}$	-	-	-	-	-	-	$4.0x10^{-1}$	1.9	-	-	-	-	-	-	-
Insects	-	-	-	-	$3.8x10^{-1}$	-	-	-	-	-	2.5	-	-	2.1	-	$3.5x10^{-1}$	2.6
Birds	-	-	-	-	-	$9.9x10^{-3}$	-	-	$9.2x10^{-3}$	-	-	-	-	-	-	-	-
Mouse	-	-	-	-	$8.9x10^{-6}$	$9.2x10^{-6}$	$1.7x10^{-4}$	-	-	-	-	-	-	-	-	-	-
Rabbit	-	-	-	-	-	$3.2x10^{-4}$	-	-	-	-	-	-	-	-	-	-	-
Total	$9.6x10^{-1}$	1.2	1.3	$5.0x10^{-1}$	$7.9x10^{-1}$	$6.5x10^{-2}$	$1.1x10^{-1}$	$4.0x10^{-1}$	$7.5x10^{-1}$	3.6	2.6	$3.9x10^{-1}$	$6.1x10^{-1}$	2.4	$1.9x10^{-1}$	2.7	2.9

TABLE E.1-2. INTAKE BY PATHWAY FOR POLYGON AB - STRONTIUM

Strontium	**Mammal (mg/kg-d)**								**Bird (mg/kg-d)**								
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Muskrat**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Bufflehead**	**Pied-Billed Grebe**	**Red-Eyed Vireo**	**Mallard**	**Song Sparrow**	**Yellow Warbler**
Water	$7.2x10^{-2}$	$1.5x10^{-1}$	$1.3x10^{-1}$	$7.3x10^{-2}$	$6.1x10^{-2}$	$6.5x10^{-2}$	$8.2x10^{-2}$	$4.5x10^{-2}$	$2.4x10^{-2}$	$4.8x10^{-2}$	$9.8x10^{-2}$	$3.1x10^{-2}$	$2.4x10^{-2}$	$8.6x10^{-2}$	$2.0x10^{-2}$	$1.1x10^{-1}$	$1.1x10^{-1}$
Sediment	-	-	-	1.4	-	-	-	-	-	-	-	2.9	$5.5x10^{-1}$	-	$5.5x10^{-1}$	-	-
Soil	$8.2x10^{-1}$	$2.1x10^{-1}$	$4.5x10^{-1}$	-	$9.5x10^{-1}$	$1.1x10^{-1}$	$8.9x10^{-1}$	$1.2x10^{-1}$	$7.6x10^{-1}$	2.5	1.3	-	-	1.2	-	1.5	1.5
Fish	-	-	-	-	-	-	-	-	-	-	-	-	$1.8x10^{1}$	-	-	-	-
Benthic	-	-	-	2.0	5.6	-	-	-	-	-	-	$5.6x10^{1}$	$3.2x10^{1}$	-	$2.9x10^{1}$	-	-
Aquatic Veg	-	-	-	$5.6x10^{1}$	-	-	-	-	-	-	-	3.6	-	-	5.5	-	-
Terr Veg	$1.0x10^{1}$	4.6	$1.5x10^{1}$	-	3.1	$4.8x10^{-1}$	-	4.6	3.0	$1.7x10^{1}$	-	-	-	1.9	-	$2.6x10^{1}$	2.3
Earthworms	-	$1.0x10^{1}$	-	-	-	-	-	-	5.3	$2.5x10^{1}$	-	-	-	-	-	-	-
Insects	-	-	-	-	1.2	-	-	-	-	-	8.0	-	-	6.8	-	1.1	8.3
Birds	-	-	-	-	-	$2.5x10^{-2}$	-	-	$2.3x10^{-2}$	-	-	-	-	-	-	-	-
Mouse	-	-	-	-	$5.3x10^{-5}$	$5.4x10^{-5}$	$9.8x10^{-4}$	-	-	-	-	-	-	-	-	-	-
Rabbit	-	-	-	-	-	$1.9x10^{-3}$	-	-	-	-	-	-	-	-	-	-	-
Total	$1.1x10^{1}$	$1.5x10^{1}$	$1.6x10^{1}$	$6.0x10^{1}$	$1.1x10^{1}$	$6.9x10^{-1}$	$9.7x10^{-1}$	4.8	9.1	$4.5x10^{1}$	9.4	$6.3x10^{1}$	$5.0x10^{1}$	$1.0x10^{1}$	$3.5x10^{1}$	$2.8x10^{1}$	$1.2x10^{1}$

TABLE E.1-3. INTAKE BY PATHWAY FOR POLYGON AB - ZIRCONIUM

Zirconium	**Mammal (mg/kg-d)**								**Bird (mg/kg-d)**								
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Muskrat**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Bufflehead**	**Pied-Billed Grebe**	**Red-Eyed Vireo**	**Mallard**	**Song Sparrow**	**Yellow Warbler**
Water	2.1×10^{-4}	4.5×10^{-4}	3.8×10^{-4}	2.2×10^{-4}	1.8×10^{-4}	1.9×10^{-4}	2.4×10^{-4}	1.3×10^{-4}	7.2×10^{-5}	1.4×10^{-4}	2.9×10^{-4}	9.1×10^{-5}	7.2×10^{-5}	2.5×10^{-4}	6.0×10^{-5}	3.3×10^{-4}	3.2×10^{-4}
Sediment	-	-	-	7.2×10^{-2}	-	-	-	-	-	-	-	1.5×10^{-1}	2.8×10^{-2}	-	2.8×10^{-2}	-	-
Soil	3.0×10^{-1}	7.8×10^{-2}	1.7×10^{-1}	-	3.5×10^{-1}	4.2×10^{-2}	3.3×10^{-1}	4.4×10^{-2}	2.8×10^{-1}	9.1×10^{-1}	4.9×10^{-1}	-	-	4.4×10^{-1}	-	5.6×10^{-1}	5.5×10^{-1}
Fish	-	-	-	-	-	-	-	-	-	-	-	-	1.3×10^{-1}	-	-	-	-
Benthic	-	-	-	1.3×10^{-2}	3.6×10^{-2}	-	-	-	-	-	-	3.7×10^{-1}	2.1×10^{-1}	-	1.9×10^{-1}	-	-
Aquatic Veg	-	-	-	1.9×10^{-6}	-	-	-	-	-	-	-	1.2×10^{-7}	-	-	1.9×10^{-7}	-	-
Terr Veg	5.6×10^{-2}	2.5×10^{-2}	8.3×10^{-2}	-	1.7×10^{-2}	2.6×10^{-3}	-	2.5×10^{-2}	1.6×10^{-2}	9.3×10^{-2}	-	-	-	1.1×10^{-2}	-	1.4×10^{-1}	1.3×10^{-2}
Earthworms	-	3.3×10^{-1}	-	-	-	-	-	-	1.7×10^{-1}	8.2×10^{-1}	-	-	-	-	-	-	-
Insects	-	-	-	-	1.7×10^{-3}	-	-	-	-	-	1.1×10^{-2}	-	-	9.3×10^{-3}	-	1.5×10^{-3}	1.1×10^{-2}
Birds	-	-	-	-	-	2.2×10^{-7}	-	-	2.1×10^{-7}	-	-	-	-	-	-	-	-
Mouse	-	-	-	-	1.7×10^{-10}	1.7×10^{-10}	3.1×10^{-9}	-	-	-	-	-	-	-	-	-	-
Rabbit	-	-	-	-	-	1.4×10^{-8}	-	-	-	-	-	-	-	-	-	-	-
Total	3.6×10^{-1}	4.3×10^{-1}	2.5×10^{-1}	8.5×10^{-2}	4.1×10^{-1}	4.5×10^{-2}	3.3×10^{-1}	7.0×10^{-2}	4.7×10^{-1}	1.8	5.0×10^{-1}	5.2×10^{-1}	3.7×10^{-1}	4.6×10^{-1}	2.2×10^{-1}	7.1×10^{-1}	5.8×10^{-1}

TABLE E.1-4. INTAKE BY PATHWAY FOR POLYGON C – STRONTIUM

Strontium	Mammal							Birds
Pathway	Eastern Cotton-tail Rabbit	Deer Mouse	Meadow Vole	Raccoon	Red Fox	Weasel	White-Tailed Deer	Yellow Warbler
Soil	$7.4x10^{-1}$	$1.9x10^{-1}$	$4.1x10^{-1}$	$8.5x10^{-1}$	$1.0x10^{-1}$	$8.0x10^{-1}$	$1.1x10^{-1}$	1.4
Terr Veg	3.4	1.5	5.1	1.1	$1.6x10^{-1}$	-	1.5	$7.8x10^{-1}$
Earthworms	-	2.5	-	-	-	-	-	-
Insects	-	-	-	$1.4x10^{-1}$	-	-	-	$9.2x10^{-1}$
Birds	-	-	-	-	$4.9x10^{-3}$	-	-	-
Mouse	-	-	-	$1.8x10^{-5}$	$1.9x10^{-5}$	$3.4x10^{-4}$	-	-
Rabbit	-	-	-	-	$7.0x10^{-4}$	-	-	-
Total	4.2	4.2	5.5	2.0	$2.7x10^{-1}$	$8.0x10^{-1}$	1.7	3.0

TABLE E.1-5. INTAKE BY PATHWAY FOR POLYGON C – ZIRCONIUM

Zirconium	Mammal							Birds
Pathway	Eastern Cotton-tail Rabbit	Deer Mouse	Meadow Vole	Raccoon	Red Fox	Weasel	White-Tailed Deer	Yellow Warbler
Soil	$3.0x10^{-1}$	$7.8x10^{-2}$	$1.7x10^{-1}$	$3.5x10^{-1}$	$4.2x10^{-2}$	$3.3x10^{-1}$	$4.4x10^{-2}$	$5.6x10^{-1}$
Terr Veg	$9.8x10^{-3}$	$4.3x10^{-3}$	$1.4x10^{-2}$	$3.0x10^{-3}$	$4.6x10^{-4}$	-	$4.4x10^{-3}$	$2.2x10^{-3}$
Earthworms	-	$1.1x10^{-1}$	-	-	-	-	-	-
Insects	-	-	-	$1.7x10^{-3}$	-	-	-	$1.1x10^{-2}$
Birds	-	-	-	-	$1.6x10^{-7}$	-	-	-
Mouse	-	-	-	$1.2x10^{-10}$	$1.2x10^{-10}$	$2.3x10^{-9}$	-	-
Rabbit	-	-	-	-	$1.1x10^{-8}$	-	-	-
Total	$3.1x10^{-1}$	$1.9x10^{-1}$	$1.8x10^{-1}$	$3.6x10^{-1}$	$4.3x10^{-2}$	$3.3x10^{-1}$	$4.9x10^{-2}$	$5.7x10^{-1}$

TABLE E.1-6. INTAKE BY PATHWAY FOR POLYGON D – STRONTIUM

Strontium	Mammal							Birds					
Pathway	Eastern Cotton-tail Rabbit	Deer Mouse	Meadow Vole	Raccoon	Red Fox	Weasel	White-Tailed Deer	American Crow	American Robin	Bank Swallow	Red-Eyed Vireo	Song Sparrow	Yellow Warbler
Water	$3.0x10^{-2}$	$6.3x10^{-2}$	$5.3x10^{-2}$	$2.5x10^{-2}$	$2.6x10^{-2}$	$3.3x10^{-2}$	$1.9x10^{-2}$	$1.0x10^{-2}$	$1.9x10^{-2}$	$4.0x10^{-2}$	$3.5x10^{-2}$	$4.6x10^{-2}$	$4.5x10^{-2}$
Soil	1.2	$3.2x10^{-1}$	$6.8x10^{-1}$	1.4	$1.7x10^{-1}$	1.4	$1.8x10^{-1}$	1.1	3.8	2.0	1.8	2.3	2.3
Benthic	-	-	-	$1.3x10^{1}$	-	-	-	-	-	-	-	-	-
Terr Veg	5.5	2.4	8.1	1.7	$2.6x10^{-1}$	-	2.5	1.6	9.0	-	1.0	$1.4x10^{1}$	1.2
Earthworms	-	5.4	-	-	-	-	-	2.9	$1.3x10^{1}$	-	-	-	-
Insects	-	-	-	$5.1x10^{-1}$	-	-	-	-	-	3.3	2.8	$4.6x10^{-1}$	3.4
Birds	-	-	-	-	$5.9x10^{-2}$	-	-	$5.4x10^{-2}$	-	-	-	-	-
Mouse	-	-	-	$3.1x10^{-5}$	$3.1x10^{-5}$	$5.7x10^{-4}$	-	-	-	-	-	-	-
Rabbit	-	-	-	-	$1.2x10^{-3}$	-	-	-	-	-	-	-	-
Total	6.8	8.2	8.8	5.9	$4.7x10^{-1}$	1.4	2.7	5.6	$2.6x10^{1}$	5.3	5.7	$1.6x10^{1}$	7.0

TABLE E.1-7. INTAKE BY PATHWAY FOR POLYGON D – ZIRCONIUM

Zirconium	**Mammal**							**Birds**					
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Red-Eyed Vireo**	**Song Sparrow**	**Yellow Warbler**
Water	$2.0x10^{-3}$	$4.2x10^{-3}$	$3.5x10^{-3}$	$1.6x10^{-3}$	$1.8x10^{-3}$	$2.2x10^{-3}$	$1.2x10^{-3}$	$6.7x10^{-4}$	$1.3x10^{-3}$	$2.7x10^{-3}$	$2.4x10^{-3}$	$3.0x10^{-3}$	$3.0x10^{-3}$
Soil	$3.2x10^{-1}$	$8.3x10^{-2}$	$1.8x10^{-1}$	$3.7x10^{-1}$	$4.5x10^{-2}$	$3.5x10^{-1}$	$4.7x10^{-2}$	$3.0x10^{-1}$	$9.7x10^{-1}$	$5.2x10^{-1}$	$4.6x10^{-1}$	$6.0x10^{-1}$	$5.9x10^{-1}$
Benthic	-	-	-	$7.1x10^{-1}$	-	-	-	-	-	-	-	-	-
Terr Veg	$2.0x10^{-2}$	$8.6x10^{-3}$	$2.9x10^{-2}$	$5.9x10^{-3}$	$9.2x10^{-4}$	-	$8.8x10^{-3}$	$5.7x10^{-3}$	$3.2x10^{-2}$	-	$3.6x10^{-3}$	$4.9x10^{-2}$	$4.4x10^{-3}$
Earthworms	-	1.6	-	-	-	-	-	$8.4x10^{-1}$	4.0	-	-	-	-
Insects	-	-	-	$1.7x10^{-3}$	-	-	-	-	-	$1.1x10^{-2}$	$9.3x10^{-3}$	$1.5x10^{-3}$	$1.1x10^{-2}$
Birds	-	-	-	-	$2.9x10^{-6}$	-	-	$2.7x10^{-6}$	-	-	-	-	-
Mouse	-	-	-	$5.4x10^{-10}$	$5.6x10^{-10}$	$1.0x10^{-8}$	-	-	-	-	-	-	-
Rabbit	-	-	-	-	$1.2x10^{-8}$	-	-	-	-	-	-	-	-
Total	$3.4x10^{-1}$	1.7	$2.1x10^{-1}$	$7.2x10^{-1}$	$4.8x10^{-2}$	$3.5x10^{-1}$	$5.7x10^{-2}$	1.1	5.0	$5.4x10^{-1}$	$4.8x10^{-1}$	$6.5x10^{-1}$	$6.1x10^{-1}$

TABLE E.1-8. INTAKE BY PATHWAY FOR LAKE ONTARIO – CADMIUM

Cadmium	**Birds**		
Pathway	**Bufflehead**	**Pied-Billed Grebe**	**Mallard**
Water	$2.1x10^{-6}$	$1.7x10^{-6}$	$1.4x10^{-6}$
Sediment	$5.4x10^{-3}$	$1.0x10^{-3}$	$1.0x10^{-3}$
Fish	-	$9.3x10^{-3}$	-
Benthic	$3.8x10^{-2}$	$2.1x10^{-2}$	$1.9x10^{-2}$
Aquatic Veg	$7.2x10^{-4}$	-	$1.1x10^{-3}$
Total	$4.4x10^{-2}$	$3.2x10^{-2}$	$2.1x10^{-2}$

TABLE E.1-9. INTAKE BY PATHWAY FOR LAKE ONTARIO – COPPER

Copper	**Birds**		
Pathway	**Bufflehead**	**Pied-Billed Grebe**	**Mallard**
Water	$5.0x10^{-5}$	$3.9x10^{-5}$	$3.2x10^{-5}$
Sediment	$1.8x10^{-1}$	$3.5x10^{-2}$	$3.5x10^{-2}$
Fish	-	$3.5x10^{-1}$	-
Benthic	$3.6x10^{-1}$	$2.0x10^{-1}$	$1.8x10^{-1}$
Aquatic Veg	$2.2x10^{-2}$	-	$3.4x10^{-2}$
Total	$5.7x10^{-1}$	$5.9x10^{-1}$	$2.5x10^{-1}$

TABLE E.1-10. INTAKE BY PATHWAY FOR LAKE ONTARIO – LEAD

Lead	**Birds**		
Pathway	**Bufflehead**	**Pied-Billed Grebe**	**Mallard**
Water	$7.8x10^{-6}$	$6.2x10^{-6}$	$5.1x10^{-6}$
Sediment	$1.6x10^{-1}$	$3.1x10^{-2}$	$3.1x10^{-2}$
Fish	-	$5.2x10^{-2}$	-
Benthic	$1.3x10^{-1}$	$7.5x10^{-2}$	$6.8x10^{-2}$
Aquatic Veg	$5.3x10^{-4}$	-	$8.0x10^{-4}$
Total	$3.0x10^{-1}$	$1.6x10^{-1}$	$9.9x10^{-2}$

TABLE E.1-11. INTAKE BY PATHWAY FOR LAKE ONTARIO – SELENIUM

Selenium	**Birds**		
Pathway	**Bufflehead**	**Pied-Billed Grebe**	**Mallard**
Water	$2.2x10^{-5}$	$1.7x10^{-5}$	$1.4x10^{-5}$
Sediment	$8.4x10^{-3}$	$1.6x10^{-3}$	$1.6x10^{-3}$
Fish	-	$1.5x10^{-1}$	-
Benthic	$9.9x10^{-2}$	$5.6x10^{-2}$	$5.0x10^{-2}$
Aquatic Veg	$6.1x10^{-4}$	-	$9.3x10^{-4}$
Total	$1.1x10^{-1}$	$2.0x10^{-1}$	$5.3x10^{-2}$

TABLE E.1-12. PERCENT INTAKE BY PATHWAY FOR POLYGON AB – COPPER

Copper	Mammal (mg/kg-d)								Bird (mg/kg-d)								
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Muskrat**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Bufflehead**	**Pied-Billed Grebe**	**Red-Eyed Vireo**	**Mallard**	**Song Sparrow**	**Yellow Warbler**
Water	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.02%	0.0%	0.0%	0.0%	0.0%	0.0%
Sediment	-	-	-	10.7%	-	-	-	-	-	-	-	28.1%	3.5%	-	10.9%	-	-
Soil	10.1%	2.1%	4.0%	-	14.3%	21.0%	99.7%	3.5%	11.9%	8.1%	6.0%	-	-	5.8%	-	6.7%	6.0%
Fish	-	-	-	-	-	-	-	-	-	-	-	-	72.8%	-	-	-	-
Benthic	-	-	-	1.8%	3.2%	-	-	-	-	-	-	64.7%	23.8%	-	66.8%	-	-
Aquatic Veg	-	-	-	87.5%	-	-	-	-	-	-	-	7.2%	-	-	22.3%	-	-
Terr Veg	89.9%	32.7%	96.0%	-	33.6%	62.9%	-	96.5%	33.4%	39.4%	-	-	-	6.7%	-	80.3%	6.7%
Earthworms	-	65.2%	-	-	-	-	-	-	53.4%	52.5%	-	-	-	-	-	-	-
Insects	-	-	-	-	48.9%	-	-	-	-	-	94.0%	-	-	87.6%	-	13.0%	87.3%
Birds	-	-	-	-	-	15.4%	-	-	1.2%	-	-	-	-	-	-	-	-
Mouse	-	-	-	-	0.001%	0.014%	0.2%	-	-	-	-	-	-	-	-	-	-
Rabbit	-	-	-	-	-	0.5%	-	-	-	-	-	-	-	-	-	-	-
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE E.1-13. PERCENT INTAKE BY PATHWAY FOR POLYGON AB - STRONTIUM

Strontium	Mammal (mg/kg-d)								Bird (mg/kg-d)								
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Muskrat**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Bufflehead**	**Pied-Billed Grebe**	**Red-Eyed Vireo**	**Mallard**	**Song Sparrow**	**Yellow Warbler**
Water	0.6%	1.0%	0.8%	0.1%	0.6%	9.4%	8.4%	0.9%	0.3%	0.1%	1.0%	0.05%	0.0%	0.9%	0.1%	0.4%	0.9%
Sediment	-	-	-	2.4%	-	-	-	-	-	-	-	4.6%	1.1%	-	1.6%	-	-
Soil	7.3%	1.4%	2.9%	-	8.7%	16.6%	91.5%	2.5%	8.3%	5.5%	14.2%	-	-	11.8%	-	5.4%	12.3%
Fish	-	-	-	-	-	-	-	-	-	-	-	-	35.6%	-	-	-	-
Benthic	-	-	-	3.3%	50.8%	-	-	-	-	-	-	89.6%	63.2%	-	82.5%	-	-
Aquatic Veg	-	-	-	94.2%	-	-	-	-	-	-	-	5.8%	-	-	15.9%	-	-
Terr Veg	92.0%	30.2%	96.3%	-	28.7%	70.1%	-	96.6%	32.8%	37.9%	-	-	-	19.2%	-	90.3%	19.1%
Earthworms	-	67.4%	-	-	-	-	-	-	58.4%	56.4%	-	-	-	-	-	-	-
Insects	-	-	-	-	11.3%	-	-	-	-	-	84.8%	-	-	68.1%	-	3.9%	67.7%
Birds	-	-	-	-	-	3.6%	-	-	0.2%	-	-	-	-	-	-	-	-
Mouse	-	-	-	-	0.000%	0.008%	0.1%	-	-	-	-	-	-	-	-	-	-
Rabbit	-	-	-	-	-	0.3%	-	-	-	-	-	-	-	-	-	-	-
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE E.1-14. PERCENT INTAKE BY PATHWAY FOR POLYGON AB - ZIRCONIUM

Zirconium	**Mammal (mg/kg-d)**								**Bird (mg/kg-d)**								
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Muskrat**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Bufflehead**	**Pied-Billed Grebe**	**Red-Eyed Vireo**	**Mallard**	**Song Sparrow**	**Yellow Warbler**
Water	0.1%	0.1%	0.2%	0.3%	0.04%	0.4%	0.1%	0.2%	0.02%	0.01%	0.1%	0.02%	0.02%	0.1%	0.03%	0.05%	0.1%
Sediment	-	-	-	84.5%	-	-	-	-	-	-	-	28.7%	7.6%	-	13.1%	-	-
Soil	84.3%	18.0%	66.6%	-	86.4%	93.7%	99.9%	63.5%	59.6%	50.0%	97.8%	-	-	95.6%	-	79.8%	95.8%
Fish	-	-	-	-	-	-	-	-	-	-	-	-	35.7%	-	-	-	-
Benthic	-	-	-	15.2%	8.9%	-	-	-	-	-	-	71.3%	56.7%	-	86.9%	-	-
Aquatic Veg	-	-	-	0.0%	-	-	-	-	-	-	-	0.0%	-	-	0.0%	-	-
Terr Veg	15.7%	5.8%	33.3%	-	4.2%	5.9%	-	36.3%	3.5%	5.1%	-	-	-	2.3%	-	19.9%	2.2%
Earthworms	-	76.2%	-	-	-	-	-	-	36.9%	44.9%	-	-	-	-	-	-	-
Insects	-	-	-	-	0.4%	-	-	-	-	-	2.1%	-	-	2.0%	-	0.2%	1.9%
Birds	-	-	-	-	-	0.0%	-	-	0.0%	-	-	-	-	-	-	-	-
Mouse	-	-	-	-	0.0%	0.0%	0.0%	-	-	-	-	-	-	-	-	-	-
Rabbit	-	-	-	-	-	0.0%	-	-	-	-	-	-	-	-	-	-	-
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE E.1-15. PERCENT INTAKE BY PATHWAY FOR POLYGON C – STRONTIUM

Strontium	**Mammal**							**Birds**
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**Yellow Warbler**
Soil	17.6%	4.5%	7.4%	41.8%	38.1%	100.0%	6.5%	44.3%
Terr Veg	82.4%	35.9%	92.6%	51.5%	59.8%	-	93.5%	25.6%
Earthworms	-	59.7%	-	-	-	-	-	-
Insects	-	-	-	6.7%	-	-	-	30.1%
Birds	-	-	-	-	1.8%	-	-	-
Mouse	-	-	-	0.001%	0.01%	0.04%	-	-
Rabbit	-	-	-	-	0.3%	-	-	-
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE E.1-16. PERCENT INTAKE BY PATHWAY FOR POLYGON C – ZIRCONIUM

Zirconium	**Mammal**							**Birds**
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**Yellow Warbler**
Soil	96.9%	41.1%	92.0%	98.7%	98.9%	100.0%	91.0%	97.6%
Terr Veg	3.1%	2.3%	8.0%	0.8%	1.1%	-	9.0%	0.4%
Earthworms	-	56.6%	-	-	-	-	-	-
Insects	-	-	-	0.5%	-	-	-	2.0%
Birds	-	-	-	-	0.0%	-	-	-
Mouse	-	-	-	0.0%	0.0%	0.0%	-	-
Rabbit	-	-	-	-	0.0%	-	-	-
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE E.1-17. PERCENT INTAKE BY PATHWAY FOR POLYGON D – STRONTIUM

Strontium	**Mammal**							**Birds**					
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Red-Eyed Vireo**	**Song Sparrow**	**Yellow Warbler**
Water	0.4%	0.8%	0.6%	0.4%	5.6%	2.4%	0.7%	0.2%	0.1%	0.7%	0.6%	0.3%	0.6%
Soil	18.4%	3.9%	7.7%	24.3%	37.1%	97.6%	6.8%	20.5%	14.3%	37.9%	31.6%	14.1%	32.7%
Benthic	-	-	-	223.7%	-	-	-	-	-	-	-	-	-
Terr Veg	81.1%	29.4%	91.7%	28.3%	54.9%	-	92.5%	28.3%	34.3%	-	18.1%	82.9%	17.9%
Earthworms	-	65.9%	-	-	-	-	-	50.9%	51.3%	-	-	-	-
Insects	-	-	-	8.6%	-	-	-	-	-	61.3%	49.6%	2.8%	48.8%
Birds	-	-	-	-	12.5%	-	-	1.0%	-	-	-	-	-
Mouse	-	-	-	0.0%	0.0%	0.0%	-	-	-	-	-	-	-
Rabbit	-	-	-	-	0.2%	-	-	-	-	-	-	-	-
Total	100.0%	100.0%	100.0%	285.4%	110.4%	100.0%	100.0%	100.8%	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE E.1-18. PERCENT INTAKE BY PATHWAY FOR POLYGON D – ZIRCONIUM

Zirconium	**Mammal**							**Birds**					
Pathway	**Eastern Cotton-tail Rabbit**	**Deer Mouse**	**Meadow Vole**	**Raccoon**	**Red Fox**	**Weasel**	**White-Tailed Deer**	**American Crow**	**American Robin**	**Bank Swallow**	**Red-Eyed Vireo**	**Song Sparrow**	**Yellow Warbler**
Water	0.6%	0.2%	1.7%	0.2%	3.7%	0.6%	2.2%	0.1%	0.0%	0.5%	0.5%	0.5%	0.5%
Soil	93.8%	4.9%	84.6%	51.9%	94.4%	99.4%	82.5%	26.1%	19.6%	97.5%	96.8%	91.9%	96.9%
Benthic	-	-	-	98.8%	-	-	-	-	-	-	-	-	-
Terr Veg	5.7%	0.5%	13.7%	0.8%	1.9%	-	15.3%	0.5%	0.6%	-	0.8%	7.4%	0.7%
Earthworms	-	94.3%	-	-	-	-	-	73.4%	79.8%	-	-	-	-
Insects	-	-	-	0.2%	-	-	-	-	-	2.0%	1.9%	0.2%	1.8%
Birds	-	-	-	-	0.0%	-	-	0.0%	-	-	-	-	-
Mouse	-	-	-	0.0%	0.0%	0.0%	-	-	-	-	-	-	-
Rabbit	-	-	-	-	0.0%	-	-	-	-	-	-	-	-
Total	100.0%	100.0%	100.0%	152.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

TABLE E.1-19. PERCENT INTAKE BY PATHWAY FOR LAKE ONTARIO – CADMIUM

Cadmium	**Birds**		
Pathway	**Bufflehead**	**Pied-Billed Grebe**	**Mallard**
Water	0.00%	0.01%	0.01%
Sediment	12.2%	3.2%	4.8%
Fish	-	29.4%	-
Benthic	86.2%	67.4%	90.1%
Aquatic Veg	1.6%	-	5.1%
Total	100.0%	100.0%	100.0%

TABLE E.1-20. PERCENT INTAKE BY PATHWAY FOR LAKE ONTARIO – COPPER

Copper	**Birds**		
Pathway	**Bufflehead**	**Pied-Billed Grebe**	**Mallard**
Water	0.01%	0.01%	0.01%
Sediment	32.4%	5.9%	13.9%
Fish	-	59.5%	-
Benthic	63.6%	34.6%	72.7%
Aquatic Veg	3.9%	-	13.4%
Total	100.0%	100.0%	100.0%

TABLE E.1-21. PERCENT INTAKE BY PATHWAY FOR LAKE ONTARIO – LEAD

Lead	**Birds**		
Pathway	**Bufflehead**	**Pied-Billed Grebe**	**Mallard**
Water	0.003%	0.004%	0.005%
Sediment	54.7%	19.4%	31.0%
Fish	-	32.9%	-
Benthic	45.1%	47.7%	68.2%
Aquatic Veg	0.2%	-	0.8%
Total	100.0%	100.0%	100.0%

TABLE E.1-22. PERCENT INTAKE BY PATHWAY FOR LAKE ONTARIO – SELENIUM

Selenium	**Birds**		
Pathway	**Bufflehead**	**Pied-Billed Grebe**	**Mallard**
Water	0.02%	0.01%	0.03%
Sediment	7.8%	0.8%	3.0%
Fish	-	71.9%	-
Benthic	91.6%	27.3%	95.2%
Aquatic Veg	0.6%	-	1.8%
Total	100.0%	100.0%	100.0%

E.2 SAMPLE CALCULATION

Note:
FW indicates fresh weight / DW indicates dry weight

Strontium – Polygon AB

Parameter	Units	Symbol	Value	Reference or Equation
Water -to-aquatic vegetation transfer factor	L/kg (FW)	TFav	260	Bird and Schwartz 1996
Water-to-benthic invertebrate transfer factor	L/kg (FW)	TFbi	450	Bird and Schwartz 1996
Feed-to-flesh transfer factor for mammals	d/kg (FW)	TFmam	0.005	IAEA 1994, NCRP 1996, Baes et al. 1984, U.S. EPA 1998, CSA 1987
Water concentration	mg/L	Watc	0.734	Maximum concentration in Coots Pond
Soil concentration	mg/kg (DW)	Soilc	200	Maximum concentration in Polygon AB
Sediment concentration	mg/kg (DW)	Sedc	701.61	Maximum concentration in Coots Pond
Terrestrial Vegetation concentration (in DW)	mg/kg (DW)	TvegcDW	155.8	Maximum concentration in Polygon AB
Terrestrial Vegetation concentration (in FW)	mg/kg (FW)	Tvegc	46.7	converted from DW to FW using an assumed moisture content of 70% =TvegcDW*(1-0.7)
Earthworm concentration (in FW)	mg/kg (FW)	Wormc	104.23	Maximum concentration in Polygon AB
Insect concentration (in FW)	mg/kg (FW)	Insc	18.38	Maximum concentration in Polygon AB
Aquatic Vegetation concentration	mg/kg (FW)	Avegc	190.84	=Watc * Tfav
Benthic Invertebrates concentration	mg/kg (FW)	Benc	330.3	=Watc * Tfbi
Mouse concentration	mg/kg (FW)		see below	Max of Meadow Vole and Deer Mouse concentrations using feed-to-flesh transfer factor
Bufflehead				
Body weight	kg	BWbh	0.473	Cornell 2003, NatureServe 2008
Water ingestion rate	L/d	QwatLbh	0.04	U.S. EPA 1993 (allometric scaling)
Sediment ingestion rate	g DW/d	Qseddwbh	3.9	Beyer et al. 1994
Food ingestion rate	g FW/d	Qffwbh	179	U.S. EPA 1993 (allometric scaling)
Fraction of food that is aquatic vegetation	-	favbh	0.1	NatureServe 2008, Cornell 2003
Fraction of food that is benthic invertebrates	-	fbibh	0.9	NatureServe 2008, Cornell 2003
Toxicity Reference Value (NOAEL)	mg/kg-d	toxbh	-	TRV not available
Fraction of time at site	-	flocbh	0.5	assumed to be at the site 6 months a year
Intake of COC from water by body weight	mg/kg-d	Iwbh	3.10E-02	=QwatLbh*Watc*flocbh/BWbh
Intake of COC from sediment by body weight	mg/kg-d	Isedbh	2.89E+00	=(Qseddwbh/1000)*Sedc*flocbh/BWbh
Intake of COC from aquatic vegetation by body weight	mg/kg-d	Iavbh	3.61E+00	=(Qffwbh*favbh/1000)*Avegc*flocbh/BWbh

Parameter	Units	Symbol	Value	Reference or Equation
Intake of COC from benthic invertebrates by body weight	mg/kg-d	Ibibh	5.62E+01	=(Qffwbh*fbibh/1000)*Benc*flocbh/BWbh
Total intake	mg/kg-d	Itotbh	6.28E+01	=Iwbh+Isedbh+Iavbh+Ibibh
Screening Index	-	SIbh	**n/a**	=Itotbh/toxbh
Deer Mouse				
Body weight	kg	BWdm	0.019	U.S. EPA 1993
Water ingestion rate	L/d	QwatLdm	0.004	U.S. EPA 1993
Soil ingestion rate	g DW/d	Qsdwdm	0.02	Beyer et al. (1994)
Food ingestion rate	g FW/d	Qffwdm	3.7	U.S. EPA 1993
Fraction of food that is terrestrial vegetation	-	ftvdm	0.5	U.S. EPA 1993
Fraction of food that is earthworms	-	fewdm	0.5	U.S. EPA 1993
Toxicity Reference Value (NOAEL)	mg/kg-d	toxdm	263	Sample et al. (1996)
Fraction of time at site	-	flocdm	1	assumed to be at the site year round
Intake of COC from water by body weight	mg/kg-d	Iwdm	1.55E-01	=QwatLdm*Watc*flocdm/BWdm
Intake of COC from soil by body weight	mg/kg-d	Isdm	2.11E-01	=(Qsdwdm/1000)*Soilc*flocdm/BWdm
Intake of COC from terrestrial vegetation by body weight	mg/kg-d	Itvdm	4.55E+00	=(Qffwdm*ftvdm/1000)*Tvegc*flocdm/BWdm
Intake of COC from earthworm by body weight	mg/kg-d	Iewdm	1.01E+01	=(Qffwdm*fewdm/1000)*Wormc*flocdm/BWdm
Total intake	mg/kg-d	Itotdm	1.51E+01	=Iwdm+Isdm+Itvdm+Iewdm
Screening Index	-	SIdm	**0.06**	=Itotdm/toxdm
Deer mouse concentration	mg/kg (FW)	Dmousec	1.43E-03	=Itotdm*BWdm*TFmam
Meadow Vole				
Body weight	kg	BWmv	0.04	NatureServe 2007, U.S. EPA 1993, Neuburger, T. 1999
Water ingestion rate	L/d	QwatLmv	0.007	U.S. EPA 1993
Soil ingestion rate	g DW/d	Qsdwmv	0.09	Beyer et al. (1994)
Food ingestion rate	g FW/d	Qffwmv	13	U.S. EPA 1993
Fraction of food that is terrestrial vegetation	-	ftvmv	1	U.S. EPA 1993, assumed
Toxicity Reference Value (NOAEL)	mg/kg-d	toxmv	263	Sample et al. (1996)
Fraction of time at site	-	flocmv	1	assumed to be at the site year round

Parameter	Units	Symbol	Value	Reference or Equation
Intake of COC from water by body weight	mg/kg-d	Iwmv	1.28E-01	=QwatLmv*Watc*flocmv/BWmv
Intake of COC from soil by body weight	mg/kg-d	Ismv	4.50E-01	=(Qsdwmv/1000)*Soilc*flocmv/BWmv
Intake of COC from terrestrial vegetation by body weight	mg/kg-d	Itvmv	1.52E+01	=(Qffwmv*ftvmv/1000)*Tvegc*flocmv/BWmv
Total intake	mg/kg-d	Itotmv	1.58E+01	=Iwmv+Ismv+Itvmv
Screening Index	-	SImv	**0.06**	=Itotmv/toxmv
Meadow vole concentration	mg/kg (FW)	Mvolec	3.16E-03	=Itotmv*BWmv*TFmam
Raccoon				
Body weight	kg	BWra	5.7	U.S. EPA 1993
Water ingestion rate	L/d	QwatLra	0.47	U.S. EPA 1993
Soil ingestion rate	g DW/d	Qsdwra	27	Beyer et al. (1994)
Food ingestion rate	g FW/d	Qffwra	958	U.S. EPA 1993 (allometric scaling)
Fraction of food that is terrestrial vegetation	-	ftvra	0.4	U.S. EPA 1993, assumed
Fraction of food that is benthic invertebrates	-	fbira	0.1	U.S. EPA 1993, assumed
Fraction of food that is insects	-	finra	0.4	U.S. EPA 1993, assumed
Fraction of food that is mouse	-	fmoura	0.1	U.S. EPA 1993, assumed
Toxicity Reference Value	mg/kg-d	toxra	263	Sample et al. (1996)
Fraction of time at site	-	flocra	1	assumed to be at the site year round
Intake of COC from water by body weight	mg/kg-d	Iwra	6.05E-02	=QwatLra*Watc*flocra/BWra
Intake of COC from soil by body weight	mg/kg-d	Isra	9.47E-01	=(Qsdwra/1000)*Soilc*flocra/BWra
Intake of COC from terrestrial vegetation by body weight	mg/kg-d	Itvra	3.14E+00	=(Qffwra*ftvra/1000)*Tvegc*flocra/BWra
Intake of COC from benthic invertebrates by body weight	mg/kg-d	Ibira	5.55E+00	=(Qffwra*fbira/1000)*Benc*flocra/Bwra
Intake of COC from insects body weight	mg/kg-d	Iinra	1.24E+00	=(Qffwra*finra/1000)*Insc*flocra/BWra
Intake of COC from mouse by body weight	mg/kg-d	Imoura	5.30E-05	=(Qffwra*fmoura/1000)*max(Dmousec,Mvolec)*flocra/BWra
Total intake	mg/kg-d	Itotra	1.09E+01	=Iwra+Isra+Itvra+Ibira+Iinra+Imoura
Screening Index	-	Sira	**0.04**	=Itotra/toxra

APPENDIX F

RADIOACTIVITY CALCULATIONS

APPENDIX F.1
TRANSFER FACTORS AND DOSE CONVERSION COEFFICIENTS

TABLE F.1-1
SUMMARY OF UPPER ESTIMATE OF TRANSFER FACTORS USED IN RADIOLOGICAL UPTAKE CALCULATIONS

Terrestrial Environment

Element	Soil to Vegetation TF (kg/kg dw)		Soil to Berries TF (kg/kg dw)		Earthworms	
	Value	Reference	Value	Reference	Value	Reference
C-14	2.50E+01	Sheppard et al. (1994)	7.00E-01	PNNL (2003)	1.00E+00	assumed[b]
H-3	1.00E+00	assumed[a]	1.00E+00	assumed[a]	1.00E+00	assumed[a]
Sr-90	3.00E+00	GENII, 2003, Table D.7	2.50E-01	Baes *et al.* 1984	1.00E+00	assumed[b]
Co-60	2.30E-01	GENII, 2003, Table D.7	7.00E-03	Baes *et al.* 1984 and PNNL (2003)	1.00E+00	assumed[b]
Cs-134	4.60E-01	GENII, 2003, Table D.7	2.20E-01	GENII, 2003, Table D.5	1.00E+00	assumed[b]
I-131	4.00E-02	GENII, 2003, Table D.7	4.00E-02	GENII, 2003, Table D.5	1.00E+00	assumed[b]
Cs-137	4.60E-01	GENII, 2003, Table D.7)	2.20E-01	GENII, 2003, Table D.5	1.00E+00	assumed[b]

Element	Bird Ingestion TF (d/kg fw)		Mammal Ingestion[c] TF (d/kg fw) - Rabbit		Mammal Ingestion[c] TF (d/kg fw) - Deer	
	Value	Reference	Value	Reference	Value	Reference
C-14	8.50E+00	CSA, 2008, Table G3	8.90E+00	CSA, 2008, Table G3	6.20E-01	CSA, 2008, Table G3
H-3	1.00E+00	assumed[a]	1.00E+00	assumed[a]	1.00E+00	assumed[a]
Sr-90	7.60E-02	CSA, 2008, Table G3	1.90E-01	CSA, 2008, Table G3	4.00E-02	CSA, 2008, Table G3
Co-60	1.20E+00	CSA, 2008, Table G3	1.80E-01	CSA, 2008, Table G3	1.20E-02	CSA, 2008, Table G3
Cs-134	4.40E+00	CSA, 2008, Table G3	1.10E+02	CSA, 2008, Table G3	1.50E-01	CSA, 2008, Table G3
I-131	8.70E-01	CSA, 2008, Table G3	4.60E-01	CSA, 2008, Table G3	3.20E-02	CSA, 2008, Table G3
Cs-137	4.40E+00	CSA, 2008, Table G3	1.10E+02	CSA, 2008, Table G3	1.50E-01	CSA, 2008, Table G3

TABLE F.1-1 (con't)
SUMMARY OF UPPER ESTIMATE OF TRANSFER FACTORS USED IN RADIOLOGICAL UPTAKE CALCULATIONS

Freshwater Aquatic Environment

Element	Sediment-Water, K_d (L/kg dw)		Water to Aquatic Plant TF (L/kg dw)		Water to Benthic Invertebrate TF (L/kg fw)	
	Value	Reference[d]	Value	Reference	Value	Reference
C-14	5.00E+01	CSA, 2008, Table G.2	1.01E+05	Bird and Schwartz (1996)	9.00E+03	PNNL (2003)
H-3	1.00E+00	assumed	1.00E+00	assumed	1.00E+00	assumed
Sr-90	1.30E+02	CSA, 2008, Table G.2	2.70E+03	Bird and Schwartz (1996)	1.00E+02	GENII, 2003, Table 2.13
Co-60	6.00E+02	CSA, 2008, Table G.2	7.90E+03	Bird and Schwartz (1996)	2.00E+03	GENII, 2003, Table 2.13
Cs-134	2.70E+03	CSA, 2008, Table G.2	9.80E+02	Bird and Schwartz (1996)	5.00E+02	GENII, 2003, Table 2.13
I-131	7.60E+01	CSA, 2008, Table G.2	9.60E+02	Bird and Schwartz (1996)	1.00E+02	PNNL (2003)
Cs-137	2.70E+03	CSA, 2008, Table G.2	9.80E+02	Bird and Schwartz (1996)	5.00E+02	GENII, 2003, Table 2.13

Element	Water to Fish TF (L/kg fw)		Water to Amphibian/Reptile TF (L/kg fw)	
	Value	Reference	Value	Reference
C-14	5.72E+03	CSA, 2008, Table A.25a	5.72E+03	Assumed same as fish
H-3	1.00E+00	assumed	1.00E+00	assumed
Sr-90	2.00E+00	CSA, 2008, Table A.25a	2.00E+00	Assumed same as fish
Co-60	5.40E+01	CSA, 2008, Table A.25a	5.40E+01	Assumed same as fish
Cs-134	3.50E+03	CSA, 2008, Table A.25a	4.80E+02	Ewing et al, 1996
I-131	6.00E+00	CSA, 2008, Table A.25a	1.25E+02	Chant 1999
Cs-137	3.50E+03	CSA, 2008, Table A.25a	4.80E+02	Ewing et al, 1996

Note: [a] - transfer factor assumed to be 1, since tritium is assumed to be entirely HTO (i.e. no elemental tritium assumed)

[b] In the absence of other data, earthworms were assumed to be equal to the surrounding media

[c] TF from air to animal only used for tritium. A value of 2.33 m^3/kg (for both rabbit and deer) was obtained from CSA 2008, Table A.13

[d] Sediment K_ds are 10 times the sand K_ds provided in Table G.2

F.1.1 Transfer Factors used in Radiological Uptake Calculations

Transfer factors are the ratio of the concentration of an element in an organism of interest, such as plants and animals or in food, to the concentration in the source medium, such as soil (for plants), plant forage (for animals), or water (for fish, crustaceans, mollusks, and aquatic plants). Transfer factors are used in calculating radionuclide uptake by animals and humans via food pathways. Measurements show that similar concentrations of various radionuclides in soil or water do not produce the same concentrations once they are taken up into tissue. Transfer factors are used in radiological risk assessments to estimate the amount of radioactivity that could be present in a food or organism based on the calculated concentration in the source medium (i.e., soil, water or animal feed). By calculating the concentration in the food, the total intake can be estimated and a dose calculated as a result of the intake. Transfer factors used are most often selected from recommended values listed by national or international organizations for use in radiological food chain transport calculations such as CSA, 2008; NCRP, 1996; IAEA, 1994 for example. Tables of transfer factors used in this study were listed by element and feed source.

As discussed in Appendix D, all of the radionuclides identified in the baseline characterization program were determined to be COPC for the assessment of the radiological effects of the NND Project on non-human biota. Of this list of radionuclides, seven in particular (i.e. tritium, Co-60, Cs-134, Cs-137, C-14, Sr-90 and I-131) were selected to be used in the risk assessment due to their prevalence in the environment, historical concerns regarding environmental concentrations and relevance to nuclear power generation.

Sediment concentrations were masured on a dry weight basis. To estimate the dose, a wet weight sediment concentration is required. To complete this calculation a water content for sediment (WCs) of 90% was assumed (Perry and Taylor 2007).

TABLE F.1-2
DOSE CONVERSION COEFFICIENTS FOR ECOLOGICAL RECEPTORS

Unweighted Internal Dose Conversion Coefficients (Gy/y per Bq/kg)

Biota	Radionuclide							Reference
	C-14	H-3	Sr-90	Co-60	Cs-134	I-131	Cs-137	
Bivalve Mollusc	2.54E-07	2.89E-08	5.26E-06	1.05E-06	1.23E-06	1.05E-06	1.40E-06	Fasset (2003) Table 4-7 Freshwater DCCs for Internal Irradiation
Vascular plant	2.10E-07	2.89E-08	5.52E-07	3.15E-07	2.89E-07	3.68E-07	3.77E-07	
Amphibian	2.45E-07	2.89E-08	4.99E-06	8.67E-07	1.05E-06	1.05E-06	1.31E-06	
Predator fish	2.54E-07	2.89E-08	5.34E-06	1.31E-06	1.40E-06	1.14E-06	1.40E-06	
Forage fish	2.54E-07	2.89E-08	5.52E-06	1.75E-06	1.75E-06	1.23E-06	1.58E-06	
Mammal	2.54E-07	2.89E-08	5.61E-06	2.63E-06	2.37E-06	1.40E-06	1.84E-06	
Bird	2.54E-07	2.89E-08	5.61E-06	3.15E-06	2.72E-06	1.49E-06	1.93E-06	
Earthworms	2.45E-07	2.89E-08	4.47E-06	5.82E-07*	9.64E-07	9.64E-07	1.23E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal Irradiation
Mouse	2.54E-07	2.89E-08	5.26E-06	1.31E-05**	1.14E-06	1.05E-06	1.40E-06	
Rabbit	2.54E-07	2.89E-08	5.61E-06	1.31E-05**	2.10E-06	1.31E-06	1.75E-06	
Red Fox	2.54E-07	2.89E-08	5.61E-06	1.31E-05**	2.63E-06	1.40E-06	1.93E-06	
Row Deer	2.54E-07	2.89E-08	5.69E-06	1.31E-05**	3.42E-06	1.66E-06	2.19E-06	
Weasel	2.54E-07	2.89E-08	5.34E-06	1.31E-05**	1.23E-06	1.05E-06	1.40E-06	

Unweighted External Dose Conversion Coefficients for Exposure in water (Gy/y per Bq/L water)[1]

Biota	Radionuclide							Reference
	C-14	H-3	Sr-90	Co-60	Cs-134	I-131	Cs-137	
Bivalve Mollusc	2.72E-10	1.05E-12	4.73E-07	1.23E-05	7.45E-06	1.84E-06	2.72E-06	Fasset (2003) Table 4-8 Freshwater DCCs for External Irradiation[1]
Vascular plant	4.03E-08	1.66E-10	5.17E-06	1.31E-05	8.41E-06	2.54E-06	3.77E-06	
Amphibian	4.20E-10	1.58E-12	7.01E-07	1.23E-05	7.62E-06	1.84E-06	2.80E-06	
Predator fish	2.37E-10	1.05E-12	3.68E-07	1.23E-05	7.36E-06	1.75E-06	2.63E-06	
Forage fish	1.40E-10	5.52E-13	2.37E-07	1.14E-05	7.01E-06	1.66E-06	2.54E-06	
Mammal	7.36E-11	3.15E-13	1.23E-07	1.05E-05	6.31E-06	1.49E-06	2.28E-06	
Bird	6.13E-11	2.72E-13	9.64E-08	9.64E-06	5.96E-06	1.40E-06	2.19E-06	

Unweighted External Dose Conversion Coefficients for Exposure in Sediment (Gy/y per Bq/kg sediment)[1]

Biota	Radionuclide							Reference
	C-14	H-3	Sr-90	Co-60	Cs-134	I-131	Cs-137	
Bivalve Mollusc	2.72E-10	1.05E-12	4.73E-07	1.23E-05	7.45E-06	1.84E-06	2.72E-06	Taken to be the same as external dose coefficients for exposure in water
Amphibian	4.20E-10	1.58E-12	7.01E-07	1.23E-05	7.62E-06	1.84E-06	2.80E-06	
Forage fish	1.40E-10	5.52E-13	2.37E-07	1.14E-05	7.01E-06	1.66E-06	2.54E-06	
Mammal	7.36E-11	3.15E-13	1.23E-07	1.05E-05	6.31E-06	1.49E-06	2.28E-06	

TABLE F.1-2 (con't)
DOSE CONVERSION COEFFICIENTS FOR ECOLOGICAL RECEPTORS

External Dose Conversion Coefficients s for Exposure in Soil (Gy/y per Bq/kg soil)

Biota	Radionuclide							Reference
	C-14	H-3	Sr-90	Co-60	Cs-134	I-131	Cs-137	
Plants	0.00E+00	0.00E+00	9.64E-13	ND	2.72E-06	6.66E-07	9.64E-07	Terrestrial FASSET (2003) Table 3-11 DCCs for External Irradiation for herbs[2]
Earthworms	0.00E+00	0.00E+00	9.64E-13	9.46E-08*	2.80E-06	6.75E-07	1.05E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for External Irradiation[2]
Mouse	0.00E+00	0.00E+00	8.76E-13	1.10E-07**	2.80E-06	6.75E-07	1.05E-06	
Rabbit	0.00E+00	0.00E+00	7.88E-13	1.10E-07**	2.45E-06	5.87E-07	8.76E-07	
Red Fox	0.00E+00	0.00E+00	7.01E-13	1.10E-07**	2.28E-06	5.52E-07	8.32E-07	
Row Deer	0.00E+00	0.00E+00	3.77E-13	1.10E-07**	1.84E-06	4.38E-07	6.66E-07	
Weasel	0.00E+00	0.00E+00	8.76E-13	1.10E-07**	2.72E-06	6.66E-07	9.64E-07	
Herbivorous Birds	0.00E+00	0.00E+00	3.59E-13	ND	2.63E-06	6.31E-07	9.64E-07	
Carnivorous Birds	0.00E+00	0.00E+00	8.76E-14	ND	2.10E-06	4.99E-07	7.53E-07	

Notes: 1. Species assumed to live on/in water
2. Species assumed to live on/in soil contaminated to 10 cm.
ND: No data
* Not included in FASSET (2003), value obtained from Blaylock *et al*. 1993 for earthworms
** Not included in FASSET (2003), value for muskrat obtained from Blaylock *et al.* 1993 and used for all mammals

F.1.2 Dose Conversion Coefficients for Freshwater

The purpose was to present a methodology for evaluating the potential for biota to incur effects from exposure to chronic low-level radiation in the environment. Depending upon the element and the chemical form, radionuclides may accumulate in bottom sediment or remain in the water column in the dissolved state. From either location, they can subsequently accumulate in biota and be transferred through the aquatic food chain. Contamination of the environment by radionuclides inevitably results in an increase in the radiation exposure of natural populations of organisms that occupy the contaminated area. Aquatic organisms receive external radiation exposure from radionuclides in water, sediment, and from other biota such as vegetation. They also receive internal radiation exposure from radionuclides ingested via food and water and from radionuclides absorbed through the skin and respiratory organs.

Dose conversion coefficients were calculated for mono-energetic electrons and photons (FASSET, 2003). From such data, the dose rates to organisms were calculated from equilibrium concentrations of radionuclides in the environmental media (soil and water).

External exposure for organisms on soil; details the values given for a homogeneously contaminated volume source with a thickness of 10 cm and a soil density of 1.6 g/cm³. The values are given in units of [Gy/y per Bq/Kg soil].

Internal exposure of organisms; details the values given for radionuclides that are homogeneously distributed in the organism. The values are given in units of Gy/y per Bq/kg.

Internal exposures for organisms in freshwater ecosystems; details the values given for radionuclide exposure in a freshwater ecosystem. The values are given in units of Gy/y per Bq/kg.

External exposures for organisms in freshwater ecosystems; details the values given for radionuclide exposure in a freshwater ecosystem. The values are given in units of Gy/y per Bq/kg.

APPENDIX F.2

SUMMARY OF CALCULATED DOSES

TABLE F.2-1
OVERALL SUMMARY OF CALCULATED DOSES – EXISTING CONDITIONS

Receptor Category	Indicator Species	Total Dose (all radionuclides & all pathways) (mGy/d)	Benchmark	SI
Summary of Calculated Doses, in mGy/d for Terrestrial Species - Site Maximum				
Terrestrial Invertebrates	Earthworm (soil)	9.95E-05	1	<0.001
	Earthworm (gw)	3.02E-05	1	<0.001
Terrestrial Vegetation	Plants	2.12E-04	1	<0.001
Mammals	Red Fox	4.71E-03	1	0.0047
	Cotton-tail Rabbit	4.26E-04	1	<0.001
	Meadow Vole	5.53E-05	1	<0.001
	Deer Mouse	4.53E-05	1	<0.001
	Whitetailed Deer	1.80E-03	1	0.002
	Raccoon	1.59E-03	1	0.002
	Weasel	1.03E-04	1	<0.001
Birds	Yellow Warbler	1.64E-05	1	<0.001
	Song Sparrow	1.69E-05	1	<0.001
	Bank Swallow	1.69E-05	1	<0.001
	Red eyed Vireo	1.70E-05	1	<0.001
	American Crow	2.76E-05	1	<0.001
	American Robin	2.49E-05	1	<0.001
Summary of Calculated Doses, in mGy/d for Aquatic Species – Coots Pond				
Fish	Forage Fish	6.28E-04	0.6	0.001
	Predator Fish	5.92E-04	0.6	<0.001
Benthic Invertebrates		5.42E-04	6	<0.001
Aquatic Vegetation		9.31E-05	3	<0.001
Amphibians	Turtle	1.10E-04	3	<0.001
	Frog	1.10E-04	3	<0.001
Aquatic Mammals	Muskrat	4.77E-04	1	<0.001
Aquatic Birds	Bufflehead	5.48E-05	1	<0.001
	Mallard	6.80E-05	1	<0.001
	Pied-Billed Grebe	7.08E-05	1	<0.001
Summary of Calculated Doses, in mGy/d for Near Shore Lake Ontario				
Fish	Forage Fish	3.02E-04[1]	0.6	<0.001
	Predator Fish	1.25E-04[1]	0.6	<0.001
Benthic Invertebrates		5.47E-04	6	<0.001
Aquatic Vegetation		9.31E-05	3	<0.001
Aquatic Birds	Mallard	6.82E-05	1	<0.001
	Bufflehead	5.46E-05	1	<0.001
	Pied-Billed Grebe	4.95E-05[1]	1	<0.001

[1] Values are based on maximum measured fish concentration in Site Study Area. One fish sample (Round Goby) recorded in the Regional Study Area had a tritium concentration of 52 Bq/kg. If this sample were used for the calculation, the doses would be:

a) Total dose to forage fish of 3.09E-04 and 1.32E-04 to predator fish;
b) Total dose to Pied-Billed Grebe of 4.98E-05

TABLE F.2-2
SUMMARY OF CALCULATED DOSES (mGy/d) BY RADIONUCLIDE – EXISTING CONDITIONS

Summary of Calculated Doses, in mGy/d for Terrestrial Species - Site Maximum

Receptor Category	Invertebrates		Terr. Plant	Mammals						
Indicator Species	**Earthworm (soil)**	**Earthworm (gw)**	**Plants**	**Red Fox**	**Cotton-Tail Rabbit**	**Meadow Vole**	**Deer Mouse**	**White Tailed Deer**	**Raccoon**	**Short-tailed weasel**
C-14	2.58E-05	1.68E-07	3.16E-05	1.26E-04	9.20E-05	4.43E-06	1.23E-06	2.59E-04	2.42E-04	2.32E-06
H-3	8.79E-06	1.57E-05	1.18E-04	1.90E-05	3.52E-05	3.02E-06	1.74E-06	1.41E-03	6.20E-05	1.90E-06
Sr-90	6.12E-06	6.12E-07	1.36E-05	1.54E-06	7.23E-06	3.24E-07	4.92E-08	6.18E-05	1.42E-05	2.86E-08
Co-60	9.41E-07	9.27E-07	4.32E-07	1.66E-06	1.44E-06	2.33E-07	1.93E-07	4.00E-06	4.57E-06	2.36E-07
Cs-134	5.59E-06	5.16E-06	4.53E-06	2.41E-03	1.29E-04	7.72E-06	5.59E-06	1.53E-05	6.27E-04	3.09E-05
I-131	2.41E-05	4.49E-06	1.97E-05	9.47E-06	1.27E-05	8.43E-06	8.26E-06	2.57E-05	2.56E-05	8.17E-06
Cs-137	2.82E-05	3.12E-06	2.49E-05	2.15E-03	1.49E-04	3.11E-05	2.83E-05	2.53E-05	6.19E-04	5.99E-05
Total Dose (mGy/d)	9.95E-05	3.02E-05	2.12E-04	4.71E-03	4.26E-04	5.53E-05	4.53E-05	1.80E-03	1.59E-03	1.03E-04
Benchmark	1	1	1	1	1	1	1	1	1	1
SI	<0.001	<0.001	<0.001	0.0047	<0.001	<0.001	<0.001	0.002	0.002	<0.001

Receptor Category	Birds					
Indicator Species	**Yellow Warbler**	**Song Sparrow**	**Bank Swallow**	**Red-eyed Vireo**	**American Crow**	**American Robin**
C-14	1.59E-06	1.43E-06	2.02E-06	2.02E-06	8.26E-06	6.77E-06
H-3	2.70E-07	6.25E-07	3.23E-07	3.45E-07	1.76E-06	1.49E-06
Sr-90	4.17E-09	9.53E-09	5.08E-09	5.37E-09	5.09E-08	3.85E-08
Co-60	3.67E-08	8.39E-08	4.46E-08	4.72E-08	3.58E-07	2.72E-07
Cs-134	1.72E-06	1.86E-06	1.74E-06	1.75E-06	2.75E-06	2.47E-06
I-131	3.12E-06	3.12E-06	3.15E-06	3.15E-06	3.77E-06	3.59E-06
Cs-137	9.61E-06	9.74E-06	9.64E-06	9.64E-06	1.07E-05	1.03E-05
Total Dose (mGy/d)	1.64E-05	1.69E-05	1.69E-05	1.70E-05	2.76E-05	2.49E-05
Benchmark	1.0	1.0	1.0	1.0	1.0	1.0
SI	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE F.2-2 (Cont'd)
SUMMARY OF CALCULATED DOSES (mGy/d) BY RADIONUCLIDE – EXISTING CONDITIONS

Summary of Calculated Doses, in mGy/d for Aquatic Species – Coots Pond

Receptor Category	Amphibians		Fish		Mammal	Birds			Benthic Invertebrates	Aquatic Plant
Indicator Species	**Turtle**	**Frog**	**Forage**	**Predator**	**Muskrat**	**Bufflehead**	**Mallard**	**Pied-Bill Grebe**		
C-14	2.28E-05	2.28E-05	2.44E-05	2.44E-05	9.71E-05	1.56E-05	2.36E-05	1.61E-05	1.94E-05	2.52E-05
H-3	9.11E-06	9.11E-06	1.83E-05	1.83E-05	8.64E-06	8.13E-07	1.27E-06	1.20E-06	2.38E-06	1.38E-05
Sr-90	2.44E-06	2.44E-06	7.92E-06	7.37E-06	2.40E-06	2.16E-06	3.27E-06	1.16E-06	3.23E-04	2.67E-06
Co-60	1.81E-05	1.81E-05	1.81E-05	1.86E-05	2.51E-05	7.27E-06	7.45E-06	7.14E-06	1.85E-05	1.84E-05
Cs-134	1.19E-05	1.19E-05	1.20E-05	1.20E-05	1.94E-04	6.19E-06	6.76E-06	5.80E-06	1.19E-05	1.19E-05
I-131	3.95E-05	3.95E-05	5.41E-04	5.06E-04	1.09E-05	1.97E-05	2.23E-05	3.67E-05	1.61E-04	1.54E-05
Cs-137	5.65E-06	5.65E-06	5.65E-06	5.52E-06	1.39E-04	3.00E-06	3.40E-06	2.72E-06	5.65E-06	5.68E-06
Total Dose (mGy/d)	1.10E-04	1.10E-04	6.28E-04	5.92E-04	4.77E-04	5.48E-05	6.80E-05	7.08E-05	5.42E-04	9.31E-05
Benchmark	3	3	0.6	0.6	1	1	1	1	6	3
SI	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Summary of Calculated Doses, in mGy/d for Lake Ontario

Receptor Category	Fish		Benthic Invertebrates	Aquatic Plants	Aquatic Birds		
Indicator Species	**Forage**	**Predator**			**Bufflehead**	**Mallard**	**Pied-Billed Grebe**
C-14	2.55E-05	2.55E-05	1.94E-05	2.52E-05	1.56E-05	2.37E-05	1.65E-05
H-3	5.46E-06[1]	5.46E-06[1]	2.38E-06	1.38E-05	3.44E-07	7.13E-07	3.66E-07[1]
Sr-90	1.08E-05	7.37E-06	3.23E-04	2.67E-06	2.16E-06	2.53E-06	1.16E-06
Co-60	8.82E-05	1.86E-05	1.85E-05	1.84E-05	7.27E-06	7.57E-06	8.60E-06
Cs-134	5.52E-05	1.20E-05	1.19E-05	1.19E-05	6.19E-06	7.14E-06	5.80E-06
I-131	7.12E-05	5.03E-05	1.61E-04	1.54E-05	1.97E-05	2.23E-05	1.43E-05
Cs-137	4.57E-05	5.52E-06	1.09E-05	5.68E-06	3.32E-06	4.19E-06	2.78E-06
Total Dose (mGy/d)	3.02E-04[1]	1.25E-04[1]	5.47E-04	9.31E-05	5.46E-05	6.82E-05	4.95E-05[1]
Benchmark	0.6	0.6	6.0	3.0	1.0	1.0	1.0
SI	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

[1] Values are based on maximum measured fish concentration in Site Study Area. One fish sample (Round Goby) recorded in the Regional Study Area had a tritium concentration of 52 Bq/kg. If this sample were used for the calculation, the doses would be:

a) H-3 to forage and predator fish would be 1.24E-05 mGy/d;
b) Total dose to forage fish of 3.09E-04 and 1.32E-04 to predator fish;
c) H-3 to Pied-Billed Grebe of 6.64E-07;
d) Total dose to Pied-Billed Grebe of 4.98E-05

TABLE F.2-3
OVERALL SUMMARY OF CALCULATED DOSES – FUTURE CONDITIONS

Receptor Category	Indicator Species	Total Dose (all radionuclides & all pathways) (mGy/d)	Benchmark	SI
Summary of Calculated Doses, in mGy/d for Terrestrial Species - Site Maximum				
Terrestrial Invertebrates	Earthworm (soil)	1.46E-04	1	<0.001
	Earthworm (gw)	3.02E-05	1	<0.001
Terrestrial Vegetation	Plants	2.47E-04	1	<0.001
Mammals	Red Fox	9.27E-03	1	0.0093
	Cotton-tail Rabbit	7.57E-04	1	<0.001
	Meadow Vole	1.17E-04	1	<0.001
	Deer Mouse	9.93E-05	1	<0.001
	Whitetailed Deer	1.86E-03	1	0.002
	Raccoon	2.62E-03	1	0.003
	Weasel	2.20E-04	1	<0.001
Birds	Yellow Warbler	2.93E-05	1	<0.001
	Song Sparrow	2.97E-05	1	<0.001
	Bank Swallow	2.99E-05	1	<0.001
	Red eyed Vireo	3.00E-05	1	<0.001
	American Crow	4.23E-05	1	<0.001
	American Robin	3.48E-05	1	<0.001
Summary of Calculated Doses, in mGy/d for Aquatic Species – Coots Pond				
Fish	Forage Fish	6.28E-04	0.6	0.001
	Predator Fish	5.92E-04	0.6	<0.001
Benthic Invertebrates		5.42E-04	6	<0.001
Aquatic Vegetation		9.31E-05	3	<0.001
Amphibians	Turtle	1.10E-04	3	<0.001
	Frog	1.10E-04	3	<0.001
Aquatic Mammals	Muskrat	4.90E-04	1	<0.001
Aquatic Birds	Bufflehead	5.48E-05	1	<0.001
	Mallard	6.80E-05	1	<0.001
	Pied-Billed Grebe	7.08E-05	1	<0.001
Summary of Calculated Doses, in mGy/d for Near Shore Lake Ontario (Cooling Tower Scenario)				
Fish	Forage Fish	3.15E-04	0.6	<0.001
	Predator Fish	1.37E-04	0.6	<0.001
Benthic Invertebrates		5.63E-04	6	<0.001
Aquatic Vegetation		9.74E-05	3	<0.001
Aquatic Birds	Mallard	7.03E-05	1	<0.001
	Bufflehead	5.63E-05	1	<0.001
	Pied-Billed Grebe	5.10E-05	1	<0.001

Note: The doses provided in this table are due to the bounding release scenario (highest emissions from each reactor type for each radionuclide).

TABLE F.2-4
SUMMARY OF CALCULATED DOSES (mGy/d) BY RADIONUCLIDE – FUTURE CONDITIONS

Summary of Calculated Doses, in mGy/d for Terrestrial Species - Site Maximum

Receptor Category	Invertebrates		Terr. Plant	Mammals						
Indicator Species	Earthworm (soil)	Earthworm (gw)	Plants	Red Fox	Cotton-tail Rabbit	Meadow Vole	Deer Mouse	White Tailed Deer	Raccoon	Short-tailed weasel
C-14	2.58E-05	1.68E-07	3.16E-05	1.26E-04	9.20E-05	4.43E-06	1.23E-06	2.59E-04	2.42E-04	2.32E-06
H-3	8.79E-06	1.57E-05	1.18E-04	3.47E-05	4.83E-05	1.61E-05	1.48E-05	1.42E-03	7.62E-05	1.57E-05
Sr-90	6.12E-06	6.12E-07	1.40E-05	1.59E-06	7.46E-06	3.34E-07	5.07E-08	6.38E-05	2.42E-05	2.94E-08
Co-60	5.36E-06	9.27E-07	6.42E-07	5.03E-06	5.28E-06	3.35E-06	3.29E-06	8.51E-06	1.04E-05	3.38E-06
Cs-134	1.76E-05	5.16E-06	1.62E-05	2.51E-03	1.44E-04	1.98E-05	1.76E-05	2.33E-05	6.71E-04	4.33E-05
I-131	2.50E-05	4.49E-06	2.06E-05	1.03E-05	1.35E-05	9.39E-06	9.22E-06	2.63E-05	2.64E-05	9.11E-06
Cs-137	5.69E-05	3.12E-06	4.68E-05	6.58E-03	4.46E-04	6.33E-05	5.31E-05	5.75E-05	1.57E-03	1.46E-04
Total Dose (mGy/d)	1.46E-04	3.02E-05	2.47E-04	9.27E-03	7.57E-04	1.17E-04	9.93E-05	1.86E-03	2.62E-03	2.20E-04
Benchmark	1	1	1	1	1	1	1	1	1	1
SI	<0.001	<0.001	<0.001	0.0093	<0.001	<0.001	<0.001	0.002	0.003	<0.001

Receptor Category	Birds					
Indicator Species	Yellow Warbler	Song Sparrow	Bank Swallow	Red-eyed Vireo	American Crow	American Robin
C-14	1.59E-06	1.43E-06	2.02E-06	2.02E-06	8.26E-06	6.77E-06
H-3	2.70E-07	6.25E-07	3.23E-07	3.45E-07	1.76E-06	1.49E-06
Sr-90	4.20E-09	9.59E-09	5.12E-09	5.41E-09	5.16E-08	3.89E-08
Co-60	5.71E-08	1.04E-07	7.16E-08	7.37E-08	8.06E-07	5.88E-07
Cs-134	6.23E-06	6.38E-06	6.25E-06	6.26E-06	7.35E-06	2.73E-06
I-131	3.48E-06	3.48E-06	3.46E-06	3.50E-06	4.12E-06	3.94E-06
Cs-137	1.77E-05	1.77E-05	1.78E-05	1.78E-05	2.00E-05	1.92E-05
Total Dose (mGy/d)	2.93E-05	2.97E-05	2.99E-05	3.00E-05	4.23E-05	3.48E-05
Benchmark	1.0	1.0	1.0	1.0	1.0	1.0
SI	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE F.2-4 (Cont'd)
SUMMARY OF CALCULATED DOSES (mGy/d) BY RADIONUCLIDE – FUTURE CONDITIONS

Summary of Calculated Doses, in mGy/d for Aquatic Species – Coots Pond

Receptor Category	Amphibians		Fish		Mammal	Birds			Benthic	Aquatic
Indicator Species	**Turtle**	**Frog**	**Forage**	**Predator**	**Muskrat**	**Bufflehead**	**Mallard**	**Pied-Bill Grebe**	**Invertebrates**	**Plant**
C-14	2.28E-05	2.28E-05	2.44E-05	2.44E-05	9.71E-05	1.56E-05	2.36E-05	1.61E-05	1.94E-05	2.52E-05
H-3	9.11E-06	9.11E-06	1.83E-05	1.83E-05	2.17E-05	8.13E-07	1.27E-06	1.20E-06	2.38E-06	1.38E-05
Sr-90	2.44E-06	2.44E-06	7.92E-06	7.37E-06	2.40E-06	2.16E-06	3.27E-06	1.16E-06	3.23E-04	2.67E-06
Co-60	1.81E-05	1.81E-05	1.81E-05	1.86E-05	2.51E-05	7.27E-06	7.45E-06	7.14E-06	1.85E-05	1.84E-05
Cs-134	1.19E-05	1.19E-05	1.20E-05	1.20E-05	1.94E-04	6.19E-06	6.76E-06	5.80E-06	1.19E-05	1.19E-05
I-131	3.95E-05	3.95E-05	5.41E-04	5.06E-04	1.09E-05	1.97E-05	2.23E-05	3.67E-05	1.61E-04	1.54E-05
Cs-137	5.65E-06	5.65E-06	5.65E-06	5.52E-06	1.39E-04	3.00E-06	3.40E-06	2.72E-06	5.65E-06	5.68E-06
Total Dose (mGy/d)	1.10E-04	1.10E-04	6.28E-04	5.92E-04	4.90E-04	5.48E-05	6.80E-05	7.08E-05	5.42E-04	9.31E-05
Benchmark	3	3	0.6	0.6	1	1	1	1	6	3
SI	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Summary of Calculated Doses, in mGy/d for Lake Ontario (Cooling Tower Scenario)

Receptor Category	Fish		Benthic	Aquatic	Aquatic Birds		
Indicator Species	**Forage**	**Predator**	**Invertebrates**	**Plants**	**Bufflehead**	**Mallard**	**Pied-Billed Grebe**
C-14	2.55E-05	2.55E-05	1.94E-05	2.52E-05	1.56E-05	2.37E-05	1.65E-05
H-3	1.80E-05	1.80E-05	1.80E-05	1.80E-05	2.01E-06	2.85E-06	1.83E-06
Sr-90	1.08E-05	7.37E-06	3.23E-04	2.67E-06	2.16E-06	2.53E-06	1.16E-06
Co-60	8.82E-05	1.86E-05	1.85E-05	1.84E-05	7.27E-06	7.57E-06	8.60E-06
Cs-134	5.52E-05	1.20E-05	1.19E-05	1.19E-05	6.19E-06	7.14E-06	5.80E-06
I-131	7.12E-05	5.03E-05	1.61E-04	1.54E-05	1.97E-05	2.23E-05	1.43E-05
Cs-137	4.57E-05	5.52E-06	1.09E-05	5.68E-06	3.32E-06	4.19E-06	2.78E-06
Total Dose (mGy/d)	3.15E-04	1.37E-04	5.63E-04	9.74E-05	5.63E-05	7.03E-05	5.10E-05
Benchmark	0.6	0.6	6.0	3.0	1.0	1.0	1.0
SI	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

APPENDIX F.3

DETAILED DOSE CALCULATIONS

Estimate of Effects of Radionuclides on Terrestrial Ecological Receptors – Site Maximum – Existing Conditions

Estimate of Effects of Radionuclides on Terrestrial Invertebrates - Earthworm (from soil) - Site Maximum - Existing

C-14

soil concentration	Bq/kg DW	sconc	1.51E+01	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	1.51E+01	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	3.84E+01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	2.45E-07	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	9.42E-06	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	9.42E-06	=Di+De

H-3

soil concentration	Bq/kg DW	sconc	0.00E+00	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	0.00E+00	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	3.70E+01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di_uw	1.07E-06	=econc(FW)*DCi
weighted internal dose	Gy/y	Di	3.21E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	3.21E-06	=Di+De

Sr-90				
soil concentration	Bq/kg DW	sconc	1.00E+01	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	1.00E+01	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	5.00E-01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	4.47E-06	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	2.23E-06	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-13	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	9.64E-12	=sconc*DCe
total dose	Gy/y	Dt	2.23E-06	=Di+De

Co-60				
soil concentration	Bq/kg DW	sconc	5.56E-01	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	5.56E-01	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	5.00E-01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	5.82E-07	Blaylock et al. 1993 for earthworms
internal dose	Gy/y	Di	2.91E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.46E-08	Blaylock et al. 1993 for earthworms
external dose from soil	Gy/y	De	5.26E-08	=sconc*DCe
total dose	Gy/y	Dt	3.44E-07	=Di+De

Cs-134				
soil concentration	Bq/kg DW	sconc	5.56E-01	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	5.56E-01	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	5.00E-01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	9.64E-07	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	4.82E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	1.56E-06	=sconc*DCe
total dose	Gy/y	Dt	2.04E-06	=Di+De

I-131				
soil concentration	Bq/kg DW	sconc	4.44E+00	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	4.44E+00	=sconc*TFe

Estimate of Effects of Radionuclides on Terrestrial Invertebrates - Earthworm (from soil) - Site Maximum - Existing

earthworm concentration	Bq/kg FW	econc(FW)	6.00E+00	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	9.64E-07	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	5.78E-06	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	6.75E-07	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	3.00E-06	=sconc*DCe
total dose	Gy/y	Dt	8.78E-06	=Di+De

Cs-137				
soil concentration	Bq/kg DW	sconc	9.22E+00	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	9.22E+00	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	5.00E-01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	6.13E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.05E-06	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	9.69E-06	=sconc*DCe
total dose	Gy/y	Dt	1.03E-05	=Di+De

Estimate of Effects of Radionuclides on Terrestrial Invertebrates - Earthworm (GW) - Site Maximum - Existing

C-14

groundwater concentration	Bq/L	gwconc	2.50E-01	Maximum GW at Site
transfer factor for earthworms	L/kg (FW)	TFe	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	2.50E-01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	2.45E-07	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	6.13E-08	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	0.00E+00	=gwconc*Dce
total dose	Gy/y	Dt	6.13E-08	=Di+De

H-3

groundwater concentration	Bq/L	gwconc	6.60E+01	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFe	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bq/kg (FW)	econc(FW)	6.60E+01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di_uw	1.91E-06	=econc(FW)*DCi
weighted internal dose	Gy/y	Di	5.72E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	0.00E+00	=gwconc*Dce
total dose	Gy/y	Dt	5.72E-06	=Di+De

Sr-90				
groundwater concentration	Bq/L	gwconc	5.00E-02	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFe	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bq/kg (FW)	econc(FW)	5.00E-02	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	4.47E-06	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	2.23E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-13	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	4.82E-14	=gwconc*Dce
total dose	Gy/y	Dt	2.23E-07	=Di+De

Co-60				
groundwater concentration	Bq/L	wconc	5.00E-01	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFaq	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	5.00E-01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	5.82E-07	Earthworms-Blaylock et al. 1993

Estimate of Effects of Radionuclides on Terrestrial Invertebrates - Earthworm (GW) - Site Maximum - Existing

internal dose	Gy/y	Di	2.91E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCFe	9.46E-08	Earthworms-Blaylock et al. 1993
external dose from water	Gy/y	De	4.73E-08	=gwconc*Dce
total dose	Gy/y	Dt	3.38E-07	=Di+De

Cs-134				
groundwater concentration	Bq/L	wconc	5.00E-01	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFaq	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	5.00E-01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	9.64E-07	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	4.82E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCFe	2.80E-06	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	1.40E-06	=gwconc*Dce
total dose	Gy/y	Dt	1.88E-06	=Di+De

I-131				
groundwater concentration	Bq/L	wconc	1.00E+00	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFaq	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	1.00E+00	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	9.64E-07	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	9.64E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCFe	6.75E-07	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	6.75E-07	=gwconc*Dce
total dose	Gy/y	Dt	1.64E-06	=Di+De

Cs-137				
groundwater concentration	Bq/L	wconc	5.00E-01	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFaq	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	5.00E-01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	6.13E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCFe	1.05E-06	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	5.26E-07	=gwconc*Dce
total dose	Gy/y	Dt	1.14E-06	=Di+De

Estimate of Effects of Radionuclides on Terrestrial Plants - Site Maximum - Existing

C-14

soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
air concentration	Bq/m3	aconc	1.10E-01	Max air concentration at site
vegetation-air transfer factor	m3/kg(FW)	TFvs	4.75E+02	CSA 2008
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	Maximum measured plant concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.10E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	1.15E-05	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	1.15E-05	=Di+De

H-3

soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	1.00E+00	assumed
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	0.00E+00	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	Maximum measured vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation

Estimate of Effects of Radionuclides on Terrestrial Plants - Site Maximum - Existing

internal dose	Gy/y	Di_uw	1.43E-05	=vconc(FW)*DCi
weighted internal dose	Gy/y	Di	4.29E-05	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	4.29E-05	=Di+De

Sr-90				
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	3.00E+00	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	3.00E+01	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	9.00E+00	=vconc(DW)*(1-WCv)
internal DC	Gy/y per Bq/kg	DCi	5.52E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	4.97E-06	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-13	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	9.64E-12	=sconc*DCe
total dose	Gy/y	Dt	4.97E-06	=Di+De

Co-60				
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	2.30E-01	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	1.28E-01	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	Maximum measured vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.15E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	1.58E-07	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	1.58E-07	=Di+De

Cs-134				
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	4.60E-01	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	2.56E-01	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	Maximum measured vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.89E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	1.45E-07	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-06	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	1.51E-06	=sconc*DCe
total dose	Gy/y	Dt	1.65E-06	=Di+De

I-131				
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	4.00E-02	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	1.78E-01	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	Maximum measured vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.68E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	4.23E-06	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	6.66E-07	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	2.96E-06	=sconc*DCe
total dose	Gy/y	Dt	7.19E-06	=Di+De

Cs-137				
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	4.60E-01	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	4.24E+00	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	Maximum measured vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.77E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation

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internal dose	Gy/y	Di	1.88E-07	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-07	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	8.89E-06	=sconc*DCe
total dose	Gy/y	Dt	9.07E-06	=Di+De

Estimate of Effects of Radionuclides on American Robin - Site Maximum - Existing

Information on American Robin

water intake	L/d	Qwatar	0.01
total food intake (DW)	g (FW)/d	Qfwwar	93
Soil intake	g/d	Qsrar	1.9
fraction that is worms	-	ferar	0.4
fraction that is berries	-	fbrar	0.6
fraction of time in area	-	flocrar	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	3.84E+01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.25E-03	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	1.43E-02	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	7.14E-01	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	4.14E-01	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	1.14E+00	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	8.50E+00	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	9.72E+00	=Itot*Tfrar
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.47E-06	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	2.47E-06	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	3.70E+01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	3.90E-01	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	6.88E-01	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	5.19E+00	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	6.27E+00	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	1.00E+00	assumed
Robin concentration	Bq/kg	arconc(FW)	6.27E+00	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.81E-07	=arconc*DCi
weighted internal dose	Gy/y	Di	5.44E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	5.44E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site

Estimate of Effects of Radionuclides on American Robin - Site Maximum - Existing

Worms concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	2.50E-04	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	9.50E-03	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	9.30E-03	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	1.40E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	3.30E-02	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	7.60E-02	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	2.51E-03	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.41E-08	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.38E-13	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.41E-08	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	2.50E-03	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	5.28E-04	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	9.30E-03	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	1.40E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	2.63E-02	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	1.20E+00	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	3.15E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.94E-08	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	9.94E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.56E-01	Maximum Soil Concentration at Site
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Soil Concentration Polygon AB
Worms concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	2.78E-03	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	5.28E-04	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	9.30E-03	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	1.40E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	2.66E-02	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	4.40E+00	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	1.17E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.17E-07	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	5.84E-07	=sconc*DCe*flocrv
total dose	Gy/y	Dt	9.01E-07	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond

Estimate of Effects of Radionuclides on American Robin - Site Maximum - Existing

soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	6.00E+00	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.00E-02	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	4.22E-03	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	1.12E-01	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	2.79E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	1.54E-01	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	8.70E-01	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	1.34E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.99E-07	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.11E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.31E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	2.50E-03	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	8.76E-03	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	9.30E-03	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	1.40E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	3.45E-02	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	4.40E+00	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	1.52E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.93E-07	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	3.47E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	3.77E-06	=Di+De

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Information on Yellow Warbler

water intake	L/d	Qwatyw	0.003
total food intake (DW)	g (FW)/d	Qfwwyw	11
Soil intake	g/d	Qsyw	0.15
fraction that is insects	-	fiyw	0.9
fraction that is berries	-	fbyw	0.1
fraction of time in area	-	flocyw	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	3.75E-04	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	1.13E-03	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	2.58E-01	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	8.17E-03	=berconc*Qfwwyw*fbyw/1000*flocyw

Estimate of Effects of Radionuclides on Yellow Warbler - Site Maximum - Existing

total intake	Bq/d	Itot	2.68E-01	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	8.50E+00	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	2.28E+00	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.79E-07	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocyw
total dose	Gy/y	Dt	5.79E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.17E-01	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	9.16E-01	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	1.02E-01	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	1.14E+00	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	1.00E+00	assumed
yellow warbler concentration	Bq/kg	ywconc(FW)	1.14E+00	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	3.28E-08	=ywconc*DCi
weighted internal dose	Gy/y	Di	9.84E-08	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocyw
total dose	Gy/y	Dt	9.84E-08	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-05	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	7.50E-04	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	2.48E-03	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	2.75E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	3.58E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	7.60E-02	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	2.72E-04	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.52E-09	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.38E-13	=sconc*DCe*flocyw
total dose	Gy/y	Dt	1.52E-09	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site

Estimate of Effects of Radionuclides on Yellow Warbler - Site Maximum - Existing

insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-04	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	4.17E-05	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	2.48E-03	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	2.75E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	3.54E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	1.20E+00	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	4.25E-03	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.34E-08	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocyw
total dose	Gy/y	Dt	1.34E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-04	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	4.17E-05	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	2.48E-03	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	2.75E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	3.54E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	4.40E+00	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	1.56E-02	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.23E-08	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	5.84E-07	=sconc*DCe*flocyw
total dose	Gy/y	Dt	6.26E-07	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	4.00E+00	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	3.00E-03	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	3.33E-04	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	1.98E-02	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	5.50E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	2.37E-02	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	8.70E-01	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	2.06E-02	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.07E-08	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation

Estimate of Effects of Radionuclides on Yellow Warbler - Site Maximum - Existing

external dose	Gy/y	De	1.11E-06	=sconc*DCe*flocyw
total dose	Gy/y	Dt	1.14E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-04	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	6.92E-04	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	2.48E-03	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	2.75E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	4.19E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	4.40E+00	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	1.84E-02	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.55E-08	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	3.47E-06	=sconc*DCe*flocyw
total dose	Gy/y	Dt	3.51E-06	=Di+De

Estimate of Effects of Radionuclides on Song Sparrow - Site Maximum - Existing

Information on Song Sparrow

water intake	L/d	Qwatsp	0.004	
total food intake (DW)	g (FW)/d	Qfwwsp	16	
Soil intake	g/d	Qssp	0.2	
fraction that is insects	-	finsp	0.1	
fraction that is seeds	-	fssp	0.9	(used berries for seeds)
fraction of time in area	-	flocsp	0.8	

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	8.00E-04	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	2.41E-03	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	6.68E-02	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	1.71E-01	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	2.41E-01	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	8.50E+00	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	2.05E+00	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.21E-07	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsp
total dose	Gy/y	Dt	5.21E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
berry-soil transfer	kg/kg(DW)	TFbs	1.00E+00	assumed

Estimate of Effects of Radionuclides on Song Sparrow - Site Maximum - Existing

factor				
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	2.50E-01	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	0.00E+00	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	2.37E-01	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	2.14E+00	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	2.63E+00	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	1.00E+00	assumed
sparrow concentration	Bq/kg	spconc(FW)	2.63E+00	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	7.60E-08	=spconc*DCi
weighted internal dose	Gy/y	Di	2.28E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsp
total dose	Gy/y	Dt	2.28E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.60E-04	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	1.60E-03	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	6.40E-04	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	5.76E-03	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	8.16E-03	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	7.60E-02	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	6.20E-04	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.48E-09	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.38E-13	=sconc*DCe*flocsp
total dose	Gy/y	Dt	3.48E-09	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.60E-03	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	8.89E-05	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	6.40E-04	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	5.76E-03	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	8.09E-03	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	1.20E+00	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	9.71E-03	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.06E-08	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsp
total dose	Gy/y	Dt	3.06E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site

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insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.60E-03	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	8.89E-05	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	6.40E-04	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	5.76E-03	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	8.09E-03	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	4.40E+00	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	3.56E-02	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.67E-08	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	5.84E-07	=sconc*DCe*flocsp
total dose	Gy/y	Dt	6.81E-07	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	4.00E+00	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	6.40E-03	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	7.11E-04	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	5.12E-03	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	1.15E-02	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	2.38E-02	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	8.70E-01	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	2.07E-02	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.08E-08	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.11E-06	=sconc*DCe*flocsp
total dose	Gy/y	Dt	1.14E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.60E-03	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	1.48E-03	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	6.40E-04	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	5.76E-03	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	9.48E-03	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	4.40E+00	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	4.17E-02	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.03E-08	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	3.47E-06	=sconc*DCe*flocsp
total dose	Gy/y	Dt	3.55E-06	=Di+De

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Information on Bank Swallow

water intake	L/d	Qwatsw	0.004
total food intake (DW)	g (FW)/d	Qfwwsw	13
Soil intake	g/d	Qssw	0.2
fraction that is insects	-	finsw	1
fraction of time in area	-	flocsw	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	5.00E-04	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	1.51E-03	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	3.39E-01	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	3.41E-01	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	8.50E+00	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	2.90E+00	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.37E-07	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsw
total dose	Gy/y	Dt	7.37E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	1.56E-01	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	0.00E+00	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	1.20E+00	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	1.36E+00	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	1.00E+00	assumed
swallow concentration	Bq/kg	swconc(FW)	1.36E+00	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	3.93E-08	=swconc*DCi
weighted internal dose	Gy/y	Di	1.18E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsw
total dose	Gy/y	Dt	1.18E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	1.00E-04	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	1.00E-03	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	3.25E-03	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	4.35E-03	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	7.60E-02	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	3.31E-04	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.85E-09	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation

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external dose	Gy/y	De	4.38E-13	=sconc*DCe*flocsw
total dose	Gy/y	Dt	1.85E-09	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	5.56E-05	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	3.25E-03	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	4.31E-03	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	1.20E+00	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	5.17E-03	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.63E-08	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsw
total dose	Gy/y	Dt	1.63E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	5.56E-05	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	3.25E-03	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	4.31E-03	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	4.40E+00	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	1.89E-02	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.14E-08	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	5.84E-07	=sconc*DCe*flocsw
total dose	Gy/y	Dt	6.35E-07	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	4.00E+00	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	4.00E-03	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	4.44E-04	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	2.60E-02	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	3.04E-02	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	8.70E-01	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	2.65E-02	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.94E-08	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.11E-06	=sconc*DCe*flocsw
total dose	Gy/y	Dt	1.15E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatsw*flocsw

Estimate of Effects of Radionuclides on Bank Swallow - Site Maximum - Existing

intake of soil	Bq/d	Is	9.22E-04	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	3.25E-03	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	5.17E-03	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	4.40E+00	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	2.28E-02	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.39E-08	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	3.47E-06	=sconc*DCe*flocsw
total dose	Gy/y	Dt	3.52E-06	=Di+De

Estimate of Effects of Radionuclides on Red-Eyed Vireo - Site Maximum - Existing

Information on Red-Eyed Vireo

water intake	L/d	Qwatrv	0.004
total food intake (DW)	g (FW)/d	Qfwwrv	14
Soil intake	g/d	Qsrv	0.2
fraction that is insects	-	ferv	0.9
fraction that is berries	-	fbrv	0.1
fraction of time in area	-	flocrv	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	5.00E-04	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	1.51E-03	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	3.29E-01	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	1.04E-02	wconc*Qwatrv/1000*flocrv
total intake	Bq/d	Itot	3.41E-01	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	8.50E+00	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	2.90E+00	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.37E-07	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	7.37E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.56E-01	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	1.17E+00	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	1.30E-01	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	1.45E+00	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	1.00E+00	assumed
vireo concentration	Bq/kg	rvconc(FW)	1.45E+00	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	4.20E-08	=rvconc*DCi
weighted internal dose	Gy/y	Di	1.26E-07	=Di_uw*RBE

Estimate of Effects of Radionuclides on Red-Eyed Vireo - Site Maximum - Existing

external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.26E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.00E-04	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	1.00E-03	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	3.15E-03	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	3.50E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	4.60E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	7.60E-02	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	3.50E-04	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.96E-09	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.38E-13	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.96E-09	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	5.56E-05	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	3.15E-03	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	3.50E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	4.56E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	1.20E+00	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	5.47E-03	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.72E-08	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.72E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	5.56E-05	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	3.15E-03	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	3.50E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	4.56E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	4.40E+00	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	2.00E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation

Estimate of Effects of Radionuclides on Red-Eyed Vireo - Site Maximum - Existing

internal dose	Gy/y	Di	5.44E-08	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	5.84E-07	=sconc*DCe*flocrv
total dose	Gy/y	Dt	6.38E-07	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	4.00E+00	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	4.00E-03	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	4.44E-04	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	2.52E-02	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	7.00E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	3.03E-02	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	8.70E-01	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	2.64E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.93E-08	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.11E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.15E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	9.22E-04	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	3.15E-03	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	3.50E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	5.42E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	4.40E+00	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	2.39E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.60E-08	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	3.47E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	3.52E-06	=Di+De

Estimate of Effects of Radionuclides on American Crow - Site Maximum - Existing

Information on American Crow

water intake	L/d	Qwatcr	0.03
total food intake (DW)	g (FW)/d	Qffwcr	115
Soil intake	g/d	Qscr	3.4
fraction that is earthworms	-	fecr	0.4
fraction that is berries	-	fbcr	0.5
fraction that is birds	-	fbdcr	0.1
fraction of time in area	-	floccr	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site

Estimate of Effects of Radionuclides on American Crow - Site Maximum - Existing

earthworm concentration	Bq/kg(FW)	econc(FW)	3.84E+01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	9.72E+00	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	3.75E-03	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	2.56E-02	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	8.83E-01	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	4.27E-01	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	5.59E-02	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	1.40E+00	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	8.50E+00	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	1.19E+01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.01E-06	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*floccr
total dose	Gy/y	Dt	3.01E-06	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	3.70E+01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	6.27E+00	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.17E+00	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	0.00E+00	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	8.51E-01	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	5.35E+00	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	3.60E-02	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	7.40E+00	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	1.00E+00	assumed
crow concentration	Bq/kg	crconc(FW)	7.40E+00	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.14E-07	=crconc*DCi
weighted internal dose	Gy/y	Di	6.42E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*floccr
total dose	Gy/y	Dt	6.42E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	2.51E-03	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-04	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	1.70E-02	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	1.15E-02	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	1.44E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	1.44E-05	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	4.36E-02	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	7.60E-02	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	3.32E-03	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.86E-08	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.38E-13	=sconc*DCe*floccr

Estimate of Effects of Radionuclides on American Crow - Site Maximum - Existing

total dose	Gy/y	Dt	1.86E-08	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	3.15E-02	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-03	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	9.44E-04	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	1.15E-02	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	1.44E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	1.81E-04	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	3.45E-02	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	1.20E+00	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	4.14E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.31E-07	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*floccr
total dose	Gy/y	Dt	1.31E-07	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	1.17E-01	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-03	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	9.44E-04	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	1.15E-02	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	1.44E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	6.72E-04	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	3.50E-02	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	4.40E+00	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	1.54E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.18E-07	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	5.84E-07	=sconc*DCe*floccr
total dose	Gy/y	Dt	1.00E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	6.00E+00	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	1.34E-01	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	3.00E-02	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	7.56E-03	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	1.38E-01	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	2.88E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	7.69E-04	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	2.05E-01	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	8.70E-01	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	1.78E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation

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internal dose	Gy/y	Di	2.66E-07	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.11E-06	=sconc*DCe*floccr
total dose	Gy/y	Dt	1.38E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	1.52E-01	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-03	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	1.57E-02	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	1.15E-02	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	1.44E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	8.73E-04	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	4.99E-02	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	4.40E+00	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	2.20E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.23E-07	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	3.47E-06	=sconc*DCe*floccr
total dose	Gy/y	Dt	3.90E-06	=Di+De

Estimate of Effects of Radionuclides on Deer Mouse - Site Maximum - Existing

Information on Deer Mouse

water intake	L/d	Qwatdm	0.004
total food intake (DW)	g (FW)/d	Qfwwdm	3.7
Soil intake	g/d	Qsdm	0.02
fraction that is insects	-	fbdm	0.5
fraction that is veg	-	fvdm	0.5
fraction of time in area	-	flocdm	1

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water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from veg calculations
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	3.01E-04	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	9.66E-02	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	1.01E-01	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	1.99E-01	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	8.90E+00	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	1.77E+00	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.51E-07	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocdm
total dose	Gy/y	Dt	4.51E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from veg calculations

Estimate of Effects of Radionuclides on Deer Mouse - Site Maximum - Existing

intake of water	Bq/d	Iwat	3.12E-01	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	3.42E-01	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	9.16E-01	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	1.57E+00	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.00E+00	assumed
deer mouse concentration-ing	Bq/kg	dmconc-ing(FW)	1.57E+00	=Itot*Tfdm
air concentration	Bq/m3	aconc	2.46E+00	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
deer mouse concentration-inh	Bq/kg	dmconc-inh(FW)	5.73E+00	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.11E-07	=(dmconc-ing+dmconc-inh)*DCi
weighted internal dose	Gy/y	Di	6.33E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocdm
total dose	Gy/y	Dt	6.33E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	9.00E+00	from veg calculations
intake of water	Bq/d	Iwat	2.00E-04	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	2.00E-04	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	9.25E-04	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	1.67E-02	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	1.80E-02	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.90E-01	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	3.42E-03	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	5.26E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.80E-08	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	8.76E-12	=sconc*DCe*flocdm
total dose	Gy/y	Dt	1.80E-08	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	2.00E-03	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	1.11E-05	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	9.25E-04	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	9.25E-04	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	3.86E-03	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.80E-01	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	6.95E-04	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	9.10E-09	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	6.13E-08	=sconc*DCe*flocdm
total dose	Gy/y	Dt	7.04E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	2.00E-03	wconc*Qwatdm*flocdm

Estimate of Effects of Radionuclides on Deer Mouse - Site Maximum - Existing

intake of soil	Bq/d	Is	1.11E-05	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	9.25E-04	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	9.25E-04	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	3.86E-03	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.10E+02	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	4.25E-01	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	1.14E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.84E-07	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.56E-06	=sconc*DCe*flocdm
total dose	Gy/y	Dt	2.04E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	4.00E+00	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from veg calculations
intake of water	Bq/d	Iwat	8.00E-03	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	8.89E-05	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	7.40E-03	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	2.13E-02	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	3.68E-02	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	4.60E-01	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	1.69E-02	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.78E-08	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	6.75E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	3.00E-06	=sconc*DCe*flocdm
total dose	Gy/y	Dt	3.02E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	2.00E-03	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	1.84E-04	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	9.25E-04	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	9.25E-04	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	4.03E-03	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.10E+02	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	4.44E-01	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	6.22E-07	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.05E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	9.69E-06	=sconc*DCe*flocdm
total dose	Gy/y	Dt	1.03E-05	=Di+De

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Information on Meadow Vole

water intake	L/d	Qwatmv	0.007
total food intake (DW)	g (FW)/d	Qfwwmv	13
Soil intake	g/d	Qsmv	0.09
fraction that is veg	-	fvmv	1.0
fraction of time in area	-	flocmv	1

Estimate of Effects of Radionuclides on Meadow Vole - Site Maximum - Existing

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water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from veg calculations
intake of water	Bq/d	Iwat	1.75E-03	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	1.35E-03	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	7.13E-01	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	7.16E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	8.90E+00	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	6.37E+00	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.62E-06	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocmv
total dose	Gy/y	Dt	1.62E-06	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from veg calculations
intake of water	Bq/d	Iwat	5.46E-01	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	6.44E+00	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	6.98E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.00E+00	assumed
meadow vole concentration-ing	Bq/kg	mvconc-ing(FW)	6.98E+00	=Itot*Tfmv
air concentration	Bq/m3	aconc	2.46E+00	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
meadow vole concentration-inh	Bq/kg	mvconc-inh(FW)	5.73E+00	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	3.68E-07	=(mvconc-ing+mvconc-inh)*DCi
weighted internal dose	Gy/y	Di	1.10E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocmv
total dose	Gy/y	Dt	1.10E-06	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	9.00E+00	from veg calculations
intake of water	Bq/d	Iwat	3.50E-04	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	9.00E-04	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	1.17E-01	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	1.18E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.90E-01	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	2.25E-02	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	5.26E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.18E-07	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	8.76E-12	=sconc*DCe*flocmv
total dose	Gy/y	Dt	1.18E-07	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	3.50E-03	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	5.00E-05	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	6.50E-03	=vconc*Qfwwmv*fvmv/1000*flocmv

Estimate of Effects of Radionuclides on Meadow Vole - Site Maximum - Existing

total intake	Bq/d	Itot	1.01E-02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.80E-01	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	1.81E-03	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	2.37E-08	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	6.13E-08	=sconc*DCe*flocmv
total dose	Gy/y	Dt	8.50E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	3.50E-03	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	5.00E-05	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	6.50E-03	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	1.01E-02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.10E+02	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	1.11E+00	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	1.14E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.26E-06	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.56E-06	=sconc*DCe*flocmv
total dose	Gy/y	Dt	2.82E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from veg calculations
intake of water	Bq/d	Iwat	1.40E-02	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	4.00E-04	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	1.50E-01	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	1.64E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	4.60E-01	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	7.54E-02	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	7.93E-08	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	6.75E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	3.00E-06	=sconc*DCe*flocmv
total dose	Gy/y	Dt	3.08E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	3.50E-03	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	8.30E-04	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	6.50E-03	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	1.08E-02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.10E+02	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	1.19E+00	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.67E-06	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.05E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	9.69E-06	=sconc*DCe*flocmv
total dose	Gy/y	Dt	1.14E-05	=Di+De

Estimate of Effects of Radionuclides on Short-Tailed Weasel - Site Maximum - Existing

Information on Weasel

water intake	L/d	Qwatrf	0.02	
total food intake (DW)	g (FW)/d	Qffwrf	56	
soil intake	g/d	Qsrf	0.8	
fraction that is small mammal	-	fsmrf	1	meadow vole
fraction of time in area	-	flocrf	1	

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	6.37E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	5.00E-03	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	1.20E-02	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	3.57E-01	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	3.74E-01	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	8.90E+00	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	3.33E+00	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	8.45E-07	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrf
total dose	Gy/y	Dt	8.45E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.27E+01	from meadow vole calculations
intake of water	Bq/d	Iwat	1.56E+00	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	7.12E-01	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	2.27E+00	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.00E+00	assumed
weasel concentration-ing	Bq/kg	wconc-ing(FW)	2.27E+00	=Itot*TFw
air concentration	Bq/m3	aconc	2.46E+00	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
weasel concentration-inh	Bq/kg	wconc-inh(FW)	5.73E+00	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.31E-07	=(wconc-ing+wconc-inh)*DCi
weighted internal dose	Gy/y	Di	6.94E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrf
total dose	Gy/y	Dt	6.94E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	2.25E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	8.00E-03	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	1.26E-03	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	1.03E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.90E-01	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	1.95E-03	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	5.34E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.04E-08	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	8.76E-12	=sconc*DCe*flocrf

Estimate of Effects of Radionuclides on Short-Tailed Weasel - Site Maximum - Existing

total dose	Gy/y	Dt	1.04E-08	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.81E-03	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-02	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	4.44E-04	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	1.01E-04	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	1.05E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.80E-01	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	1.90E-03	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	2.49E-08	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	6.13E-08	=sconc*DCe*flocrf
total dose	Gy/y	Dt	8.62E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.11E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-02	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	4.44E-04	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	6.19E-02	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	7.24E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.10E+02	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	7.96E+00	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	9.76E-06	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.51E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	1.13E-05	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	7.54E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	4.00E-02	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	3.56E-03	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	4.22E-03	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	4.78E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	4.60E-01	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	2.20E-02	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.31E-08	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	6.66E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	2.96E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	2.98E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.19E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-02	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	7.38E-03	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	6.67E-02	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	8.41E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.10E+02	CSA, 2008, Table G3

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Weasel concentration	Bq/kg	wconc(FW)	9.25E+00	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.30E-05	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	8.89E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	2.19E-05	=Di+De

Estimate of Effects of Radionuclides on Eastern Cottontail Rabbit - Site Maximum - Existing

Information on Eastern Cottontail

water intake	L/d	Qwatctr	0.12
total food intake (DW)	g (FW)/d	Qfwwctr	269
Soil intake	g/d	Qsctr	5
fraction that is veg	-	fvctr	1.0
fraction of time in area	-	flocctr	1

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from veg calculations
intake of water	Bq/d	Iwat	3.00E-02	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	7.53E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	1.47E+01	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	1.49E+01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	8.90E+00	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	1.32E+02	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	3.36E-05	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocctr
total dose	Gy/y	Dt	3.36E-05	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from veg calculations
intake of water	Bq/d	Iwat	9.36E+00	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	1.33E+02	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	1.43E+02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.00E+00	assumed
cottontail rabbit concentration-ing	Bq/kg	ctrconc-ing(FW)	1.43E+02	=Itot*Tfctr
air concentration	Bq/m3	aconc	2.46E+00	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
cottontail rabbit concentration-inh	Bq/kg	ctrconc-inh(FW)	5.73E+00	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	4.29E-06	=(ctrconc-ing+ctrconc-inh)*DCi
weighted internal dose	Gy/y	Di	1.29E-05	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocctr
total dose	Gy/y	Dt	1.29E-05	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	9.00E+00	from veg calculations
intake of water	Bq/d	Iwat	6.00E-03	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	5.00E-02	sconc*Qsctr/1000*flocctr

Estimate of Effects of Radionuclides on Eastern Cottontail Rabbit - Site Maximum - Existing

intake of veg	Bq/d	Iveg	2.42E+00	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	2.48E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.90E-01	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	4.71E-01	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.64E-06	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.88E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	7.88E-12	=sconc*DCe*flocctr
total dose	Gy/y	Dt	2.64E-06	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	6.00E-02	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	2.78E-03	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	1.35E-01	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	1.97E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.80E-01	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	3.55E-02	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	4.65E-07	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	6.13E-08	=sconc*DCe*flocctr
total dose	Gy/y	Dt	5.27E-07	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	6.00E-02	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	2.78E-03	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	1.35E-01	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	1.97E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.10E+02	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	2.17E+01	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	2.10E-06	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	4.56E-05	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.45E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.36E-06	=sconc*DCe*flocctr
total dose	Gy/y	Dt	4.70E-05	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from veg calculations
intake of water	Bq/d	Iwat	2.40E-01	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	2.22E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	3.09E+00	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	3.36E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	4.60E-01	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	1.54E+00	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.03E-06	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	5.87E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	2.61E-06	=sconc*DCe*flocctr
total dose	Gy/y	Dt	4.64E-06	=Di+De

Estimate of Effects of Radionuclides on Eastern Cottontail Rabbit - Site Maximum - Existing

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	6.00E-02	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	4.61E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	1.35E-01	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	2.41E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.10E+02	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	2.65E+01	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.64E-05	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	8.08E-06	=sconc*DCe*flocctr
total dose	Gy/y	Dt	5.44E-05	=Di+De

Estimate of Effects of Radionuclides on White-Tailed Deer - Site Maximum - Existing

Information on White-Tailed Deer

water intake	L/d	Qwatdr	6.8
total food intake (DW)	g (FW)/d	Qfwwdr	10900
Soil intake	g/d	Qsdr	66
fraction that is veg	-	fvdr	1.0
fraction of time in area	-	flocdr	1

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from veg calculations
intake of water	Bq/d	Iwat	1.70E+00	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	9.93E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	5.97E+02	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	6.00E+02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	6.20E-01	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	3.72E+02	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	9.45E-05	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocdr
total dose	Gy/y	Dt	9.45E-05	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from veg calculations
intake of water	Bq/d	Iwat	5.30E+02	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	5.40E+03	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	5.93E+03	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	1.00E+00	assumed
deer concentration-ing	Bq/kg	drconc-ing(FW)	5.93E+03	=Itot*Tfdr
air concentration	Bq/m3	aconc	2.46E+00	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
deer concentration-inh	Bq/kg	drconc-inh(FW)	5.73E+00	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.71E-04	=(drconc-ing+drconc-inh)*DCi
weighted internal dose	Gy/y	Di	5.14E-04	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for

Estimate of Effects of Radionuclides on White-Tailed Deer - Site Maximum - Existing

				external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocdr
total dose	Gy/y	Dt	5.14E-04	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	9.00E+00	from veg calculations
intake of water	Bq/d	Iwat	3.40E-01	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	6.60E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	9.81E+01	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	9.91E+01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	4.00E-02	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	3.96E+00	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	5.69E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.26E-05	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	3.77E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	3.77E-12	=sconc*DCe*flocdr
total dose	Gy/y	Dt	2.26E-05	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	3.40E+00	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	3.67E-02	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	5.45E+00	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	8.89E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	1.20E-02	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	1.07E-01	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	1.40E-06	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	6.13E-08	=sconc*DCe*flocdr
total dose	Gy/y	Dt	1.46E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	3.40E+00	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	3.67E-02	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	5.45E+00	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	8.89E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	1.50E-01	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	1.33E+00	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	3.42E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.55E-06	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.02E-06	=sconc*DCe*flocdr
total dose	Gy/y	Dt	5.58E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from veg calculations
intake of water	Bq/d	Iwat	1.36E+01	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	2.93E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	1.25E+02	=vconc*Qfwwdr*fvdr/1000*flocdr

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total intake	Bq/d	Itot	1.39E+02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	3.20E-02	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	4.46E+00	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	1.66E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	7.42E-06	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.38E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.95E-06	=sconc*DCe*flocdr
total dose	Gy/y	Dt	9.36E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	3.40E+00	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	6.09E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	5.45E+00	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	9.46E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	1.50E-01	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	1.42E+00	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	2.19E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	3.11E-06	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	6.66E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	6.14E-06	=sconc*DCe*flocdr
total dose	Gy/y	Dt	9.25E-06	=Di+De

Estimate of Effects of Radionuclides on Raccoon - Site Maximum - Existing

Information on Raccoon

water intake	L/d	Qwatrc	0.47	
total food intake (DW)	g (FW)/d	Qffwrc	958	
soil intake	g/d	Qsrc	27	
fraction that is fruit	-	ffrc	0.15	fruit taken to be berries
fraction that is insects	-	finrc	0.4	
fraction that is vegetation	-	fvrc	0.25	
fraction that is small mammal	-	fsmrc	0.10	deer mouse
fraction that is benthic invert	-	fbirc	0.10	
fraction of time in area	-	flocrc	1	
inhalation rate	m3/d	inrate	2.32	

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	2.78E+01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	6.37E+00	maximum of deer mouse and meadow vole
intake from water	Bq/d	Iwat	1.18E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	4.06E-01	sconc*Qsrc/1000*flocrc
intake from fruit	Bq/d	Ifr	2.13E+00	=berconc*Qffwrc*flocrc/1000*ffrc
intake from insects	Bq/d	Iin	2.00E+01	=inrconc*Qffwrc*flocrc/1000*finrc
intake from vegetation	Bq/d	Iv	1.31E+01	=vconc*Qffwrf*fbcr/1000*flocrf
intake from benthos	Bq/d	Ibi	2.66E+00	=biconc*Qffwrc*fbirc/1000*flocrc
intake from small mammals	Bq/d	Ism	6.10E-01	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	3.91E+01	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc-ing	8.90E+00	CSA, 2008, Table G3
raccoon concentration-ing	Bq/kg	rcconc-ing(FW)	3.48E+02	=Itot*TFrc

Estimate of Effects of Radionuclides on Raccoon - Site Maximum - Existing

raccoon concentration-tot	Bq/kg	rcconc(FW)	3.48E+02	=rcconc-ing
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	8.83E-05	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrc
total dose	Gy/y	Dt	8.83E-05	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	1.00E+01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	1.27E+01	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	3.67E+01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	2.67E+01	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	7.09E+01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	1.19E+02	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	9.58E-01	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	1.22E+00	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	2.55E+02	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.00E+00	assumed
raccoon concentration-ing	Bq/kg	rcconc-ing(FW)	2.55E+02	=Itot*TFrc
air concentration	Bq/m3	aconc	2.46E+00	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
racoon concentration-inh	Bq/kg	rcconc-inh(FW)	5.73E+00	=aconc*TFrc-inh
raccoon concentration-tot	Bq/kg	rcconc(FW)	2.61E+02	=rcconc-ing+rcconc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di_uw	7.54E-06	=rcconc*DCi
weighted internal dose	Gy/y	Di	2.26E-05	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrc
total dose	Gy/y	Dt	2.26E-05	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	2.23E+01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	9.00E+00	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	2.25E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.35E-02	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	2.70E-01	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	7.19E-02	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	1.92E-01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	2.16E+00	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	2.14E+00	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	2.15E-03	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	4.85E+00	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.90E-01	CSA, 2008, Table G3
raccoon concentration-ing	Bq/kg	rcconc-ing(FW)	9.22E-01	=Itot*TFrc
raccoon concentration-tot	Bq/kg	rcconc(FW)	9.22E-01	=rcconc-ing+rcconc-inh

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internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	5.17E-06	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	7.01E-12	=sconc*DCe*flocrc
total dose	Gy/y	Dt	5.17E-06	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	5.00E-01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	1.81E-03	maximum of deer mouse and meadow vole
air concentration	Bq/m3	aconc	1.10E-01	Max at site
intake of water	Bq/d	Iwat	2.35E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	1.50E-02	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	7.19E-02	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	1.92E-01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	1.20E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	4.79E-02	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	1.73E-04	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	6.81E-01	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.80E-01	CSA, 2008, Table G3
raccoon concentration	Bq/kg	rcconc(FW)	1.23E-01	=Itot*TFrc
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	1.61E-06	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	6.13E-08	=sconc*DCe*flocrc
total dose	Gy/y	Dt	1.67E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	5.00E-01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	1.11E+00	maximum of deer mouse and meadow vole
air concentration	Bq/m3	aconc	1.10E-01	Max at site
intake of water	Bq/d	Iwat	2.35E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	1.50E-02	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	7.19E-02	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	1.92E-01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	1.20E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	4.79E-02	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	1.06E-01	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	7.87E-01	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.10E+02	CSA, 2008, Table G3
raccoon concentration	Bq/kg	rcconc(FW)	8.66E+01	=Itot*TFrc
internal DC	Gy/y per Bq/kg	DCi	2.63E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	2.28E-04	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.28E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox

Estimate of Effects of Radionuclides on Raccoon - Site Maximum - Existing

external dose	Gy/y	De	1.27E-06	=sconc*DCe*flocrc
total dose	Gy/y	Dt	2.29E-04	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	4.00E+00	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	5.41E+01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	7.54E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	9.40E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	1.20E-01	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	1.44E-01	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	1.53E+00	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	2.75E+00	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	5.18E+00	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	7.22E-03	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	1.07E+01	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	4.60E-01	CSA, 2008, Table G3
raccoon concentration	Bq/kg	rcconc(FW)	4.91E+00	=Itot*TFrc
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	6.89E-06	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	5.52E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	2.45E-06	=sconc*DCe*flocrc
total dose	Gy/y	Dt	9.34E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	5.00E-01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	1.19E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.35E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	2.49E-01	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	7.19E-02	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	1.92E-01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	1.20E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	4.79E-02	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	1.14E-01	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	1.03E+00	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.10E+02	CSA, 2008, Table G3
raccoon concentration	Bq/kg	rcconc(FW)	1.13E+02	=Itot*TFrc
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	2.18E-04	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.32E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	7.67E-06	=sconc*DCe*flocrc
total dose	Gy/y	Dt	2.26E-04	=Di+De

Estimate of Effects of Radionuclides on Red Fox - Site Maximum - Existing

Information on Red Fox

water intake	L/d	Qwatrf	0.4	

Estimate of Effects of Radionuclides on Red Fox - Site Maximum - Existing

total food intake (DW)	g (FW)/d	Qffwrf	313	
soil intake	g/d	Qsrf	2.6	
fraction that is terrestrial veg	-	ftvrf	0.15	
fraction that is rabbit	-	frrf	0.4	
fraction that is bird	-	fdrf	0.20	
fraction that is small mammal	-	fsmrf	0.25	meadow vole
fraction of time in area	-	flocrf	1	

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	1.32E+02	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	9.72E+00	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	6.37E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	3.91E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	1.65E+01	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	2.57E+00	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	6.09E-01	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	4.98E-01	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	2.04E+01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	8.90E+00	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	1.81E+02	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.61E-05	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrf
total dose	Gy/y	Dt	4.61E-05	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	1.48E+02	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	6.27E+00	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.27E+01	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	3.12E+01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	0.00E+00	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	1.86E+01	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	2.32E+01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	3.92E-01	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	9.95E-01	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	7.44E+01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.00E+00	assumed
red fox concentration-ing	Bq/kg	rfconc-ing(FW)	7.44E+01	=Itot*TFrf
air concentration	Bq/m3	aconc	2.46E+00	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
red fox concentration-inh	Bq/kg	rfconc-inh(FW)	5.73E+00	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.32E-06	=(rfconc-ing+rfconc-inh)*DCi
weighted internal dose	Gy/y	Di	6.95E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrf

Estimate of Effects of Radionuclides on Red Fox - Site Maximum - Existing

total dose	Gy/y	Dt	6.95E-06	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.00E+01	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	4.71E-01	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	2.51E-03	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	9.00E+00	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	2.25E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.00E-02	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	2.60E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	5.89E-02	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	4.23E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	1.57E-04	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	1.76E-03	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	5.29E-01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.90E-01	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	1.01E-01	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	5.64E-07	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	7.01E-12	=sconc*DCe*flocrf
total dose	Gy/y	Dt	5.64E-07	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	3.55E-02	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	3.15E-02	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.81E-03	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	1.44E-03	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	4.45E-03	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	2.35E-02	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	1.97E-03	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	1.42E-04	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	2.31E-01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.80E-01	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	4.17E-02	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	5.46E-07	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	6.13E-08	=sconc*DCe*flocrf
total dose	Gy/y	Dt	6.07E-07	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	2.17E+01	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	1.17E-01	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from vegetation calculations
small mammal	Bq/kg(FW)	mvconc(FW	1.11E+00	maximum of deer mouse and meadow vole

Estimate of Effects of Radionuclides on Red Fox - Site Maximum - Existing

concentration				
intake of water	Bq/d	Iwat	2.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	1.44E-03	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	2.72E+00	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	2.35E-02	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	7.31E-03	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	8.65E-02	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	3.04E+00	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.10E+02	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	3.34E+02	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	2.63E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	8.78E-04	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.28E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.27E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	8.79E-04	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.44E+00	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	1.54E+00	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	1.34E-01	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	7.54E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	8.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	1.16E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	1.93E-01	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	5.40E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	8.37E-03	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	5.90E-03	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	1.56E+00	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	4.60E-01	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	7.17E-01	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.01E-06	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	5.52E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	2.45E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	3.46E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	9.22E+00	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	2.65E+01	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	1.52E-01	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.19E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	2.40E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	3.31E+00	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	2.35E-02	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	9.51E-03	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	9.32E-02	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	3.66E+00	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.10E+02	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	4.03E+02	=Itot*TFrf
internal DC	Gy/y per	DCi	1.93E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal

Estimate of Effects of Radionuclides on Red Fox - Site Maximum - Existing

	Bq/kg			irradiation
internal dose	Gy/y	Di	7.77E-04	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.32E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	7.67E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	7.84E-04	=Di+De

Estimate of Effects of Radionuclides on Aquatic Ecological Receptors – Coots Pond – Existing Conditions

Estimate of Effects of Radionuclides on Aquatic Benthic Invertebrates - Coots Pond - Existing

C-14

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	2.25E+05	US DOE (2003)
benthic invert concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.06E-06	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.49E-10	=sedconc(WW)*DC
total dose	Gy/y	Dt	7.06E-06	=Di+De

H-3

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+00	assumed
benthic invert concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.89E-07	=biconc*DCi
weighted internal dose	Gy/y	Di	8.67E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.05E-12	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.13E-10	=sedconc(WW)*DC
total dose	Gy/y	Dt	8.68E-07	=Di+De

Sr-90

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	5.26E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.17E-04	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.73E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	5.06E-07	=sedconc(WW)*DC
total dose	Gy/y	Dt	1.18E-04	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	2.00E+03	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.26E-07	=biconc*DCi

Estimate of Effects of Radionuclides on Aquatic Benthic Invertebrates - Coots Pond - Existing

external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	6.22E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	6.75E-06	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	5.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.13E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.45E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.74E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	4.35E-06	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	2.50E+03	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.69E-05	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	2.06E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	5.89E-05	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	5.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	1.36E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	2.06E-06	=Di+De

Estimate of Effects of Radionuclides on Aquatic Plants - Coots Pond - Existing

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water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	1.01E+05	Bird and Schwartz (1996) & US DOE (2003), (L/kg) dw
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	2.53E+04	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	4.37E+01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.10E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.19E-06	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	4.03E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.01E-08	=wconc*Dce
total dose	Gy/y	Dt	9.20E-06	=Di+De

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water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond

Estimate of Effects of Radionuclides on Aquatic Plants - Coots Pond - Existing

aquatic plant transfer factor	L/kg (DW)	TFaq	1.00E+00	assumed
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	7.80E+01	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.80E+01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.68E-06	=aqconc(FW)*DCi
weighted internal dose	Gy/y	Di	5.03E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.30E-08	=wconc*Dce
total dose	Gy/y	Dt	5.04E-06	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	2.70E+03	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	1.35E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	1.30E+00	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	5.52E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.17E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	5.17E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.58E-07	=wconc*Dce
total dose	Gy/y	Dt	9.76E-07	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	7.90E+03	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	3.95E+03	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.15E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.58E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.31E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	6.57E-06	=wconc*Dce
total dose	Gy/y	Dt	6.73E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	9.80E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	4.90E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.89E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.45E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	8.41E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	4.20E-06	=wconc*Dce
total dose	Gy/y	Dt	4.35E-06	=Di+De

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water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	9.60E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	1.92E+03	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	1.50E+00	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.68E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.52E-07	=aqconc(FW)*DCi
external DC	Gy/y per	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external

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	Bq/kg			irradiation
external dose from water	Gy/y	De	5.08E-06	=wconc*Dce
total dose	Gy/y	Dt	5.63E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	9.80E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	4.90E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.77E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.88E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	3.77E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.88E-06	=wconc*Dce
total dose	Gy/y	Dt	2.07E-06	=Di+De

Estimate of Effects of Radionuclides on Forage Fish - Coots Pond - Existing

Fraction of time in water	ffw	0.5
Fraction of time in sediment	ffs	0.5

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Water				
water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	5.72E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	3.50E+01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.89E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.40E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-11	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	8.89E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.40E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	9.01E-11	=sedconc*DCe*ffs
total dose-water&sediment	Gy/y	Dt	8.90E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	1.00E+00	assumed
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	7.70E+01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.23E-06	=fconc(FW)*DCi
weighted internal dose	Gy/y	Di	6.68E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	5.52E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	2.15E-11	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	6.68E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	5.52E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation

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external dose from sediment	Gy/y	De-s	2.76E-13	=sedconc*DCe*ffs
total dose-water&sediment	Gy/y	Dt	6.68E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	2.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	5.52E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	2.76E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.37E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	5.91E-09	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	2.77E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.37E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.26E-07	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	2.89E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	5.40E+01	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.76E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.14E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	2.85E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	3.72E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.14E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.89E-06	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	6.61E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.76E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	2.63E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2

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pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.01E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.76E-06	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	4.39E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	6.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	1.59E+02	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	1.95E-04	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.66E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.66E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.97E-04	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.66E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	9.31E-07	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	1.98E-04	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.58E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	7.88E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	6.35E-07	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.42E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	6.37E-07	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	2.06E-06	= Di+De-w+De-s

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water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	5720.00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	3.50E+01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.89E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.37E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.91E-11	=wconc*Dce

Estimate of Effects of Radionuclides on Predator Fish - Coots Pond - Existing

total dose	Gy/y	Dt	8.90E-06	=Di+De

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water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	1.00E+00	assumed
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	7.70E+01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.23E-06	=fconc(FW)*DCi
weighted internal dose	Gy/y	Di	6.68E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.05E-12	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	8.20E-11	=wconc*Dce
total dose	Gy/y	Dt	6.68E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	2.00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	5.34E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.67E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	3.68E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.84E-08	=wconc*Dce
total dose	Gy/y	Dt	2.69E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	5.40E+01	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.57E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	6.13E-06	=wconc*Dce
total dose	Gy/y	Dt	7.45E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.36E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	3.68E-06	=wconc*Dce
total dose	Gy/y	Dt	4.38E-06	=Di+De

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water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	6.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	1.59E+02	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.14E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.81E-04	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.75E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	3.50E-06	=wconc*Dce
total dose	Gy/y	Dt	1.85E-04	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond

Estimate of Effects of Radionuclides on Predator Fish - Coots Pond - Existing

Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.63E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.31E-06	=wconc*Dce
total dose	Gy/y	Dt	2.01E-06	=Di+De

Estimate of Effects of Radionuclides on Frog - Coots Pond - Existing

Fraction of time in water	ffrogw	0.5
Fraction of time in sediment	ffrogs	0.5

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Water				
water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	5.72E+03	No specific information available, use TF for fish: CSA, 2008, Table A.25a
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	3.39E+01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.45E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.32E-06	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	4.20E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	5.26E-11	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	8.32E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	4.20E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.70E-10	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	8.32E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	1.00E+00	assumed
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	3.80E+01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.10E-06	=frconc(FW)*DCi
weighted internal dose	Gy/y	Di	3.30E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	6.49E-09	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	3.30E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.48E-08	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	3.33E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond

Estimate of Effects of Radionuclides on Frog - Coots Pond - Existing

Frog transfer factor	L/kg (FW)	TFfr	2.00E+00	No specific information available, use TF for fish: CSA, 2008, Table A.25a
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	1.00E-01	=wconc*TFfr
internal DC	Gy/y per Bq/kg	DCi	4.99E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.99E-07	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-08	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	5.17E-07	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.01E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	3.75E-07	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	8.91E-07	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	5.40E+01	No specific information available, use TF for fish: CSA, 2008, Table A.25a
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	5.00E-01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	8.67E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.34E-07	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	3.07E-06	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	3.50E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	3.11E-06	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	6.61E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	4.80E+02	Ewing et al, 1996
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	5.00E-01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.26E-07	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.62E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.91E-06	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	2.43E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.62E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation

Estimate of Effects of Radionuclides on Frog - Coots Pond - Existing

external dose from sediment	Gy/y	De-s	1.91E-06	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	4.34E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	1.25E+02	Chant 1999
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	1.10E+01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.16E-05	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.84E-06	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	1.34E-05	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.03E-06	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	1.44E-05	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	4.80E+02	Ewing et al, 1996
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	5.00E-01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.57E-07	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	7.01E-07	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	1.36E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	7.03E-07	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	2.06E-06	= Di+De-w+De-s

Estimate of Effects of Radionuclides on Painted Turtle - Coots Pond – Existing

Fraction of time in water	fturtlew	0.5
Fraction of time in sediment	fturtles	0.5

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Water				
water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	5.72E+03	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	3.39E+01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	2.45E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.32E-06	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	4.20E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	5.26E-11	=wconc*DCe*fturtlew

Estimate of Effects of Radionuclides on Painted Turtle - Coots Pond – Existing

total dose-water	Gy/y	Dt-w	8.32E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	4.20E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.70E-10	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	8.32E-06	= Di+De-w+De-s

H-3

Water				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	1.00E+00	assumed
Turtle concentration-fw	Bq/kg (FW)	turconc(FW	3.80E+01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.10E-06	=turconc(FW)*DCi
weighted internal dose	Gy/y	Di	3.30E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	6.49E-09	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	3.30E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.48E-08	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	3.33E-06	= Di+De-w+De-s

Sr-90

Water				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	2.00E+00	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	1.00E-01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	4.99E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.99E-07	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-08	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	5.17E-07	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.01E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	3.75E-07	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	8.91E-07	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	5.40E+01	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	5.00E-01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	8.67E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation

Estimate of Effects of Radionuclides on Painted Turtle - Coots Pond – Existing

internal dose	Gy/y	Di	4.34E-07	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	3.07E-06	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	3.50E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	3.11E-06	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	6.61E-06	= Di+De-w+De-s

Cs-134

Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	4.80E+02	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	5.00E-01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.26E-07	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.62E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.91E-06	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	2.43E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.62E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.91E-06	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	4.34E-06	= Di+De-w+De-s

I-131

Water				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	1.25E+02	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	1.10E+01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.16E-05	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.84E-06	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	1.34E-05	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.03E-06	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	1.44E-05	= Di+De-w+De-s

Cs-137

Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond

Estimate of Effects of Radionuclides on Painted Turtle - Coots Pond – Existing

Turtle transfer factor	L/kg (FW)	Tftur	4.80E+02	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	5.00E-01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.57E-07	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	7.01E-07	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	1.36E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	7.03E-07	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	2.06E-06	= Di+De-w+De-s

Estimate of Effects of Radionuclides on Birds - Bufflehead - Coots Pond - Existing

Information on Bufflehead

water intake	L/d	Qwatbh	0.04
total food intake (FW)	g (FW)/d	Qffwbh	179
fraction that is benthos	-	fbibh	0.9
fraction that is aquatic veg	-	favbh	0.1
sediment intake	g (DW)/d	Qsdwbh	3.9
fraction of time in area	-	flocbh	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	5.00E-03	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	2.26E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	3.52E-01	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	2.13E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	2.64E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.25E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.71E-06	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	5.71E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.80E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.56E+00	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	8.14E-01	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.67E-01	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	5.81E-01	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	3.42E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	3.42E+00	tot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation

Estimate of Effects of Radionuclides on Birds - Bufflehead - Coots Pond - Existing

internal dose	Gy/y	Di_uw	9.89E-08	=bhconc*DCi
weighted internal dose	Gy/y	Di	2.97E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.06E-11	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	2.97E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	1.82E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	1.05E-02	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.95E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	1.85E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	1.40E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.87E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	7.89E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	7.74E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.44E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	2.65E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.84E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.71E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocbh

Estimate of Effects of Radionuclides on Birds - Bufflehead - Coots Pond - Existing

total dose	Gy/y	Dt	2.26E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	4.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.41E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	1.21E-02	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.95E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	4.48E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	3.90E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.80E-06	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	7.20E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.84E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.47E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	1.09E-06	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) - Mallard - Coots Pond - Existing

Information on Mallard

water intake	L/d	Qwats	0.06
total food intake (FW)	g (FW)/d	Qffws	250
fraction that is benthos	-	fbis	0.75
fraction that is aquatic veg	-	favs	0.25
sediment intake	g (DW)/d	Qsdws	1.7
fraction of time in area	-	flocs	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.61E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.37E+00	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	9.27E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	3.99E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	3.39E+01	=Itot*Tfbird

Estimate of Effects of Radionuclides on Birds (Large) - Mallard - Coots Pond - Existing

internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.61E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	8.61E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.80E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	2.34E+00	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	9.38E-01	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.81E+00	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	2.53E-01	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	5.34E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
mallard concentration	Bq/kg (FW)	sconc(FW)	5.34E+00	tot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.54E-07	=sconc*DCi
weighted internal dose	Gy/y	Di	4.63E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.06E-11	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	4.63E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.09E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	6.97E-01	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	8.50E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	2.80E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	2.13E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.19E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.19E-06	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	4.25E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	8.18E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	9.81E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.09E-07	=sconc*DCi
external DC from water	Gy/y per	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external

Estimate of Effects of Radionuclides on Birds (Large) - Mallard - Coots Pond - Existing

	Bq/kg			irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.72E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	4.25E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	8.18E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	3.60E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.77E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.47E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	5.07E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	4.69E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	8.50E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	5.19E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	4.51E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.72E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	8.12E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	4.25E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	8.18E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	3.60E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.93E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.24E-06	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe - Coots Pond - Existing

Information on Pied-Billed Grebe

water intake	L/d	Qwats	0.03
total food intake (FW)	g (FW)/d	Qffws	173.0
fraction that is benthos	-	fbis	0.5
fraction that is fish	-	favs	0.5
sediment intake	g (DW)/d	Qsdws	0.7
fraction of time in area	-	flocs	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	3.50E+01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	3.75E-03	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	1.20E+00	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	3.82E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	1.51E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	2.72E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.32E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.88E-06	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	5.88E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	7.70E+01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.17E+00	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	4.33E-01	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	1.04E-01	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	3.33E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.04E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	5.04E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.46E-07	=sconc*DCi
weighted internal dose	Gy/y	Di	4.37E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/m3	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.06E-11	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	4.37E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-04	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	9.64E-01	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	3.50E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	9.90E-01	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	7.53E-02	=Itot*Tfbird
internal DC	Gy/y per	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe - Coots Pond - Existing

	Bq/kg			irradiation
internal dose	Gy/y	Di	4.22E-07	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	4.24E-07	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	6.30E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.99E-07	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	2.61E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.31E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.27E-07	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	2.12E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	1.59E+02	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	3.00E-02	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	2.34E+00	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	3.50E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	6.88E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	9.25E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	8.05E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.20E-05	=sconc*DCi

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe - Coots Pond - Existing

external DC from water	Gy/y per Bq/m3	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	1.34E-05	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.31E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.45E-07	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	9.93E-07	=Di+De

Estimate of Effects of Radionuclides on Mammals (Small) - Muskrat - Coots Pond - Existing

Information on muskrat

water intake	L/d	Qwatm	0.12	
total food intake (FW)	g (FW)/d	Qffwm	360	
sediment intake	g/d	Qsedm	2.4	
fraction that is aquatic plants	-	faqm	0.98	
fraction that is benthic invert	-	fbim	0.02	
body weight	kg	BWm	1.2	
fraction of time in area	-	flocm	1	
fraction of time in house	-	fhm	0.7	assume all winter and half of summer

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
intake of water	Bq/d	Iwat	3.00E-02	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	1.54E+01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	2.00E-01	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	2.62E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	1.57E+01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	8.90E+00	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	139.496	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.5E-05	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	7.36E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	5.52E-12	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	7.36E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	6.63E-11	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	6.63E-11	=sedconc(WW)*Dce*fhm

Estimate of Effects of Radionuclides on Mammals (Small) - Muskrat - Coots Pond - Existing

total dose	Gy/y	Dt	3.54E-05	=Di+Dew+Des-h+des-b

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.80E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
intake of water	Bq/d	Iwat	9.36E+00	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	2.05E+01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	7.20E-02	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	7.15E-01	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	3.06E+01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.00E+00	assumed
muskrat concentration-ing	Bq/kg (FW)	mconc(FW)	3.06E+01	Itot*Tfbird
air concentration	Bq/m3	aconc	2.46E+00	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
muskrat concentration-inh	Bq/kg	mconc-inh(FW)	5.73E+00	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.05E-06	=(mconc-ing+mconc-inh)*DCi
weighted internal dose	Gy/y	Di	3.15E-06	=Di_uw*RBE
external DC (water)	Gy/y per Bq/kg	DCe	3.15E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	7.38E-12	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	3.15E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	6.58E-11	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	6.58E-11	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	3.15E-06	=Di+Dew+Des-h+des-b

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
intake of water	Bq/d	Iwat	6.00E-03	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	4.59E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	1.61E-01	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	2.40E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	6.49E-01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.90E-01	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	0.12335	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.9E-07	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	1.23E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	1.84E-09	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	1.23E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	9.18E-08	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	9.18E-08	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	8.77E-07	

Co-60

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond

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sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	1.76E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	3.60E-03	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	1.20E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	2.52E-01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.80E-01	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	0.04536	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	2.63E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.2E-07	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	1.05E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	1.58E-06	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	1.05E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	3.73E-06	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	3.73E-06	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	9.16E-06	=Di+Dew+Des-h+des-b

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	1.76E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	3.60E-03	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	1.20E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	2.52E-01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.10E+02	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	2.77E+01	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	2.37E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.6E-05	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	6.31E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	9.46E-07	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	6.31E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	2.21E-06	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	2.21E-06	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	7.09E-05	=Di+Dew+Des-h+des-b

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water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
intake of water	Bq/d	Iwat	2.40E-01	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	5.29E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	3.90E-01	=biconc(FW)*Qffwm/1000*fbim*flocm

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intake of sediment	Bq/d	Ised	2.40E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	1.18E+00	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	4.60E-01	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	0.54405	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.6E-07	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	1.49E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	8.94E-07	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	1.49E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	1.17E-06	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	1.17E-06	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	3.99E-06	=Di+Dew+Des-h+des-b

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	1.76E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	3.60E-03	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	4.32E-04	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	2.40E-01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.10E+02	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	26.4475	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	1.84E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.9E-05	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	2.28E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	3.42E-07	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	2.28E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	8.00E-07	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	8.00E-07	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	5.06E-05	=Di+Dew+Des-h+des-b

Estimate of Effects of Radionuclides on Aquatic Ecological Receptors – Lake Ontario – Existing Conditions

Estimate of Effects of Radionuclides on Aquatic Benthic Invertebrates - Near Shore Lake Ontario - Existing

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.66E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	9.79E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	9.00E+03	PNNL (2003)
benthic invert concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.06E-06	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	2.66E-10	=sedconc(WW)*DC
total dose	Gy/y	Dt	7.06E-06	=Di+De

H-3

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	7.50E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	7.50E+00	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	7.50E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+00	assumed
benthic invert concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.89E-07	=biconc*DCi
weighted internal dose	Gy/y	Di	8.67E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.05E-12	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	7.88E-12	=sedconc(WW)*DC
total dose	Gy/y	Dt	8.67E-07	=Di+De

Sr-90

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	5.26E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.17E-04	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.73E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	5.06E-07	=sedconc(WW)*DC
total dose	Gy/y	Dt	1.18E-04	=Di+De

Co-60

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	2.00E+03	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.26E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation

Estimate of Effects of Radionuclides on Aquatic Benthic Invertebrates - Near Shore Lake Ontario - Existing

external dose from sediment	Gy/y	De	6.22E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	6.75E-06	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	5.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.13E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.45E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.74E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	4.35E-06	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+02	PNNL (2003)
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.69E-05	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	2.06E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	5.89E-05	=Di+De

Cs-137

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	4.44E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.20E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	5.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.27E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	3.97E-06	=Di+De

Estimate of Effects of Radionuclides on Aquatic Plants - Near Shore Lake Ontario - Existing

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water concentration	Bq/L	wconc	2.50E-01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	1.01E+05	Bird and Schwartz (1996) & US DOE (2003), (L/kg) dw
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	2.53E+04	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	4.37E+01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	2.10E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.19E-06	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	4.03E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.01E-08	=wconc*Dce

Estimate of Effects of Radionuclides on Aquatic Plants - Near Shore Lake Ontario - Existing

total dose	Gy/y	Dt	9.20E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.50E+00	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	1.00E+00	assumed
aquatic plant concentration-D	Bg/kg (FW)	aqconc(FW)	7.50E+00	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.80E+01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.68E-06	=aqconc(FW)*DCi
weighted internal dose	Gy/y	Di	5.03E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.25E-09	=wconc*Dce
total dose	Gy/y	Dt	5.03E-06	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	2.70E+03	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	1.35E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	1.30E+00	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	5.52E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.17E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	5.17E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.58E-07	=wconc*Dce
total dose	Gy/y	Dt	9.76E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	7.90E+03	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	3.95E+03	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	3.15E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.58E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.31E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	6.57E-06	=wconc*Dce
total dose	Gy/y	Dt	6.73E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	9.80E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	4.90E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.45E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	8.41E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	4.20E-06	=wconc*Dce
total dose	Gy/y	Dt	4.35E-06	=Di+De

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water concentration	Bq/L	wconc	2.00E+00	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	9.60E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	1.92E+03	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	1.50E+00	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	3.68E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.52E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation

Estimate of Effects of Radionuclides on Aquatic Plants - Near Shore Lake Ontario - Existing

external dose from water	Gy/y	De	5.08E-06	=wconc*Dce
total dose	Gy/y	Dt	5.63E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	9.80E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	4.90E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	3.77E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.88E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	3.77E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.88E-06	=wconc*Dce
total dose	Gy/y	Dt	2.07E-06	=Di+De

Estimate of Effects of Radionuclides on Forage Fish - Near Shore Lake Ontario - Existing

Fraction of time in water	ffw	0.5
Fraction of time in sediment	ffs	0.5

C-14

Water				
water concentration	Bq/L	wconc	2.50E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	5.72E+03	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	3.66E+01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	9.30E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.40E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-11	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	9.30E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.66E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	8.30E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.40E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	5.82E-10	=sedconc*DCe*ffs
total dose-water&sediment	Gy/y	Dt	9.30E-06	= Di+De-w+De-s

H-3

Water				
water concentration	Bq/L	wconc	7.50E+00	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	1.00E+00	assumed
Fish concentration-F	Bq/kg (FW)	fconc(FW)	2.30E+01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	6.65E-07	=fconc(FW)*DCi
weighted internal dose	Gy/y	Di	1.99E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	5.52E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	2.07E-12	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.99E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	7.50E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	7.50E+00	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	7.50E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per	DCe	5.52E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external

Estimate of Effects of Radionuclides on Forage Fish - Near Shore Lake Ontario - Existing

	Bq/kg			irradiation
external dose from sediment	Gy/y	De-s	2.76E-13	=sedconc*DCe*ffs
total dose-water&sediment	Gy/y	Dt	1.99E-06	= Di+De-w+De-s

Sr-90

Water				
water concentration	Bq/L	wconc	5.00E-02	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	2.00E+00	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	5.52E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	2.76E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.37E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	5.91E-09	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	2.77E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.00E+01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.37E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.18E-06	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	3.95E-06	= Di+De-w+De-s

Co-60

Water				
water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	5.40E+01	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.76E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.14E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	2.85E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	3.72E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.00E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.14E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.85E-05	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	3.22E-05	= Di+De-w+De-s

Cs-134

Water				
water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.76E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	2.63E-06	=Di+De

Estimate of Effects of Radionuclides on Forage Fish - Near Shore Lake Ontario - Existing

Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.00E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.01E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.75E-05	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	2.01E-05	= Di+De-w+De-s

I-131

Water				
water concentration	Bq/L	wconc	2.00E+00	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	6.00E+00	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	1.31E+01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	1.60E-05	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.66E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.66E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.77E-05	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.00E+01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.66E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	8.32E-06	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	2.60E-05	= Di+De-w+De-s

Cs-137

Water				
water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario
internal DC	Gy/y per Bq/kg	DCi	1.58E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	7.88E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	6.35E-07	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.42E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	4.44E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.20E+01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.52E-05	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	1.67E-05	= Di+De-w+De-s

Estimate of Effects of Radionuclides on Predator Fish - Near Shore Lake Ontario - Existing

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water concentration	Bq/L	wconc	2.50E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	5.72E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	3.66E+01	maximum measured fish concentration in Lake Ontario - SSA

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internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.30E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.37E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.91E-11	=wconc*Dce
total dose	Gy/y	Dt	9.30E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.50E+00	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	1.00E+00	assumed
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	2.30E+01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	6.65E-07	=fconc(FW)*DCi
weighted internal dose	Gy/y	Di	1.99E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.05E-12	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.88E-12	=wconc*Dce
total dose	Gy/y	Dt	1.99E-06	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	2.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	5.34E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.67E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	3.68E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.84E-08	=wconc*Dce
total dose	Gy/y	Dt	2.69E-06	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	5.40E+01	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.57E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	6.13E-06	=wconc*Dce
total dose	Gy/y	Dt	6.79E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.36E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	3.68E-06	=wconc*Dce
total dose	Gy/y	Dt	4.38E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	6.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	1.31E+01	maximum measured fish concentration in Lake Ontario -

Estimate of Effects of Radionuclides on Predator Fish - Near Shore Lake Ontario - Existing

				SSA
internal DC	Gy/y per Bq/kg	DCi	1.14E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.49E-05	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.75E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	3.50E-06	=wconc*Dce
total dose	Gy/y	Dt	1.84E-05	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.63E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.31E-06	=wconc*Dce
total dose	Gy/y	Dt	2.01E-06	=Di+De

Estimate of Effects of Radionuclides on Birds - Bufflehead - Existing

Information on Bufflehead

water intake	L/d	Qwatbh	0.04
total food intake (FW)	g (FW)/d	Qffwbh	179
fraction that is benthos	-	fbibh	0.9
fraction that is aquatic veg	-	favbh	0.1
sediment intake	g (DW)/d	Qsdwbh	3.9
fraction of time in area	-	flocbh	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
intake of water	Bq/d	Iwat	5.00E-03	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	2.26E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	3.52E-01	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.62E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	2.64E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.24E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.70E-06	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	5.70E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.50E+00	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.80E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	7.50E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-01	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	8.14E-01	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.67E-01	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.46E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	1.45E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	1.45E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation

Estimate of Effects of Radionuclides on Birds - Bufflehead - Existing

internal dose	Gy/y	Di_uw	4.18E-08	=bhconc*DCi
weighted internal dose	Gy/y	Di	1.25E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.02E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.25E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	1.82E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	1.05E-02	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.95E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	1.85E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	1.40E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.87E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	7.89E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	7.74E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.44E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.65E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.84E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.71E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocs

Estimate of Effects of Radionuclides on Birds - Bufflehead - Existing

total dose	Gy/y	Dt	2.26E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	4.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.41E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	1.21E-02	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.95E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	4.48E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	3.90E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.80E-06	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	7.20E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	2.34E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	7.82E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	3.44E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.63E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.21E-06	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) - Mallard - Existing

Information on Mallard			
water intake	L/d	Qwats	0.06
total food intake (FW)	g (FW)/d	Qffws	250
fraction that is benthos	-	fbis	0.75
fraction that is aquatic veg	-	favs	0.25
sediment intake	g (DW)/d	Qsdws	6.4
fraction of time in area	-	flocs	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.61E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.37E+00	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	2.66E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	4.01E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3

Estimate of Effects of Radionuclides on Birds (Large) - Mallard - Existing

mallard concentration	Bq/kg (FW)	malconc(FW)	3.41E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.65E-06	=malconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	8.65E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.50E+00	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.80E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	7.50E+00	Sediment-Lake
intake of water	Bq/d	Iwat	2.25E-01	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	9.38E-01	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.81E+00	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	2.40E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	3.00E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
mallard concentration	Bq/kg (FW)	malconc(FW)	3.00E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	8.67E-08	=malconc*DCi
weighted internal dose	Gy/y	Di	2.60E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.02E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.60E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.09E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	4.06E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	3.20E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	2.16E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	1.65E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.22E-07	=malconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	9.25E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	1.60E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	9.35E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	1.12E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.54E-07	=malconc*DCi

Estimate of Effects of Radionuclides on Birds (Large) - Mallard - Existing

external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.76E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	1.60E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	9.35E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	4.11E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.12E-06	=malconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.61E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	5.07E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	4.69E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	3.20E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	5.21E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	4.53E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.75E-06	=malconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	8.15E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	3.84E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	1.16E-01	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	5.10E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.83E-07	=malconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.53E-06	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe - Existing

Information on Pied-Billed Grebe

water intake	L/d	Qwats	0.03
total food intake (FW)	g (FW)/d	Qffws	173.0
fraction that is benthos	-	fbis	0.5
fraction that is fish	-	favs	0.5
sediment intake	g (DW)/d	Qsdws	0.7
fraction of time in area	-	flocs	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	3.66E+01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
intake of water	Bq/d	Iwat	3.75E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	1.20E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	2.91E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	1.58E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	2.79E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.37E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.03E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	6.03E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.50E+00	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	2.30E+01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	7.50E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.13E-01	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.33E-01	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	2.63E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	9.95E-01	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	1.54E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	1.54E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	4.46E-08	=sconc*DCi
weighted internal dose	Gy/y	Di	1.34E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.02E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.34E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-04	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	9.64E-01	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	3.50E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	9.90E-01	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	7.53E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe - Existing

internal dose	Gy/y	Di	4.22E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	4.24E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.31E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.28E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	3.14E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.31E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.27E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.12E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	1.31E+01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	3.00E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.34E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	3.50E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	5.64E-01	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	2.94E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.56E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.81E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	5.21E-06	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe - Existing

Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	4.20E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.50E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.42E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.66E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.01E-06	=Di+De

Estimate of Effects of Radionuclides on Terrestrial Ecological Receptors - Site Maximum – Future Conditions

Estimate of Effects of Radionuclides on Terrestrial Invertebrates - Earthworm (from soil) - Site Maximum - Future

C-14

soil concentration	Bq/kg DW	sconc	1.51E+01	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	1.51E+01	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	3.84E+01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	2.45E-07	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	9.42E-06	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	9.42E-06	=Di+De

H-3

soil concentration	Bq/kg DW	sconc	0.00E+00	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	0.00E+00	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	3.70E+01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di_uw	1.07E-06	=econc(FW)*DCi
weighted internal dose	Gy/y	Di	3.21E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	3.21E-06	=Di+De

Sr-90

soil concentration	Bq/kg DW	sconc	1.03E+01	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	1.03E+01	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	5.00E-01	maximum measured earthworm concentration
internal DC	Gy/y per Bq/kg	DCi	4.47E-06	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	2.23E-06	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-13	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	9.95E-12	=sconc*DCe
total dose	Gy/y	Dt	2.23E-06	=Di+De

Co-60

soil concentration	Bq/kg DW	sconc	1.08E+01	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	1.08E+01	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	1.61E+00	maximum of measured or predicted concentration (corrected for 85% water)
internal DC	Gy/y per Bq/kg	DCi	5.82E-07	Blaylock et al. 1993 for earthworms
internal dose	Gy/y	Di	9.40E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.46E-08	Blaylock et al. 1993 for earthworms
external dose from soil	Gy/y	De	1.02E-06	=sconc*DCe
total dose	Gy/y	Dt	1.96E-06	=Di+De

Cs-134

soil concentration	Bq/kg DW	sconc	2.12E+00	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	2.12E+00	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
internal DC	Gy/y per Bq/kg	DCi	9.64E-07	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	4.82E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	5.94E-06	=sconc*DCe
total dose	Gy/y	Dt	6.43E-06	=Di+De

I-131

soil concentration	Bq/kg DW	sconc	4.96E+00	Maximum Soil Concentration at Site

Estimate of Effects of Radionuclides on Terrestrial Invertebrates - Earthworm (from soil) - Site Maximum - Future

transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	4.96E+00	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	6.00E+00	maximum of measured or predicted concentration (corrected for 85% water)
internal DC	Gy/y per Bq/kg	DCi	9.64E-07	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	5.78E-06	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	6.75E-07	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	3.35E-06	=sconc*DCe
total dose	Gy/y	Dt	9.13E-06	=Di+De

Cs-137

soil concentration	Bq/kg DW	sconc	1.68E+01	Maximum Soil Concentration at Site
transfer factor for earthworms	kg/kg DW	TFe	1.00E+00	assume equal to soil
earthworm concentration	Bq/kg DW	econc(DW)	1.68E+01	=sconc*TFe
earthworm concentration	Bq/kg FW	econc(FW)	2.52E+00	maximum of measured or predicted concentration (corrected for 85% water)
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 3-12 DC for Internal irradiation
internal dose	Gy/y	Di	3.09E-06	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.05E-06	FASSET (2003) Table 3-9 DC for External irradiation
external dose from soil	Gy/y	De	1.77E-05	=sconc*DCe
total dose	Gy/y	Dt	2.08E-05	=Di+De

Estimate of Effects of Radionuclides on Terrestrial Invertebrates - Earthworm (gW) - Site Maximum - Future

C-14

groundwater concentration	Bq/L	gwconc	2.50E-01	Maximum GW at Site
transfer factor for earthworms	L/kg (FW)	TFe	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	2.50E-01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	2.45E-07	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	6.13E-08	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	0.00E+00	=gwconc*Dce
total dose	Gy/y	Dt	6.13E-08	=Di+De

H-3

groundwater concentration	Bq/L	gwconc	6.60E+01	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFe	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bq/kg (FW)	econc(FW)	6.60E+01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di_uw	1.91E-06	=econc(FW)*DCi
weighted internal dose	Gy/y	Di	5.72E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	0.00E+00	=gwconc*Dce
total dose	Gy/y	Dt	5.72E-06	=Di+De

Sr-90

groundwater concentration	Bq/L	gwconc	5.00E-02	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFe	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bq/kg (FW)	econc(FW)	5.00E-02	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	4.47E-06	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	2.23E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-13	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	4.82E-14	=gwconc*Dce
total dose	Gy/y	Dt	2.23E-07	=Di+De

Co-60

groundwater concentration	Bq/L	wconc	5.00E-01	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFaq	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	5.00E-01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	5.82E-07	Earthworms-Blaylock et al. 1993
internal dose	Gy/y	Di	2.91E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCFe	9.46E-08	Earthworms-Blaylock et al. 1993

Estimate of Effects of Radionuclides on Terrestrial Invertebrates - Earthworm (gW) - Site Maximum - Future

external dose from water	Gy/y	De	4.73E-08	=gwconc*Dce
total dose	Gy/y	Dt	3.38E-07	=Di+De

Cs-134

groundwater concentration	Bq/L	wconc	5.00E-01	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFaq	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	5.00E-01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	9.64E-07	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	4.82E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCFe	2.80E-06	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	1.40E-06	=gwconc*Dce
total dose	Gy/y	Dt	1.88E-06	=Di+De

I-131

groundwater concentration	Bq/L	wconc	1.00E+00	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFaq	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	1.00E+00	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	9.64E-07	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	9.64E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCFe	6.75E-07	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	6.75E-07	=gwconc*Dce
total dose	Gy/y	Dt	1.64E-06	=Di+De

Cs-137

groundwater concentration	Bq/L	wconc	5.00E-01	Maximum GW at Site
transfer factor for earthworms	L/kg (DW)	TFaq	1.00E+00	assume equal to groundwater
earthworm concentration-FW	Bg/kg (FW)	econc(FW)	5.00E-01	=gwconc*TFe
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 3-12 for Internal irradiation
internal dose	Gy/y	Di	6.13E-07	=econc(FW)*DCi
external DC	Gy/y per Bq/kg	DCFe	1.05E-06	FASSET (2003) Table 3-9 for External irradiation
external dose from water	Gy/y	De	5.26E-07	=gwconc*Dce
total dose	Gy/y	Dt	1.14E-06	=Di+De

Estimate of Effects of Radionuclides on Terrestrial Plants - Site Maximum - Future

C-14

soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
air concentration	Bq/m3	aconc	7.42E-02	Maximum predicted air concentration at the site
vegetation-air transfer factor	m3/kg(FW)	TFvs	4.75E+02	CSA 2008 N288.1
vegetation concentration (air)	Bq/kg(FW)	vconc_p(FW)	3.52E+01	=aconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	maximum of measured or predicted concentration (corrected for 70% water)
internal DC	Gy/y per Bq/kg	DCi	2.10E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	1.15E-05	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	1.15E-05	=Di+De

H-3				
Air Concentration	Bq/kg (DW)	aconc	2.60E+01	Maximum predicted air concentration at the site
vegetation-soil transfer factor	m3/kg(FW)	TFvs	1.80E+00	N288.1 equation 6-37 (70% moisture content)
vegetation concentration (air)	Bq/kg(FW)	vconc_p(FW)	4.68E+01	=aconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	maximum of measured or predicted concentration (corrected for 70% water)
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di_uw	1.43E-05	=vconc(FW)*DCi
weighted internal dose	Gy/y	Di	4.29E-05	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-11 DCCs for external irradiation

Estimate of Effects of Radionuclides on Terrestrial Plants - Site Maximum - Future

external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	4.29E-05	=Di+De

Sr-90				
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	3.00E+00	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	3.10E+01	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	9.29E+00	=vconc(DW)*(1-WCv)
internal DC	Gy/y per Bq/kg	DCi	5.52E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	5.13E-06	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-13	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	9.95E-12	=sconc*DCe
total dose	Gy/y	Dt	5.13E-06	=Di+De

Co-60				
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	2.30E-01	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	2.48E+00	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	7.43E-01	maximum of measured or predicted concentration (corrected for 70% water)
internal DC	Gy/y per Bq/kg	DCi	3.15E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	2.34E-07	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose from soil	Gy/y	De	0.00E+00	=sconc*DCe
total dose	Gy/y	Dt	2.34E-07	=Di+De

Cs-134				
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	4.60E-01	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	9.75E-01	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 70% water)
internal DC	Gy/y per Bq/kg	DCi	2.89E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	1.45E-07	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-06	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	5.76E-06	=sconc*DCe
total dose	Gy/y	Dt	5.90E-06	=Di+De

I-131				
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	4.00E-02	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	1.98E-01	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	maximum of measured or predicted concentration (corrected for 70% water)
internal DC	Gy/y per Bq/kg	DCi	3.68E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation
internal dose	Gy/y	Di	4.23E-06	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	6.66E-07	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	3.30E-06	=sconc*DCe
total dose	Gy/y	Dt	7.53E-06	=Di+De

Cs-137				
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
vegetation-soil transfer factor	kg/kg(DW)	TFvs	4.60E-01	GENII, 2003, Table D.7 (dw)
vegetation concentration (soil)	Bq/kg(DW)	vconc(DW)	7.74E+00	=sconc*TFvs
vegetation concentration	Bq/kg(FW)	vconc(FW)	2.32E+00	maximum of measured or predicted concentration (corrected for 70% water)
internal DC	Gy/y per Bq/kg	DCi	3.77E-07	FASSET (2003) Table 4-7 Freshwater DCCs for internal irradiation

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internal dose	Gy/y	Di	8.74E-07	=vconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-07	FASSET (2003) Table 3-11 DCCs for external irradiation
external dose from soil	Gy/y	De	1.62E-05	=sconc*DCe
total dose	Gy/y	Dt	1.71E-05	=Di+De

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Information on American Robin

water intake	L/d	Qwatar	0.01
total food intake (DW)	g (FW)/d	Qfwwar	93
Soil intake	g/d	Qsrar	1.9
fraction that is worms	-	ferar	0.4
fraction that is berries	-	fbrar	0.6
fraction of time in area	-	flocrar	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	3.84E+01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.25E-03	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	1.43E-02	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	7.14E-01	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	4.14E-01	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	1.14E+00	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	8.50E+00	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	9.72E+00	=Itot*Tfrar
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.47E-06	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	2.47E-06	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	3.70E+01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	3.90E-01	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	6.88E-01	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	5.19E+00	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	6.27E+00	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	1.00E+00	assumed
Robin concentration	Bq/kg	arconc(FW)	6.27E+00	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.81E-07	=arconc*DCi
weighted internal dose	Gy/y	Di	5.44E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	5.44E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site

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intake of water	Bq/d	Iwat	2.50E-04	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	9.80E-03	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	9.30E-03	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	1.40E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	3.33E-02	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	7.60E-02	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	2.53E-03	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.42E-08	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.52E-13	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.42E-08	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	1.61E+00	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	2.50E-03	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	1.02E-02	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	3.00E-02	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	1.40E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	5.67E-02	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	1.20E+00	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	6.81E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.15E-07	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	2.15E-07	=Di+De

Cs-134				
water concentration	Bq/L	wconc	2.12E+00	Maximum Soil Concentration at Site
soil concentration	Bq/kg (DW)	sconc	5.56E-01	Soil Concentration Polygon AB
Worms concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	1.06E-02	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	5.28E-04	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	9.30E-03	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	1.40E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	3.44E-02	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	4.40E+00	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	1.51E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.11E-07	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	5.84E-07	=sconc*DCe*flocrv
total dose	Gy/y	Dt	9.95E-07	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	6.00E+00	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	1.00E-02	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	4.71E-03	sconc*Qsrar/1000*flocrar

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intake of worms	Bq/d	Ie	1.12E-01	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	2.79E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	1.54E-01	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	8.70E-01	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	1.34E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.00E-07	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.24E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.44E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
Worms concentration	Bq/kg(FW)	econc(FW)	2.52E+00	from earthworms calculations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.55E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	2.50E-03	wconc*Qwatrar*flocrar
intake of soil	Bq/d	Is	1.60E-02	sconc*Qsrar/1000*flocrar
intake of worms	Bq/d	Ie	4.69E-02	econc*Qfwwrar*flocrar/1000*ferar
intake of berries	Bq/d	Iber	1.55E-02	berconc*Qfwwar*fbrar*flocrar/1000
total intake	Bq/d	Itot	8.09E-02	=Iwat+Is+Ie+Iber
transfer factor	d/kg(FW)	Tfrar	4.40E+00	CSA, 2008, Table G3
Robin concentration	Bq/kg	arconc(FW)	3.56E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.86E-07	=arconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	6.34E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	7.02E-06	=Di+De

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Information on Yellow Warbler

water intake	L/d	Qwatyw	0.003
total food intake (DW)	g (FW)/d	Qfwwyw	11
Soil intake	g/d	Qsyw	0.15
fraction that is insects	-	fiyw	0.9
fraction that is berries	-	fbyw	0.1
fraction of time in area	-	flocyw	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	3.75E-04	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	1.13E-03	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	2.58E-01	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	8.17E-03	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	2.68E-01	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	8.50E+00	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	2.28E+00	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.79E-07	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocyw
total dose	Gy/y	Dt	5.79E-07	=Di+De

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H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.17E-01	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	9.16E-01	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	1.02E-01	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	1.14E+00	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	1.00E+00	assumed
yellow warbler concentration	Bq/kg	ywconc(FW)	1.14E+00	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	3.28E-08	=ywconc*DCi
weighted internal dose	Gy/y	Di	9.84E-08	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocyw
total dose	Gy/y	Dt	9.84E-08	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-05	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	7.74E-04	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	2.48E-03	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	2.75E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	3.60E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	7.60E-02	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	2.74E-04	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.53E-09	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.52E-13	=sconc*DCe*flocyw
total dose	Gy/y	Dt	1.53E-09	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	7.43E-01	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	7.50E-04	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	8.07E-04	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	3.68E-03	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	2.75E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	5.51E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	1.20E+00	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	6.61E-03	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.08E-08	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available

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external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocyw
total dose	Gy/y	Dt	2.08E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	7.50E-04	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	1.59E-04	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	2.48E-03	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	2.75E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	3.66E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	4.40E+00	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	1.61E-02	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.37E-08	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	2.23E-06	=sconc*DCe*flocyw
total dose	Gy/y	Dt	2.27E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	4.00E+00	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	3.00E-03	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	3.72E-04	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	1.98E-02	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	5.50E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	2.37E-02	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	8.70E-01	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	2.06E-02	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.07E-08	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.24E-06	=sconc*DCe*flocyw
total dose	Gy/y	Dt	1.27E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
insects-butterflies concentration	Bq/kg(FW)	iconc(FW)	2.32E+00	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.55E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	7.50E-04	wconc*Qwatyw*flocyw
intake of soil	Bq/d	Is	1.26E-03	sconc*Qsyw/1000*flocdm
intake of insects	Bq/d	Ii	1.15E-02	=iconc*Qfwwyw*flocyw/1000*fiyw
intake of berries	Bq/d	Iber	3.05E-04	=berconc*Qfwwyw*fbyw/1000*flocyw
total intake	Bq/d	Itot	1.38E-02	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfyw	4.40E+00	CSA, 2008, Table G3
yellow warbler concentration	Bq/kg	ywconc(FW)	6.08E-02	=Itot*Tfyw
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	Aquatic FASSET (2003) Table 4-7 Freshwater

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				DCCs for Internal irradiation
internal dose	Gy/y	Di	1.17E-07	=ywconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	6.34E-06	=sconc*DCe*flocyw
total dose	Gy/y	Dt	6.45E-06	=Di+De

Estimate of Effects of Radionuclides on Song Sparrow - Site Maximum - Future

Information on Song Sparrow

water intake	L/d	Qwatsp	0.004	
total food intake (DW)	g (FW)/d	Qfwwsp	16	
Soil intake	g/d	Qssp	0.2	
fraction that is insects	-	finsp	0.1	
fraction that is seeds	-	fssp	0.9	(used berries for seeds)
fraction of time in area	-	flocsp	0.8	

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	8.00E-04	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	2.41E-03	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	6.68E-02	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	1.71E-01	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	2.41E-01	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	8.50E+00	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	2.05E+00	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.21E-07	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsp
total dose	Gy/y	Dt	5.21E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	2.50E-01	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	0.00E+00	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	2.37E-01	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	2.14E+00	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	2.63E+00	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	1.00E+00	assumed
sparrow concentration	Bq/kg	spconc(FW)	2.63E+00	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	7.60E-08	=spconc*DCi
weighted internal dose	Gy/y	Di	2.28E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsp
total dose	Gy/y	Dt	2.28E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984

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berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.60E-04	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	1.65E-03	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	6.40E-04	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	5.76E-03	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	8.21E-03	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	7.60E-02	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	6.24E-04	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.50E-09	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.52E-13	=sconc*DCe*flocsp
total dose	Gy/y	Dt	3.50E-09	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	7.43E-01	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	1.60E-03	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	1.72E-03	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	9.51E-04	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	5.76E-03	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	1.00E-02	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	1.20E+00	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	1.20E-02	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.80E-08	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsp
total dose	Gy/y	Dt	3.80E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	1.60E-03	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	3.39E-04	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	6.40E-04	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	5.76E-03	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	8.34E-03	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	4.40E+00	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	3.67E-02	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.96E-08	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	2.23E-06	=sconc*DCe*flocsp
total dose	Gy/y	Dt	2.33E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	4.00E+00	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	6.40E-03	=wconc*Qwatsp*flocsp

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intake of soil	Bq/d	Is	7.94E-04	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	5.12E-03	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	1.15E-02	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	2.38E-02	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	8.70E-01	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	2.07E-02	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.09E-08	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.24E-06	=sconc*DCe*flocsp
total dose	Gy/y	Dt	1.27E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	2.32E+00	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.55E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	1.60E-03	=wconc*Qwatsp*flocsp
intake of soil	Bq/d	Is	2.69E-03	=sconc*Qssp/1000*flocsp
intake of insects	Bq/d	Iin	2.97E-03	=inconc*Qfwwsp*flocsp/1000*finsp
intake of berries/seeds	Bq/d	Iseed	6.40E-03	=berconc*Qfwwsp*fssp/1000*flocsp
total intake	Bq/d	Itot	1.37E-02	=Iwat+Is+Iin+Iseed
transfer factor	d/kg(FW)	Tfsp	4.40E+00	CSA, 2008, Table G3
sparrow concentration	Bq/kg	spconc(FW)	6.01E-02	=Itot*Tfsp
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	Aquatic FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.16E-07	=spconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	6.34E-06	=sconc*DCe*flocsp
total dose	Gy/y	Dt	6.45E-06	=Di+De

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Information on Bank Swallow

water intake	L/d	Qwatsw	0.004
total food intake (DW)	g (FW)/d	Qfwwsw	13
Soil intake	g/d	Qssw	0.2
fraction that is insects	-	finsw	1
fraction of time in area	-	flocsw	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	5.00E-04	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	1.51E-03	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	3.39E-01	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	3.41E-01	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	8.50E+00	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	2.90E+00	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.37E-07	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsw
total dose	Gy/y	Dt	7.37E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site

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intake of water	Bq/d	Iwat	1.56E-01	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	0.00E+00	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	1.20E+00	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	1.36E+00	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	1.00E+00	assumed
swallow concentration	Bq/kg	swconc(FW)	1.36E+00	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	3.93E-08	=swconc*DCi
weighted internal dose	Gy/y	Di	1.18E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsw
total dose	Gy/y	Dt	1.18E-07	=Di+De
Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
intake of water	Bq/d	Iwat	1.00E-04	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	1.03E-03	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	3.25E-03	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	4.38E-03	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	7.60E-02	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	3.33E-04	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.87E-09	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.52E-13	=sconc*DCe*flocsw
total dose	Gy/y	Dt	1.87E-09	=Di+De
Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	7.43E-01	Maximum of measured caterpillars or estimated vegetation
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	1.08E-03	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	4.83E-03	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	6.90E-03	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	1.20E+00	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	8.29E-03	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.61E-08	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocsw
total dose	Gy/y	Dt	2.61E-08	=Di+De
Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum of measured caterpillars or estimated vegetation
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	2.12E-04	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	3.25E-03	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	4.46E-03	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	4.40E+00	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	1.96E-02	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.33E-08	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	2.23E-06	=sconc*DCe*flocsw
total dose	Gy/y	Dt	2.28E-06	=Di+De

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I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	2.32E+00	Maximum of measured caterpillars or estimated vegetation
intake of water	Bq/d	Iwat	4.00E-03	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	4.96E-04	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	1.51E-02	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	1.96E-02	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	8.70E-01	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	1.70E-02	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.54E-08	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.24E-06	=sconc*DCe*flocsw
total dose	Gy/y	Dt	1.26E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	2.32E+00	Maximum of measured caterpillars or estimated vegetation
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatsw*flocsw
intake of soil	Bq/d	Is	1.68E-03	=sconc*Qssw/1000*flocsw
intake of insects	Bq/d	Iin	1.51E-02	=inconc*Qfwwsw*flocsw/1000*finsw
total intake	Bq/d	Itot	1.78E-02	=Iwat+Is+Iin
transfer factor	d/kg(FW)	Tfsw	4.40E+00	CSA, 2008, Table G3
swallow concentration	Bq/kg	swconc(FW)	7.82E-02	=Itot*Tfsw
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.51E-07	=swconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	6.34E-06	=sconc*DCe*flocsw
total dose	Gy/y	Dt	6.49E-06	=Di+De

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Information on Red-Eyed Vireo

water intake	L/d	Qwatrv	0.004
total food intake (DW)	g (FW)/d	Qfwwrv	14
Soil intake	g/d	Qsrv	0.2
fraction that is insects	-	ferv	0.9
fraction that is berries	-	fbrv	0.1
fraction of time in area	-	flocrv	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	5.00E-04	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	1.51E-03	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	3.29E-01	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	1.04E-02	wconc*Qwatrv/1000*flocrv
total intake	Bq/d	Itot	3.41E-01	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	8.50E+00	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	2.90E+00	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.37E-07	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	7.37E-07	=Di+De

Estimate of Effects of Radionuclides on Red-Eyed Vireo - Site Maximum - Future

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.56E-01	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	1.17E+00	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	1.30E-01	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	1.45E+00	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	1.00E+00	assumed
vireo concentration	Bq/kg	rvconc(FW)	1.45E+00	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	4.20E-08	=rvconc*DCi
weighted internal dose	Gy/y	Di	1.26E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.26E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.00E-04	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	1.03E-03	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	3.15E-03	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	3.50E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	4.63E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	7.60E-02	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	3.52E-04	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.97E-09	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.52E-13	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.97E-09	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	7.43E-01	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	1.08E-03	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	4.68E-03	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	3.50E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	7.11E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	1.20E+00	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	8.53E-03	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.69E-08	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrv
total dose	Gy/y	Dt	2.69E-08	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond

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soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	5.00E-01	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	2.12E-04	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	3.15E-03	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	3.50E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	4.71E-03	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	4.40E+00	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	2.07E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.63E-08	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	2.23E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	2.29E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	4.00E+00	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	4.00E-03	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	4.96E-04	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	2.52E-02	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	7.00E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	3.04E-02	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	8.70E-01	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	2.64E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.94E-08	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.24E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	1.28E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	iconc(FW)	2.32E+00	Maximum of measured caterpillars or estimated vegetation
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.55E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatrv*flocrv
intake of soil	Bq/d	Is	1.68E-03	sconc*Qsrv/1000*flocrv
intake of insects	Bq/d	Ii	1.46E-02	=iconc*Qfwwrv*flocrv/1000*ferv
intake of berries	Bq/d	Iber	3.89E-04	=berconc*Qfwwrv*fbrv/1000*flocrv
total intake	Bq/d	Itot	1.77E-02	=Iwat+Is+Ii+Iber
transfer factor	d/kg(FW)	Tfrv	4.40E+00	CSA, 2008, Table G3
vireo concentration	Bq/kg	rvconc(FW)	7.79E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.50E-07	=rvconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	6.34E-06	=sconc*DCe*flocrv
total dose	Gy/y	Dt	6.49E-06	=Di+De

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Information on American Crow

water intake	L/d	Qwatcr	0.03
total food intake (DW)	g (FW)/d	Qffwcr	115
Soil intake	g/d	Qscr	3.4
fraction that is earthworms	-	fecr	0.4
fraction that is berries	-	fbcr	0.5
fraction that is birds	-	fbdcr	0.1
fraction of time in area	-	floccr	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	3.84E+01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	9.72E+00	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	3.75E-03	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	2.56E-02	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	8.83E-01	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	4.27E-01	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	5.59E-02	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	1.40E+00	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	8.50E+00	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	1.19E+01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.01E-06	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*floccr
total dose	Gy/y	Dt	3.01E-06	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	3.70E+01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	6.27E+00	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	1.17E+00	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	0.00E+00	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	8.51E-01	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	5.35E+00	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	3.60E-02	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	7.40E+00	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	1.00E+00	assumed
crow concentration	Bq/kg	crconc(FW)	7.40E+00	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.14E-07	=crconc*DCi
weighted internal dose	Gy/y	Di	6.42E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*floccr
total dose	Gy/y	Dt	6.42E-07	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	2.53E-03	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
intake of water	Bq/d	Iwat	7.50E-04	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	1.75E-02	sconc*Qscr/1000*floccr

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intake of earthworms	Bq/d	Ie	1.15E-02	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	1.44E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	1.46E-05	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	4.42E-02	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	7.60E-02	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	3.36E-03	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.88E-08	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-14	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	4.52E-13	=sconc*DCe*floccr
total dose	Gy/y	Dt	1.88E-08	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	1.61E+00	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	6.81E-02	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	7.50E-03	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	1.83E-02	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	3.71E-02	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	1.44E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	3.91E-04	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	7.77E-02	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	1.20E+00	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	9.32E-02	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.94E-07	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Not available
external dose	Gy/y	De	0.00E+00	=sconc*DCe*floccr
total dose	Gy/y	Dt	2.94E-07	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	5.00E-01	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	1.51E-01	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	7.50E-03	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	3.61E-03	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	1.15E-02	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	1.44E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	8.70E-04	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	3.78E-02	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	4.40E+00	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	1.67E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.52E-07	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.10E-06	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	2.23E-06	=sconc*DCe*floccr
total dose	Gy/y	Dt	2.68E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	6.00E+00	from eathworm-soil calculations

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bird concentration	Bq/kg(FW)	bdconc(FW)	1.34E-01	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	3.00E-02	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	8.43E-03	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	1.38E-01	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	2.88E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	7.71E-04	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	2.06E-01	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	8.70E-01	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	1.79E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.67E-07	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.99E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	1.24E-06	=sconc*DCe*floccr
total dose	Gy/y	Dt	1.51E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
earthworm concentration	Bq/kg(FW)	econc(FW)	2.52E+00	from eathworm-soil calculations
bird concentration	Bq/kg(FW)	bdconc(FW)	3.56E-01	maximum of bird concentrations
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.55E-01	maximum of measured or predicted concentration (corrected for 85% water)
intake of water	Bq/d	Iwat	7.50E-03	wconc*Qwatcr*floccr
intake of soil	Bq/d	Is	2.86E-02	sconc*Qscr/1000*floccr
intake of earthworms	Bq/d	Ie	5.80E-02	=econc*Qffwcr*floccr/1000*fecr
intake of berries	Bq/d	Iber	1.60E-02	=berconc*Qffwcr*fbcr/1000*floccr
intake of birds	Bq/d	Ibd	2.05E-03	=bdconc*Qffwcr*fbdcr/1000*floccr
total intake	Bq/d	Itot	1.12E-01	=Iwat+Is+Ie+Iber+Ibd
transfer factor	d/kg(FW)	Tfcr	4.40E+00	CSA, 2008, Table G3
crow concentration	Bq/kg	crconc(FW)	4.93E-01	=Itot*Tfrv
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.51E-07	=crconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.53E-07	FASSET (2003) Table 3-9 DCCs for External irradiation
external dose	Gy/y	De	6.34E-06	=sconc*DCe*floccr
total dose	Gy/y	Dt	7.29E-06	=Di+De

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Information on Deer Mouse

water intake	L/d	Qwatdm	0.004
total food intake (DW)	g (FW)/d	Qfwwdm	3.7
Soil intake	g/d	Qsdm	0.02
fraction that is insects	-	fbdm	0.5
fraction that is veg	-	fvdm	0.5
fraction of time in area	-	flocdm	1

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from veg calculations
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	3.01E-04	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	9.66E-02	=econc*Qfwwdm*flocdm/1000*fbdm

Estimate of Effects of Radionuclides on Deer Mouse - Site Maximum - Future

intake of veg	Bq/d	Iveg	1.01E-01	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	1.99E-01	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	8.90E+00	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	1.77E+00	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.51E-07	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocdm
total dose	Gy/y	Dt	4.51E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from veg calculations
intake of water	Bq/d	Iwat	3.12E-01	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	3.42E-01	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	9.16E-01	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	1.57E+00	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.00E+00	assumed
deer mouse concentration-ing	Bq/kg	dmconc-ing(FW)	1.57E+00	=Itot*Tfdm
air concentration	Bq/m3	aconc	2.60E+01	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
deer mouse concentration-inh	Bq/kg	dmconc-inh(FW)	6.06E+01	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.80E-06	=(dmconc-ing+dmconc-inh)*DCi
weighted internal dose	Gy/y	Di	5.39E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocdm
total dose	Gy/y	Dt	5.39E-06	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum measured caterpillar concentration at site
veg concentration	Bq/kg(FW)	vconc(FW)	9.29E+00	from veg calculations
intake of water	Bq/d	Iwat	2.00E-04	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	2.06E-04	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	9.25E-04	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	1.72E-02	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	1.85E-02	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.90E-01	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	3.52E-03	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	5.26E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.85E-08	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	9.04E-12	=sconc*DCe*flocdm
total dose	Gy/y	Dt	1.85E-08	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	7.43E-01	Maximum of measured caterpillars or estimated vegetation
veg concentration	Bq/kg(FW)	vconc(FW)	7.43E-01	from veg calculations
intake of water	Bq/d	Iwat	2.00E-03	wconc*Qwatdm*flocdm

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intake of soil	Bq/d	Is	2.15E-04	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	1.37E-03	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	1.37E-03	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	4.96E-03	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.80E-01	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	8.93E-04	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	1.17E-08	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	1.19E-06	=sconc*DCe*flocdm
total dose	Gy/y	Dt	1.20E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum of measured caterpillars or estimated vegetation
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	2.00E-03	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	4.24E-05	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	9.25E-04	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	9.25E-04	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	3.89E-03	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.10E+02	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	4.28E-01	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	1.14E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.88E-07	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	5.94E-06	=sconc*DCe*flocdm
total dose	Gy/y	Dt	6.43E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	4.00E+00	Maximum of measured caterpillars or estimated vegetation
veg concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from veg calculations
intake of water	Bq/d	Iwat	8.00E-03	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	9.92E-05	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	7.40E-03	=econc*Qfwwdm*flocdm/1000*fbdm
intake of veg	Bq/d	Iveg	2.13E-02	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	3.68E-02	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	4.60E-01	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	1.69E-02	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.78E-08	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	6.75E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	3.35E-06	=sconc*DCe*flocdm
total dose	Gy/y	Dt	3.36E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
insect concentration	Bq/kg(FW)	inconc(FW)	2.32E+00	Maximum of measured caterpillars or estimated vegetation
veg concentration	Bq/kg(FW)	vconc(FW)	2.32E+00	from veg calculations
intake of water	Bq/d	Iwat	2.00E-03	wconc*Qwatdm*flocdm
intake of soil	Bq/d	Is	3.36E-04	sconc*Qsdm/1000*flocdm
intake of insects	Bq/d	Ie	4.29E-03	=econc*Qfwwdm*flocdm/1000*fbdm

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intake of veg	Bq/d	Iveg	4.29E-03	=vconc*Qfwwdm*fvdm/1000*flocdm
total intake	Bq/d	Itot	1.09E-02	=Iwat+Is+Ie+Iveg
transfer factor	d/kg(FW)	TFdm	1.10E+02	CSA, 2008, Table G3
deer mouse concentration	Bq/kg	dmconc(FW)	1.20E+00	=Itot*Tfdm
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.68E-06	=dmconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.05E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.77E-05	=sconc*DCe*flocdm
total dose	Gy/y	Dt	1.94E-05	=Di+De

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Information on Meadow Vole

water intake	L/d	Qwatmv	0.007
total food intake (DW)	g (FW)/d	Qfwwmv	13
Soil intake	g/d	Qsmv	0.09
fraction that is veg	-	fvmv	1.0
fraction of time in area	-	flocmv	1

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from veg calculations
intake of water	Bq/d	Iwat	1.75E-03	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	1.35E-03	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	7.13E-01	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	7.16E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	8.90E+00	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	6.37E+00	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.62E-06	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocmv
total dose	Gy/y	Dt	1.62E-06	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from veg calculations
intake of water	Bq/d	Iwat	5.46E-01	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	6.44E+00	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	6.98E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.00E+00	assumed
meadow vole concentration-ing	Bq/kg	mvconc-ing(FW)	6.98E+00	=Itot*Tfmv
air concentration	Bq/m3	aconc	2.60E+01	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
meadow vole concentration-inh	Bq/kg	mvconc-inh(FW)	6.06E+01	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.95E-06	=(mvconc-ing+mvconc-inh)*DCi
weighted internal dose	Gy/y	Di	5.86E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocmv
total dose	Gy/y	Dt	5.86E-06	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond

Estimate of Effects of Radionuclides on Meadow Vole - Site Maximum - Future

soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	9.29E+00	from veg calculations
intake of water	Bq/d	Iwat	3.50E-04	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	9.29E-04	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	1.21E-01	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	1.22E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.90E-01	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	2.32E-02	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	5.26E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.22E-07	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	9.04E-12	=sconc*DCe*flocmv
total dose	Gy/y	Dt	1.22E-07	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	7.43E-01	from veg calculations
intake of water	Bq/d	Iwat	3.50E-03	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	9.69E-04	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	9.66E-03	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	1.41E-02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.80E-01	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	2.54E-03	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	3.33E-08	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	1.19E-06	=sconc*DCe*flocmv
total dose	Gy/y	Dt	1.22E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	3.50E-03	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	1.91E-04	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	6.50E-03	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	1.02E-02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.10E+02	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	1.12E+00	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	1.14E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.28E-06	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	5.94E-06	=sconc*DCe*flocmv
total dose	Gy/y	Dt	7.22E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from veg calculations
intake of water	Bq/d	Iwat	1.40E-02	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	4.46E-04	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	1.50E-01	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	1.64E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	4.60E-01	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	7.54E-02	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	7.93E-08	=mvconc*DCi

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external DC	Gy/y per Bq/kg	DCe	6.75E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	3.35E-06	=sconc*DCe*flocmv
total dose	Gy/y	Dt	3.43E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	2.32E+00	from veg calculations
intake of water	Bq/d	Iwat	3.50E-03	wconc*Qwatmv*flocmv
intake of soil	Bq/d	Is	1.51E-03	sconc*Qsmv/1000*flocmv
intake of veg	Bq/d	Iveg	3.02E-02	=vconc*Qfwwmv*fvmv/1000*flocmv
total intake	Bq/d	Itot	3.52E-02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFmv	1.10E+02	CSA, 2008, Table G3
meadow vole concentration	Bq/kg	mvconc(FW)	3.87E+00	=Itot*Tfmv
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	5.43E-06	=mvconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.05E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.77E-05	=sconc*DCe*flocmv
total dose	Gy/y	Dt	2.31E-05	=Di+De

Estimate of Effects of Radionuclides on Short-Tailed Weasel - Site Maximum - Future

Information on Weasel

water intake	L/d	Qwatrf	0.02	
total food intake (DW)	g (FW)/d	Qffwrf	56	
soil intake	g/d	Qsrf	0.8	
fraction that is small mammal	-	fsmrf	1	meadow vole
fraction of time in area	-	flocrf	1	

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water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	6.37E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	5.00E-03	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	1.20E-02	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	3.57E-01	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	3.74E-01	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	8.90E+00	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	3.33E+00	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	8.45E-07	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrf
total dose	Gy/y	Dt	8.45E-07	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	6.76E+01	from meadow vole calculations
intake of water	Bq/d	Iwat	1.56E+00	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	3.79E+00	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	5.35E+00	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.00E+00	assumed
weasel concentration-ing	Bq/kg	wconc-ing(FW)	5.35E+00	=Itot*TFw
air concentration	Bq/m3	aconc	2.60E+01	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13

Estimate of Effects of Radionuclides on Short-Tailed Weasel - Site Maximum - Future

weasel concentration-inh	Bq/kg	wconc-inh(FW)	6.06E+01	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.91E-06	=(wconc-ing+wconc-inh)*DCi
weighted internal dose	Gy/y	Di	5.72E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrf
total dose	Gy/y	Dt	5.72E-06	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	2.32E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-03	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	8.26E-03	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	1.30E-03	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	1.06E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.90E-01	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	2.01E-03	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	5.34E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.07E-08	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	9.04E-12	=sconc*DCe*flocrf
total dose	Gy/y	Dt	1.07E-08	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	2.54E-03	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-02	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	8.61E-03	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	1.42E-04	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	1.88E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.80E-01	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	3.38E-03	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	4.42E-08	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat - external, for all mammals
external dose	Gy/y	De	1.19E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	1.23E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.12E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-02	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	1.70E-03	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	6.28E-02	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	7.45E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.10E+02	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	8.19E+00	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.00E-05	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation

Estimate of Effects of Radionuclides on Short-Tailed Weasel - Site Maximum - Future

external dose	Gy/y	De	5.76E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	1.58E-05	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	7.54E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	4.00E-02	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	3.97E-03	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	4.22E-03	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	4.82E-02	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	4.60E-01	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	2.22E-02	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.33E-08	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	6.66E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	3.30E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	3.33E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
small mammal concentration	Bq/kg(FW)	mvconc(FW	3.87E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-02	wconc*Qwatw*flocw
intake of soil	Bq/d	Is	1.35E-02	sconc*Qsw/1000*flocw
intake of small mammals	Bq/d	Ism	2.17E-01	=mvconc*Qffww*fsmw/1000*flocw
total intake	Bq/d	Itot	2.40E-01	=Iwat+Is+Ism
transfer factor	d/kg(FW)	TFw	1.10E+02	CSA, 2008, Table G3
Weasel concentration	Bq/kg	wconc(FW)	2.64E+01	=Itot*TFw
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	3.70E-05	=wconc*DCi
external DC	Gy/y per Bq/kg	DCe	9.64E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.62E-05	=sconc*DCe*flocrf
total dose	Gy/y	Dt	5.33E-05	=Di+De

Estimate of Effects of Radionuclides on Eastern Cottontail Rabbit - Site Maximum - Future

Information on Eastern Cottontail

water intake	L/d	Qwatctr	0.12
total food intake (DW)	g (FW)/d	Qfwwctr	269
Soil intake	g/d	Qsctr	5
fraction that is veg	-	fvctr	1.0
fraction of time in area	-	flocctr	1

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from veg calculations
intake of water	Bq/d	Iwat	3.00E-02	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	7.53E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	1.47E+01	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	1.49E+01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	8.90E+00	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	1.32E+02	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	3.36E-05	=ctrconc*DCi

Estimate of Effects of Radionuclides on Eastern Cottontail Rabbit - Site Maximum - Future

external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocctr
total dose	Gy/y	Dt	3.36E-05	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from veg calculations
intake of water	Bq/d	Iwat	9.36E+00	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	1.33E+02	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	1.43E+02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.00E+00	assumed
cottontail rabbit concentration-ing	Bq/kg	ctrconc-ing(FW)	1.43E+02	=Itot*Tfctr
air concentration	Bq/m3	aconc	2.60E+01	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
cottontail rabbit concentration-inh	Bq/kg	ctrconc-inh(FW)	6.06E+01	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	5.87E-06	=(ctrconc-ing+ctrconc-inh)*DCi
weighted internal dose	Gy/y	Di	1.76E-05	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocctr
total dose	Gy/y	Dt	1.76E-05	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	9.29E+00	from veg calculations
intake of water	Bq/d	Iwat	6.00E-03	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	5.16E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	2.50E+00	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	2.56E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.90E-01	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	4.86E-01	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.72E-06	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.88E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	8.14E-12	=sconc*DCe*flocctr
total dose	Gy/y	Dt	2.72E-06	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	7.43E-01	from veg calculations
intake of water	Bq/d	Iwat	6.00E-02	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	5.38E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	2.00E-01	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	3.14E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.80E-01	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	5.65E-02	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	7.40E-07	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	1.19E-06	=sconc*DCe*flocctr
total dose	Gy/y	Dt	1.93E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond

Estimate of Effects of Radionuclides on Eastern Cottontail Rabbit - Site Maximum - Future

soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	6.00E-02	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	1.06E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	1.35E-01	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	2.05E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.10E+02	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	2.26E+01	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	2.10E-06	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	4.74E-05	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.45E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	5.20E-06	=sconc*DCe*flocctr
total dose	Gy/y	Dt	5.26E-05	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from veg calculations
intake of water	Bq/d	Iwat	2.40E-01	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	2.48E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	3.09E+00	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	3.36E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	4.60E-01	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	1.54E+00	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.03E-06	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	5.87E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	2.91E-06	=sconc*DCe*flocctr
total dose	Gy/y	Dt	4.94E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	2.32E+00	from veg calculations
intake of water	Bq/d	Iwat	6.00E-02	wconc*Qwatctr*flocctr
intake of soil	Bq/d	Is	8.41E-02	sconc*Qsctr/1000*flocctr
intake of veg	Bq/d	Iveg	6.24E-01	=vconc*Qfwwctr*fvctr/1000*flocctr
total intake	Bq/d	Itot	7.69E-01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFctr	1.10E+02	CSA, 2008, Table G3
cottontail rabbit concentration	Bq/kg	ctrconc(FW)	8.45E+01	=Itot*Tfctr
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.48E-04	=ctrconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.76E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.47E-05	=sconc*DCe*flocctr
total dose	Gy/y	Dt	1.63E-04	=Di+De

Estimate of Effects of Radionuclides on White-Tailed Deer - Site Maximum - Future

Information on White-Tailed Deer

water intake	L/d	Qwatdr	6.8
total food intake (DW)	g (FW)/d	Qfwwdr	10900
Soil intake	g/d	Qsdr	66
fraction that is veg	-	fvdr	1.0
fraction of time in area	-	flocdr	1

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water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond

Estimate of Effects of Radionuclides on White-Tailed Deer - Site Maximum - Future

soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from veg calculations
intake of water	Bq/d	Iwat	1.70E+00	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	9.93E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	5.97E+02	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	6.00E+02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	6.20E-01	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	3.72E+02	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	9.45E-05	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocdr
total dose	Gy/y	Dt	9.45E-05	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from veg calculations
intake of water	Bq/d	Iwat	5.30E+02	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	5.40E+03	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	5.93E+03	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	1.00E+00	assumed
deer concentration-ing	Bq/kg	drconc-ing(FW)	5.93E+03	=Itot*Tfdr
air concentration	Bq/m3	aconc	2.60E+01	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
deer concentration-inh	Bq/kg	drconc-inh(FW)	6.06E+01	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.73E-04	=(drconc-ing+drconc-inh)*DCi
weighted internal dose	Gy/y	Di	5.19E-04	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocdr
total dose	Gy/y	Dt	5.19E-04	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	9.29E+00	from veg calculations
intake of water	Bq/d	Iwat	3.40E-01	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	6.81E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	1.01E+02	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	1.02E+02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	4.00E-02	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	4.09E+00	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	5.69E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.33E-05	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	3.77E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	3.89E-12	=sconc*DCe*flocdr
total dose	Gy/y	Dt	2.33E-05	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	7.43E-01	from veg calculations
intake of water	Bq/d	Iwat	3.40E+00	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	7.10E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	8.10E+00	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	1.22E+01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	1.20E-02	CSA, 2008, Table G3

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deer concentration	Bq/kg	drconc(FW)	1.46E-01	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	1.92E-06	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	1.19E-06	=sconc*DCe*flocdr
total dose	Gy/y	Dt	3.11E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from veg calculations
intake of water	Bq/d	Iwat	3.40E+00	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	1.40E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	5.45E+00	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	8.99E+00	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	1.50E-01	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	1.35E+00	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	3.42E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.61E-06	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	3.90E-06	=sconc*DCe*flocdr
total dose	Gy/y	Dt	8.51E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from veg calculations
intake of water	Bq/d	Iwat	1.36E+01	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	3.27E-01	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	1.25E+02	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	1.39E+02	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	3.20E-02	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	4.46E+00	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	1.66E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	7.42E-06	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.38E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	2.17E-06	=sconc*DCe*flocdr
total dose	Gy/y	Dt	9.59E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
veg concentration	Bq/kg(FW)	vconc(FW)	2.32E+00	from veg calculations
intake of water	Bq/d	Iwat	3.40E+00	wconc*Qwatdr*flocdr
intake of soil	Bq/d	Is	1.11E+00	sconc*Qsdr/1000*flocdr
intake of veg	Bq/d	Iveg	2.53E+01	=vconc*Qfwwdr*fvdr/1000*flocdr
total intake	Bq/d	Itot	2.98E+01	=Iwat+Is+Iveg
transfer factor	d/kg(FW)	TFdr	1.50E-01	CSA, 2008, Table G3
deer concentration	Bq/kg	drconc(FW)	4.47E+00	=Itot*Tfdr
internal DC	Gy/y per Bq/kg	DCi	2.19E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	9.79E-06	=drconc*DCi
external DC	Gy/y per Bq/kg	DCe	6.66E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.12E-05	=sconc*DCe*flocdr
total dose	Gy/y	Dt	2.10E-05	=Di+De

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Information on Raccoon

water intake	L/d	Qwatrc	0.47	
total food intake (DW)	g (FW)/d	Qffwrc	958	
soil intake	g/d	Qsrc	27	
fraction that is fruit	-	ffrc	0.15	fruit taken to be berries
fraction that is insects	-	finrc	0.4	
fraction that is vegetation	-	fvrc	0.25	
fraction that is small mammal	-	fsmrc	0.10	deer mouse
fraction that is benthic invert	-	fbirc	0.10	
fraction of time in area	-	flocrc	1	
inhalation rate	m3/d	inrate	2.32	

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-01	PNNL (2003)
berry concentration	Bq/kg(FW)	berconc(FW)	1.49E+01	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	5.22E+01	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	2.78E+01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	6.37E+00	maximum of deer mouse and meadow vole
intake from water	Bq/d	Iwat	1.18E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	4.06E-01	sconc*Qsrc/1000*flocrc
intake from fruit	Bq/d	Ifr	2.13E+00	=berconc*Qffwrc*flocrc/1000*ffrc
intake from insects	Bq/d	Iin	2.00E+01	=inrconc*Qffwrc*flocrc/1000*finrc
intake from vegetation	Bq/d	Iv	1.31E+01	=vconc*Qffwrf*fbcr/1000*flocrf
intake from benthos	Bq/d	Ibi	2.66E+00	=biconc*Qffwrc*fbirc/1000*flocrc
intake from small mammals	Bq/d	Ism	6.10E-01	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	3.91E+01	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc-ing	8.90E+00	CSA, 2008, Table G3
raccoon concentration-ing	Bq/kg	rcconc-ing(FW)	3.48E+02	=Itot*TFrc
raccoon concentration-tot	Bq/kg	rcconc(FW)	3.48E+02	=rcconc-ing
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	8.83E-05	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrc
total dose	Gy/y	Dt	8.83E-05	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	1.00E+00	assumed
berry concentration	Bq/kg(FW)	berconc(FW)	1.86E+02	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	1.85E+02	Maximum measured caterpillar concentration at site
benthos concentration	Bq/kg(FW)	bicconc(FW)	1.00E+01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	6.76E+01	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	3.67E+01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	0.00E+00	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	2.67E+01	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	7.09E+01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	1.19E+02	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	9.58E-01	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	6.48E+00	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	2.60E+02	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.00E+00	assumed
raccoon concentration-ing	Bq/kg	rcconc-ing(FW)	2.60E+02	=Itot*TFrc

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air concentration	Bq/m3	aconc	2.60E+01	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
racoon concentration-inh	Bq/kg	rcconc-inh(FW)	6.06E+01	=aconc*TFrc-inh
raccoon concentration-tot	Bq/kg	rcconc(FW)	3.21E+02	=rcconc-ing+rcconc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di_uw	9.28E-06	=rcconc*DCi
weighted internal dose	Gy/y	Di	2.78E-05	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrc
total dose	Gy/y	Dt	2.78E-05	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.50E-01	Baes et al. 1984
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	Maximum measured fruit concentration at site
insect concentration	Bq/kg(FW)	inconc(FW)	9.29E+00	taken equal to vegetation
benthos concentration	Bq/kg(FW)	bicconc(FW)	2.23E+01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	9.29E+00	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	2.32E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.35E-02	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	2.79E-01	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	7.19E-02	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	3.56E+00	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	2.22E+00	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	2.14E+00	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	2.22E-03	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	8.30E+00	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.90E-01	CSA, 2008, Table G3
raccoon concentration-ing	Bq/kg	rcconc-ing(FW)	1.58E+00	=Itot*TFrc
raccoon concentration-tot	Bq/kg	rcconc(FW)	1.58E+00	=rcconc-ing+rcconc-inh
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	8.84E-06	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	7.23E-12	=sconc*DCe*flocrc
total dose	Gy/y	Dt	8.84E-06	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	7.00E-03	Baes et al. 1984 and U.S. DOE 2003
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
insect concentration	Bq/kg(FW)	inconc(FW)	7.43E-01	Maximum of measured caterpillars or estimated vegetation
benthos concentration	Bq/kg(FW)	bicconc(FW)	5.00E-01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	7.43E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	2.54E-03	maximum of deer mouse and meadow vole
air concentration	Bq/m3	aconc	1.10E-01	Max at site
intake of water	Bq/d	Iwat	2.35E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	2.91E-01	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	7.19E-02	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	2.85E-01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	1.78E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	4.79E-02	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	2.44E-04	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	1.11E+00	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.80E-01	CSA, 2008, Table G3

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raccoon concentration	Bq/kg	rcconc(FW)	1.99E-01	=Itot*TFrc
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	2.61E-06	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	1.19E-06	=sconc*DCe*flocrc
total dose	Gy/y	Dt	3.80E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.00E-01	maximum of measured or predicted concentration (corrected for 85% water)
insect concentration	Bq/kg(FW)	inconc(FW)	5.00E-01	Maximum of measured caterpillars or estimated vegetation
benthos concentration	Bq/kg(FW)	bicconc(FW)	5.00E-01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	1.12E+00	maximum of deer mouse and meadow vole
air concentration	Bq/m3	aconc	1.10E-01	Max at site
intake of water	Bq/d	Iwat	2.35E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	5.73E-02	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	7.19E-02	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	1.92E-01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	1.20E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	4.79E-02	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	1.07E-01	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	8.31E-01	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.10E+02	CSA, 2008, Table G3
raccoon concentration	Bq/kg	rcconc(FW)	9.14E+01	=Itot*TFrc
internal DC	Gy/y per Bq/kg	DCi	2.63E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	2.40E-04	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.28E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	4.83E-06	=sconc*DCe*flocrc
total dose	Gy/y	Dt	2.45E-04	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	4.00E-02	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	1.00E+00	maximum of measured or predicted concentration (corrected for 85% water)
insect concentration	Bq/kg(FW)	inconc(FW)	4.00E+00	Maximum of measured caterpillars or estimated vegetation
benthos concentration	Bq/kg(FW)	bicconc(FW)	5.41E+01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	7.54E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	9.40E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	1.34E-01	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	1.44E-01	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	1.53E+00	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	2.75E+00	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	5.18E+00	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	7.22E-03	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	1.07E+01	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	4.60E-01	CSA, 2008, Table G3
raccoon concentration	Bq/kg	rcconc(FW)	4.92E+00	=Itot*TFrc
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	6.90E-06	=rcconc*DCi

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external DC	Gy/y per Bq/kg	DCe	5.52E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	2.74E-06	=sconc*DCe*flocrc
total dose	Gy/y	Dt	9.63E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
berry-soil transfer factor	kg/kg(DW)	TFbs	2.20E-01	GENII, 2003, Table D.5 (dw)
berry concentration	Bq/kg(FW)	berconc(FW)	5.55E-01	maximum of measured or predicted concentration (corrected for 85% water)
insect concentration	Bq/kg(FW)	inconc(FW)	2.32E+00	Maximum of measured caterpillars or estimated vegetation
benthos concentration	Bq/kg(FW)	bicconc(FW)	5.00E-01	from benthic invertebrate calculations
vegetation concentration	Bq/kg(FW)	vconc(FW)	2.32E+00	from vegetation calculations
small mammal concentration	Bq/kg(FW)	dmconc(FW	3.87E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.35E-01	wconc*Qwatrc*flocrc
intake of soil	Bq/d	Is	4.54E-01	sconc*Qsrc/1000*flocrc
intake of fruit	Bq/d	Ifr	7.98E-02	=berconc*Qffwrc*flocrc/1000*ffrc
intake of insects	Bq/d	Iin	8.90E-01	=inrconc*Qffwrc*flocrc/1000*finrc
intake of vegetation	Bq/d	Iv	5.56E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of benthos	Bq/d	Ibi	4.79E-02	=biconc*Qffwrc*fbirc/1000*flocrc
intake of small mammals	Bq/d	Ism	3.71E-01	=dmconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	2.63E+00	=Iwat+Is+Ifr+Iv+Ibi+Ism
transfer factor-ing	d/kg(FW)	TFrc	1.10E+02	CSA, 2008, Table G3
raccoon concentration	Bq/kg	rcconc(FW)	2.90E+02	=Itot*TFrc
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation as Red fox
internal dose	Gy/y	Di	5.58E-04	=rcconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.32E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation as Red fox
external dose	Gy/y	De	1.40E-05	=sconc*DCe*flocrc
total dose	Gy/y	Dt	5.72E-04	=Di+De

Estimate of Effects of Radionuclides on Red Fox - Site Maximum - Future

Information on Red Fox

water intake	L/d	Qwatrf	0.4	
total food intake (DW)	g (FW)/d	Qffwrf	313	
soil intake	g/d	Qsrf	2.6	
fraction that is terrestrial veg	-	ftvrf	0.15	
fraction that is rabbit	-	frrf	0.4	
fraction that is bird	-	fdrf	0.20	
fraction that is small mammal	-	fsmrf	0.25	meadow vole
fraction of time in area	-	flocrf	1	

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.51E+01	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	1.32E+02	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	9.72E+00	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.48E+01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	6.37E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	1.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	3.91E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	1.65E+01	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	2.57E+00	=vconc*Qffwrf*fbcr/1000*flocrf

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intake of birds	Bq/d	Id	6.09E-01	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	4.98E-01	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	2.04E+01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	8.90E+00	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	1.81E+02	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	4.61E-05	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrf
total dose	Gy/y	Dt	4.61E-05	=Di+De

H-3				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	0.00E+00	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	2.03E+02	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	6.27E+00	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	4.95E+02	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	6.76E+01	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	3.12E+01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	0.00E+00	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	2.54E+01	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	2.32E+01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	3.92E-01	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	5.29E+00	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	8.56E+01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.00E+00	assumed
red fox concentration-ing	Bq/kg	rfconc-ing(FW)	8.56E+01	=Itot*TFrf
air concentration	Bq/m3	aconc	2.60E+01	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
red fox concentration-inh	Bq/kg	rfconc-inh(FW)	6.06E+01	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	4.23E-06	=(rfconc-ing+rfconc-inh)*DCi
weighted internal dose	Gy/y	Di	1.27E-05	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	0.00E+00	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	0.00E+00	=sconc*DCe*flocrf
total dose	Gy/y	Dt	1.27E-05	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.03E+01	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	4.86E-01	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	2.53E-03	maximum of bird concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	9.29E+00	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	2.32E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.00E-02	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	2.68E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	6.08E-02	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	4.36E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	1.58E-04	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	1.81E-03	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	5.46E-01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.90E-01	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	1.04E-01	=Itot*TFrf
internal DC	Gy/y per	DCi	5.61E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal

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	Bq/kg			irradiation
internal dose	Gy/y	Di	5.81E-07	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-13	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	7.23E-12	=sconc*DCe*flocrf
total dose	Gy/y	Dt	5.81E-07	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.08E+01	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	5.65E-02	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	6.81E-02	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	7.43E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	2.54E-03	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	2.80E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	7.07E-03	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	3.49E-02	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	4.26E-03	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	1.99E-04	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	2.74E-01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.80E-01	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	4.94E-02	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	1.31E-05	Blaylock et al. 1993-Muskrat -internal, for all mammals
internal dose	Gy/y	Di	6.47E-07	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.10E-07	Blaylock et al. 1993-Muskrat -external, for all mammals
external dose	Gy/y	De	1.19E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	1.84E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	2.12E+00	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	2.26E+01	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	1.51E-01	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	5.00E-01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	1.12E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	5.51E-03	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	2.82E+00	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	2.35E-02	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	9.47E-03	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	8.77E-02	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	3.15E+00	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.10E+02	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	3.47E+02	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	2.63E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	9.11E-04	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.28E-06	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	4.83E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	9.16E-04	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	4.96E+00	Maximum Soil Concentration at Site

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rabbit concentration	Bq/kg(FW)	ctrconc(FW)	1.54E+00	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	1.34E-01	maximum of bird concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	1.15E+01	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	7.54E-02	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	8.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	1.29E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	1.93E-01	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	5.40E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	8.40E-03	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	5.90E-03	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	1.56E+00	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	4.60E-01	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	7.18E-01	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	1.01E-06	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	5.52E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	2.74E-06	=sconc*DCe*flocrf
total dose	Gy/y	Dt	3.74E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
soil concentration	Bq/kg (DW)	sconc	1.68E+01	Maximum Soil Concentration at Site
rabbit concentration	Bq/kg(FW)	ctrconc(FW)	8.45E+01	from cottontail rabbit calculations
bird concentration	Bq/kg(FW)	scconc(FW)	3.56E-01	maximum of small bird (robin, warbler, sparrow, swallow, red-eyed vireo) concentrations
vegetation concentration	Bq/kg(FW)	vconc(FW)	2.32E+00	from vegetation calculations
small mammal concentration	Bq/kg(FW)	mvconc(FW	3.87E+00	maximum of deer mouse and meadow vole
intake of water	Bq/d	Iwat	2.00E-01	wconc*Qwatrf*flocrf
intake of soil	Bq/d	Is	4.37E-02	sconc*Qscr/1000*floccr
intake of rabbits	Bq/d	Ir	1.06E+01	=ctrconc*Qffwrf*flocrf/1000*frrf
intake of vegetation	Bq/d	Iv	1.09E-01	=vconc*Qffwrf*fbcr/1000*flocrf
intake of birds	Bq/d	Id	2.23E-02	=scconc*Qffwrf*fdrf/1000*flocrf
intake of small mammals	Bq/d	Ism	3.03E-01	=mvconc*Qffwrf*fsmrf/1000*flocrf
total intake	Bq/d	Itot	1.13E+01	=Iwat+Is+Ir+Iv+Id+Ism
transfer factor	d/kg(FW)	TFrf	1.10E+02	CSA, 2008, Table G3
red fox concentration	Bq/kg	rfconc(FW)	1.24E+03	=Itot*TFrf
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	Terrestrial FASSET (2003) Table 3-12 DCCs for Internal irradiation
internal dose	Gy/y	Di	2.39E-03	=rfconc*DCi
external DC	Gy/y per Bq/kg	DCe	8.32E-07	Terrestrial FASSET (2003) Table 3-9 DCCs for external irradiation
external dose	Gy/y	De	1.40E-05	=sconc*DCe*flocrf
total dose	Gy/y	Dt	2.40E-03	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	2.25E+05	US DOE (2003)
benthic invert concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.06E-06	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.49E-10	=sedconc(WW)*DC
total dose	Gy/y	Dt	7.06E-06	=Di+De

H-3

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+00	assumed
benthic invert concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.89E-07	=biconc*DCi
weighted internal dose	Gy/y	Di	8.67E-07	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.05E-12	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.13E-10	=sedconc(WW)*DC
total dose	Gy/y	Dt	8.68E-07	=Di+De

Sr-90

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	5.26E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.17E-04	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.73E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	5.06E-07	=sedconc(WW)*DC
total dose	Gy/y	Dt	1.18E-04	=Di+De

Co-60

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	2.00E+03	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.26E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	6.22E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	6.75E-06	=Di+De

Cs-134

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in

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				Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	5.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.13E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.45E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.74E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	4.35E-06	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	2.50E+03	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.69E-05	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	2.06E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	5.89E-05	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	5.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	1.36E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	2.06E-06	=Di+De

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water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	1.01E+05	Bird and Schwartz (1996) & US DOE (2003), (L/kg) dw
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	2.53E+04	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	4.37E+01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.10E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.19E-06	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	4.03E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.01E-08	=wconc*Dce
total dose	Gy/y	Dt	9.20E-06	=Di+De

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water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	1.00E+00	assumed
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	7.80E+01	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.80E+01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.68E-06	=aqconc(FW)*DCi

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weighted internal dose	Gy/y	Di	5.03E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.30E-08	=wconc*Dce
total dose	Gy/y	Dt	5.04E-06	=Di+De

Sr-90				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	2.70E+03	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	1.35E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	1.30E+00	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	5.52E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.17E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	5.17E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.58E-07	=wconc*Dce
total dose	Gy/y	Dt	9.76E-07	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	7.90E+03	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	3.95E+03	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.15E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.58E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.31E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	6.57E-06	=wconc*Dce
total dose	Gy/y	Dt	6.73E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	9.80E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	4.90E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.89E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.45E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	8.41E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	4.20E-06	=wconc*Dce
total dose	Gy/y	Dt	4.35E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	9.60E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	1.92E+03	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	1.50E+00	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.68E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.52E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.08E-06	=wconc*Dce
total dose	Gy/y	Dt	5.63E-06	=Di+De

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant transfer factor	L/kg (DW)	TFaq	9.80E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	4.90E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum aquatic vegetation concentration at site
internal DC	Gy/y per Bq/kg	DCi	3.77E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation

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internal dose	Gy/y	Di	1.88E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	3.77E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.88E-06	=wconc*Dce
total dose	Gy/y	Dt	2.07E-06	=Di+De

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Fraction of time in water	ffw	0.5
Fraction of time in sediment	ffs	0.5

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Water				
water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	5.72E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	3.50E+01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.89E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.40E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-11	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	8.90E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.40E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	9.01E-11	=sedconc*DCe*ffs
total dose-water&sediment	Gy/y	Dt	8.90E-06	= Di+De-w+De-s

H-3

Water				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	1.00E+00	assumed
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	7.70E+01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.23E-06	=fconc(FW)*DCi
weighted internal dose	Gy/y	Di	6.68E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	5.52E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	2.15E-11	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	6.68E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	5.52E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.76E-13	=sedconc*DCe*ffs
total dose-water&sediment	Gy/y	Dt	6.68E-06	= Di+De-w+De-s

Sr-90

Water				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	2.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	5.52E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	2.76E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.37E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external

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				irradiation
external dose from water	Gy/y	De-w	5.91E-09	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	2.77E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.37E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.26E-07	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	2.89E-06	= Di+De-w+De-s

Co-60

Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	5.40E+01	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.76E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.14E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	2.85E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	3.72E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.14E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.89E-06	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	6.61E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.76E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	2.63E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.01E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.76E-06	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	4.39E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	6.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	1.59E+02	Measured fish concentration

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internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	1.95E-04	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.66E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.66E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.97E-04	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.66E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	9.31E-07	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	1.98E-04	= Di+De-w+De-s

Cs-137

Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bq/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.58E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	7.88E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	6.35E-07	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.42E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	6.37E-07	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	2.06E-06	= Di+De-w+De-s

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water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	5720.00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	3.50E+01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.89E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.37E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.91E-11	=wconc*Dce
total dose	Gy/y	Dt	8.90E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	1.00E+00	assumed
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	7.70E+01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.23E-06	=fconc(FW)*DCi
weighted internal dose	Gy/y	Di	6.68E-06	=Di_uw*RBE

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external DC	Gy/y per Bq/kg	DCe	1.05E-12	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	8.20E-11	=wconc*Dce
total dose	Gy/y	Dt	6.68E-06	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	2.00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration - Coots Pond
internal DC	Gy/y per Bq/kg	DCi	5.34E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.67E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	3.68E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.84E-08	=wconc*Dce
total dose	Gy/y	Dt	2.69E-06	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	5.40E+01	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.57E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	6.13E-06	=wconc*Dce
total dose	Gy/y	Dt	7.45E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.36E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	3.68E-06	=wconc*Dce
total dose	Gy/y	Dt	4.38E-06	=Di+De

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water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	6.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	1.59E+02	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.14E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.81E-04	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.75E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	3.50E-06	=wconc*Dce
total dose	Gy/y	Dt	1.85E-04	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	Measured fish concentration
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.63E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.31E-06	=wconc*Dce
total dose	Gy/y	Dt	2.01E-06	=Di+De

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Fraction of time in water	ffrogw	0.5
Fraction of time in sediment	ffrogs	0.5

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Water				
water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	5.72E+03	No specific information available, use TF for fish: CSA, 2008, Table A.25a
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	3.39E+01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.45E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.32E-06	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	4.20E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	5.26E-11	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	8.32E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	4.20E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.70E-10	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	8.32E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	1.00E+00	assumed
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	3.80E+01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.10E-06	=frconc(FW)*DCi
weighted internal dose	Gy/y	Di	3.30E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	6.49E-09	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	3.30E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.48E-08	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	3.33E-06	= Di+De-w+De-s

Sr-90

Water				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	2.00E+00	No specific information available, use TF for fish: CSA, 2008, Table A.25a
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	1.00E-01	=wconc*TFfr
internal DC	Gy/y per Bq/kg	DCi	4.99E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.99E-07	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-08	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	5.17E-07	=Di+De-w
Sediment				

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.01E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	3.75E-07	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	8.91E-07	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	5.40E+01	No specific information available, use TF for fish: CSA, 2008, Table A.25a
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	5.00E-01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	8.67E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.34E-07	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	3.07E-06	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	3.50E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	3.11E-06	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	6.61E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	4.80E+02	Ewing et al, 1996
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	5.00E-01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.26E-07	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.62E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.91E-06	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	2.43E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.62E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.91E-06	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	4.34E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	1.25E+02	Chant 1999
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	1.10E+01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.16E-05	=frconc(FW)*DCi

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external DC	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.84E-06	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	1.34E-05	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.03E-06	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	1.44E-05	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Frog transfer factor	L/kg (FW)	TFfr	4.80E+02	Ewing et al, 1996
Frog concentration-fw	Bq/kg (FW)	frconc(FW)	5.00E-01	Maximum measured frog concentration at site
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.57E-07	=frconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	7.01E-07	=wconc*DCe*ffrogw
total dose-water	Gy/y	Dt-w	1.36E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	7.03E-07	=sedconc(WW)*DCe*ffrogs
total dose-water&sediment	Gy/y	Dt	2.06E-06	= Di+De-w+De-s

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Fraction of time in water	fturtlew	0.5
Fraction of time in sediment	fturtles	0.5

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Water				
water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	5.72E+03	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	3.39E+01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	2.45E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.32E-06	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	4.20E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	5.26E-11	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	8.32E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	4.20E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.70E-10	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	8.32E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	1.00E+00	assumed
Turtle concentration-fw	Bq/kg (FW)	turconc(FW	3.80E+01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.10E-06	=turconc(FW)*DCi
weighted internal dose	Gy/y	Di	3.30E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	6.49E-09	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	3.30E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.48E-08	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	3.33E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	2.00E+00	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	1.00E-01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	4.99E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.99E-07	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-08	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	5.17E-07	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.01E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	3.75E-07	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	8.91E-07	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	5.40E+01	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	5.00E-01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	8.67E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.34E-07	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	3.07E-06	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	3.50E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)

Estimate of Effects of Radionuclides on Painted Turtle - Coots Pond - Future

external DC- from sediment	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	3.11E-06	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	6.61E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	4.80E+02	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	5.00E-01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.26E-07	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.62E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.91E-06	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	2.43E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.62E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.91E-06	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	4.34E-06	= Di+De-w+De-s

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Water				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	1.25E+02	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	1.10E+01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.16E-05	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.84E-06	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	1.34E-05	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.03E-06	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	1.44E-05	= Di+De-w+De-s

Cs-137

Water				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
Turtle transfer factor	L/kg (FW)	Tftur	4.80E+02	taken to be the same as frogs
Turtle concentration-fw	Bq/kg (FW)	turconc(FW)	5.00E-01	taken to be the same as frogs
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.57E-07	=turconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	7.01E-07	=wconc*DCe*fturtlew
total dose-water	Gy/y	Dt-w	1.36E-06	=Di+De-w
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond

Estimate of Effects of Radionuclides on Painted Turtle - Coots Pond - Future

sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.80E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	7.03E-07	=sedconc(WW)*DCe*fturtles
total dose-water&sediment	Gy/y	Dt	2.06E-06	= Di+De-w+De-s

Estimate of Effects of Radionuclides on Birds - Bufflehead - Coots Pond - Future

Information on Bufflehead

water intake	L/d	Qwatbh	0.04
total food intake (FW)	g (FW)/d	Qffwbh	179
fraction that is benthos	-	fbibh	0.9
fraction that is aquatic veg	-	favbh	0.1
sediment intake	g (DW)/d	Qsdwbh	3.9
fraction of time in area	-	flocbh	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	5.00E-03	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	2.26E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	3.52E-01	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	2.13E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	2.64E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.25E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.71E-06	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	5.71E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.80E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.56E+00	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	8.14E-01	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.67E-01	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	5.81E-01	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	3.42E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	3.42E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	9.89E-08	=bhconc*DCi
weighted internal dose	Gy/y	Di	2.97E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.06E-11	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	2.97E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	1.82E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	1.05E-02	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.95E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	1.85E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	1.40E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.87E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	7.89E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	7.74E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.44E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	2.65E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.84E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.71E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	2.26E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	4.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.41E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	1.21E-02	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.95E-02	=sedconc(DW)*Qsdwbh/1000*flocbh

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total intake	Bq/d	Itot	4.48E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	3.90E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.80E-06	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	7.20E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.84E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.47E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocbh
total dose	Gy/y	Dt	1.09E-06	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) - Mallard - Coots Pond - Future

Information on Mallard

water intake	L/d	Qwats	0.06
total food intake (FW)	g (FW)/d	Qffws	250
fraction that is benthos	-	fbis	0.75
fraction that is aquatic veg	-	favs	0.25
sediment intake	g (DW)/d	Qsdws	1.7
fraction of time in area	-	flocs	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.61E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.37E+00	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	9.27E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	3.99E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	3.39E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.61E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	8.61E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.80E+01	from aq plant calculation

Estimate of Effects of Radionuclides on Birds (Large) - Mallard - Coots Pond - Future

benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	2.34E+00	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	9.38E-01	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.81E+00	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	2.53E-01	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	5.34E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
mallard concentration	Bq/kg (FW)	sconc(FW)	5.34E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.54E-07	=sconc*DCi
weighted internal dose	Gy/y	Di	4.63E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.06E-11	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	4.63E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.09E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	6.97E-01	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	8.50E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	2.80E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	2.13E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.19E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.19E-06	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	4.25E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	8.18E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	9.81E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.09E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.72E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert.	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation

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concentration				
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	4.25E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	8.18E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	3.60E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.77E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.47E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	5.07E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	4.69E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	8.50E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	5.19E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	4.51E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.72E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	8.12E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	4.25E-03	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	8.18E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	sconc(FW)	3.60E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.93E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.24E-06	=Di+De

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Information on Pied-Billed Grebe

water intake	L/d	Qwats	0.03
total food intake (FW)	g (FW)/d	Qffws	173.0
fraction that is benthos	-	fbis	0.5

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fraction that is fish	-	favs	0.5
sediment intake	g (DW)/d	Qsdws	0.7
fraction of time in area	-	flocs	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	3.50E+01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	3.75E-03	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	1.20E+00	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	3.82E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	1.51E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	2.72E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.32E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.88E-06	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	5.88E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	7.70E+01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	1.17E+00	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	4.33E-01	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	1.04E-01	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	3.33E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.04E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	5.04E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	1.46E-07	=sconc*DCi
weighted internal dose	Gy/y	Di	4.37E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/m3	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.06E-11	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	4.37E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-04	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	9.64E-01	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	3.50E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	9.90E-01	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	7.53E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.22E-07	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation

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external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	4.24E-07	=Di+De

Co-60				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	6.30E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.99E-07	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	2.61E-06	=Di+De

Cs-134				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.31E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.27E-07	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	2.12E-06	=Di+De

I-131				
water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	1.59E+02	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	3.00E-02	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	2.34E+00	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	3.50E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	6.88E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	9.25E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	8.05E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.20E-05	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	1.34E-05	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe - Coots Pond - Future

Cs-137				
water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwatpbg*flocpbg
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffwpbg/1000*fbipbg*flocpbg
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdwpbg/1000*flocpbg
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.31E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.45E-07	=sconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocpbg
total dose	Gy/y	Dt	9.93E-07	=Di+De

Estimate of Effects of Radionuclides on Mammals (Small) - Muskrat - Coots Pond - Future

Information on muskrat

water intake	L/d	Qwatm	0.12	
total food intake (FW)	g (FW)/d	Qffwm	360	
sediment intake	g/d	Qsedm	2.4	
fraction that is aquatic plants	-	faqm	0.98	
fraction that is benthic invert	-	fbim	0.02	
body weight	kg	BWm	1.2	
fraction of time in area	-	flocm	1	
fraction of time in house	-	fhm	0.7	assume all winter and half of summer

C-14

water concentration	Bq/L	wconc	2.50E-01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.09E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	2.18E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.29E+00	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
intake of water	Bq/d	Iwat	3.00E-02	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	1.54E+01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	2.00E-01	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	2.62E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	1.57E+01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	8.90E+00	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	139.496	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.5E-05	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	7.36E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	5.52E-12	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	7.36E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	6.63E-11	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	6.63E-11	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	3.54E-05	=Di+Dew+Des-h+des-b

H-3

water concentration	Bq/L	wconc	7.80E+01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	2.98E+02	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	2.98E+02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	2.98E+02	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.80E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	1.00E+01	from benthos calculation
intake of water	Bq/d	Iwat	9.36E+00	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	2.05E+01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	7.20E-02	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	7.15E-01	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	3.06E+01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.00E+00	assumed
muskrat concentration-ing	Bq/kg (FW)	mconc(FW)	3.06E+01	Itot*Tfbird
air concentration	Bq/m3	aconc	2.60E+01	Maximum predicted at the site
transfer from air to animal	m3/kg(FW)	TFrc-inh	2.33E+00	CSA, 2008, Table A.13
muskrat concentration-inh	Bq/kg	mconc-inh(FW)	6.06E+01	=aconc*TFrc-inh
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.64E-06	=(mconc-ing+mconc-inh)*DCi
weighted internal dose	Gy/y	Di	7.91E-06	=Di_uw*RBE
external DC (water)	Gy/y per Bq/kg	DCe	3.15E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	7.38E-12	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	3.15E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	6.58E-11	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	6.58E-11	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	7.91E-06	=Di+Dew+Des-h+des-b

Sr-90

water concentration	Bq/L	wconc	5.00E-02	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
intake of water	Bq/d	Iwat	6.00E-03	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	4.59E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	1.61E-01	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	2.40E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	6.49E-01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.90E-01	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	0.12335	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.9E-07	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	1.23E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	1.84E-09	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	1.23E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	9.18E-08	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	9.18E-08	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	8.77E-07	

Co-60

water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd

sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	1.76E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	3.60E-03	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	1.20E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	2.52E-01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.80E-01	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	0.04536	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	2.63E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.2E-07	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	1.05E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	1.58E-06	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	1.05E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	3.73E-06	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	3.73E-06	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	9.16E-06	=Di+Dew+Des-h+des-b

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	1.76E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	3.60E-03	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	1.20E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	2.52E-01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.10E+02	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	27.72	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	2.37E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.6E-05	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	6.31E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	9.46E-07	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	6.31E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	2.21E-06	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	2.21E-06	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	7.09E-05	=Di+Dew+Des-h+des-b

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water concentration	Bq/L	wconc	2.00E+00	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
intake of water	Bq/d	Iwat	2.40E-01	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	5.29E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	3.90E-01	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	2.40E-02	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	1.18E+00	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	4.60E-01	CSA, 2008, Table G3

muskrat concentration	Bq/kg	mconc	0.54405	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.6E-07	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	1.49E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	8.94E-07	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	1.49E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	1.17E-06	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	1.17E-06	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	3.99E-06	=Di+Dew+Des-h+des-b

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water concentration	Bq/L	wconc	5.00E-01	Water Concentration Coots Pond
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment Concentration Coots Pond
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	=wconc*WCs+sedconc*(1-WCs)
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwatm*flocm
intake of aquatic plants	Bq/d	Iaq	1.76E-01	=aqconc(FW)*Qffwm/1000*faqm*flocm
intake of benthic invert.	Bq/d	Ibi	3.60E-03	=biconc(FW)*Qffwm/1000*fbim*flocm
intake of sediment	Bq/d	Ised	4.32E-04	=sedconc(DW)*Qsedm/1000*flocm
total intake	Bq/d	Itot	2.40E-01	=Iwat+Iaq+Ibi+Ised
transfer factor	d/kg	TFm	1.10E+02	CSA, 2008, Table G3
muskrat concentration	Bq/kg	mconc	26.4475	=Itot*TFm
internal DC	Gy/y per Bq/kg	DCi	1.84E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.9E-05	=mconc*DCi
external DC (water)	Gy/y per Bq/kg	DCe	2.28E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	Dew	3.42E-07	=wconc*DCe*(flocm-fhm)
external DC (sediment)	Gy/y per Bq/kg	DCe	2.28E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from house	Gy/y	Des-h	8.00E-07	=sedconc(WW)*Dce*fhm
External dose from sediment-base	Gy/y	Des-b	8.00E-07	=sedconc(WW)*Dce*fhm
total dose	Gy/y	Dt	5.06E-05	=Di+Dew+Des-h+des-b

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.66E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	9.79E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	9.00E+03	PNNL (2003)
benthic invert concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.06E-06	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	2.66E-10	=sedconc(WW)*DC
total dose	Gy/y	Dt	7.06E-06	=Di+De

H-3

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	7.58E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	7.58E+01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	7.58E+01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+00	assumed
benthic invert concentration	Bq/kg (FW)	biconc(FW)	7.58E+01	maximum of measured or predicted concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.19E-06	=biconc*DCi
weighted internal dose	Gy/y	Di	6.57E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.05E-12	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	7.97E-11	=sedconc(WW)*DC
total dose	Gy/y	Dt	6.57E-06	=Di+De

Sr-90

sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.07E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	5.26E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.17E-04	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	4.73E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	5.06E-07	=sedconc(WW)*DC
total dose	Gy/y	Dt	1.18E-04	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.08E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	2.00E+03	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.26E-07	=biconc*DCi

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external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	6.22E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	6.75E-06	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.02E-01	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	5.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.13E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	7.45E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.74E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	4.35E-06	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.12E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	1.00E+02	PNNL (2003)
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.05E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.69E-05	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	1.84E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	2.06E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	5.89E-05	=Di+De

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sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	4.44E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.20E+00	pwconc*WCs+sedconc*(1-WCs)
benthic invertebrate transfer-TF	L/kg (FW)	TFbi	5.00E+02	GENII, 2003, Table 2.13
benthic invert concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	Measured zebra mussel concentration
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=biconc*DCi
external DC	Gy/y per Bq/kg	DCe	2.72E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De	3.27E-06	=sedconc(WW)*DC
total dose	Gy/y	Dt	3.97E-06	=Di+De

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water concentration	Bq/L	wconc	2.50E-01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	1.01E+05	Bird and Schwartz (1996) & US DOE (2003), (L/kg) dw
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	2.53E+04	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	4.37E+01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	2.10E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.19E-06	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	4.03E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation

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external dose from water	Gy/y	De	1.01E-08	=wconc*Dce
total dose	Gy/y	Dt	9.20E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.58E+01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	1.00E+00	assumed
aquatic plant concentration-D	Bg/kg (FW)	aqconc(FW)	7.58E+01	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	7.58E+01	maximum of measured or predicted concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.19E-06	=aqconc(FW)*DCi
weighted internal dose	Gy/y	Di	6.57E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.66E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.26E-08	=wconc*Dce
total dose	Gy/y	Dt	6.59E-06	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	2.70E+03	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	1.35E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	1.30E+00	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	5.52E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.17E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	5.17E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.58E-07	=wconc*Dce
total dose	Gy/y	Dt	9.76E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	7.90E+03	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	3.95E+03	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	3.15E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.58E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.31E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	6.57E-06	=wconc*Dce
total dose	Gy/y	Dt	6.73E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	9.80E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	4.90E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.45E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	8.41E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	4.20E-06	=wconc*Dce
total dose	Gy/y	Dt	4.35E-06	=Di+De

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water concentration	Bq/L	wconc	2.00E+00	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	9.60E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	1.92E+03	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	1.50E+00	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	3.68E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.52E-07	=aqconc(FW)*DCi
external DC	Gy/y per	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external

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	Bq/kg			irradiation
external dose from water	Gy/y	De	5.08E-06	=wconc*Dce
total dose	Gy/y	Dt	5.63E-06	=Di+De

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water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant transfer factor	L/kg (DW)	TFaq	9.80E+02	Bird and Schwartz (1996)
aquatic plant concentration-D	Bg/kg (DW)	aqconc(DW)	4.90E+02	=wconc*TFaq
aquatic plant concentration-F	Bg/kg (FW)	aqconc(FW)	5.00E-01	Maximum measured aquatic plant concentration
internal DC	Gy/y per Bq/kg	DCi	3.77E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.88E-07	=aqconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	3.77E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.88E-06	=wconc*Dce
total dose	Gy/y	Dt	2.07E-06	=Di+De

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Fraction of time in water	ffw	0.5
Fraction of time in sediment	ffs	0.5

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Water				
water concentration	Bq/L	wconc	2.50E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	5.72E+03	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	3.66E+01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	9.30E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.40E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-11	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	9.30E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	5.00E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.66E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	8.30E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.40E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	5.82E-10	=sedconc*DCe*ffs
total dose-water&sediment	Gy/y	Dt	9.30E-06	= Di+De-w+De-s

H-3

Water				
water concentration	Bq/L	wconc	7.58E+01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	1.00E+00	assumed
Fish concentration-F	Bq/kg (FW)	fconc(FW)	7.58E+01	maximum of measured or predicted concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.19E-06	=fconc(FW)*DCi
weighted internal dose	Gy/y	Di	6.57E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	5.52E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	2.09E-11	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	6.57E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	7.58E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	1.00E+00	assumed
pore water concentration	Bq/L	pwconc	7.58E+01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	7.58E+01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	5.52E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external

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				irradiation
external dose from sediment	Gy/y	De-s	2.76E-13	=sedconc*DCe*ffs
total dose-water&sediment	Gy/y	Dt	6.57E-06	= Di+De-w+De-s

Sr-90

Water				
water concentration	Bq/L	wconc	5.00E-02	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	2.00E+00	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	5.52E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	2.76E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.37E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	5.91E-09	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	2.77E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	1.30E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	7.69E-02	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.00E+01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.37E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.18E-06	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	3.95E-06	= Di+De-w+De-s

Co-60

Water				
water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	5.40E+01	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.76E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.14E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	2.85E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	3.72E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	6.00E+02	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	8.33E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.00E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.14E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	2.85E-05	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	3.22E-05	= Di+De-w+De-s

Cs-134

Water				
water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.75E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	8.76E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.01E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.75E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	2.63E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand

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				Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.85E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	5.00E+00	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	7.01E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.75E-05	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	2.01E-05	= Di+De-w+De-s

I-131

Water				
water concentration	Bq/L	wconc	2.00E+00	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	6.00E+00	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	1.31E+01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.23E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	1.60E-05	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.66E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	1.66E-06	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.77E-05	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	7.60E+01	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	1.32E-01	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.00E+01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	1.66E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	8.32E-06	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	2.60E-05	= Di+De-w+De-s

Cs-137

Water				
water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-F	Bq/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario
internal DC	Gy/y per Bq/kg	DCi	1.58E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di-w	7.88E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De-w	6.35E-07	=wconc*DCe*ffw
total dose-water	Gy/y	Dt-w	1.42E-06	=Di+De
Sediment				
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
sediment-water Kd	L/kg	Kd	2.70E+03	CSA, 2008, From Section 7.8.2 sediment Kds 10 times sand Kd provided in Table G.2
pore water concentration	Bq/L	pwconc	4.44E-03	=sedwconc/Kd
sediment concentration-ww	Bq/kg (WW)	sedconc(WW)	1.20E+01	pwconc*WCs+sedconc*(1-WCs)
external DC- from sediment	Gy/y per Bq/kg	DCe	2.54E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from sediment	Gy/y	De-s	1.52E-05	=sedconc(WW)*DCe*ffs
total dose-water&sediment	Gy/y	Dt	1.67E-05	= Di+De-w+De-s

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C-14

water concentration	Bq/L	wconc	2.50E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	5.72E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	3.66E+01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.30E-06	=fconc(FW)*DCi

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external DC	Gy/y per Bq/kg	DCe	2.37E-10	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.91E-11	=wconc*Dce
total dose	Gy/y	Dt	9.30E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.58E+01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	1.00E+00	assumed
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	7.58E+01	maximum of measured or predicted concentration
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.19E-06	=fconc(FW)*DCi
weighted internal dose	Gy/y	Di	6.57E-06	=Di_uw*RBE
external DC	Gy/y per Bq/kg	DCe	1.05E-12	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.97E-11	=wconc*Dce
total dose	Gy/y	Dt	6.57E-06	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	2.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	5.34E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.67E-06	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	3.68E-07	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.84E-08	=wconc*Dce
total dose	Gy/y	Dt	2.69E-06	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	5.40E+01	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.31E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.57E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.23E-05	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	6.13E-06	=wconc*Dce
total dose	Gy/y	Dt	6.79E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	7.36E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	3.68E-06	=wconc*Dce
total dose	Gy/y	Dt	4.38E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	6.00E+00	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	1.31E+01	maximum measured fish concentration in Lake Ontario - SSA
internal DC	Gy/y per Bq/kg	DCi	1.14E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.49E-05	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	1.75E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	3.50E-06	=wconc*Dce
total dose	Gy/y	Dt	1.84E-05	=Di+De

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Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
Fish transfer factor	L/kg (FW)	TFf	3.50E+03	CSA, 2008, Table A.25a
Fish concentration-FW	Bg/kg (FW)	fconc(FW)	5.00E-01	maximum measured fish concentration in Lake Ontario
internal DC	Gy/y per Bq/kg	DCi	1.40E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.01E-07	=fconc(FW)*DCi
external DC	Gy/y per Bq/kg	DCe	2.63E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.31E-06	=wconc*Dce
total dose	Gy/y	Dt	2.01E-06	=Di+De

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Information on Bufflehead

water intake	L/d	Qwatbh	0.04
total food intake (FW)	g (FW)/d	Qffwbh	179
fraction that is benthos	-	fbibh	0.9
fraction that is aquatic veg	-	favbh	0.1
sediment intake	g (DW)/d	Qsdwbh	3.9
fraction of time in area	-	flocbh	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
intake of water	Bq/d	Iwat	5.00E-03	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	2.26E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	3.52E-01	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.62E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	2.64E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.24E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.70E-06	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	5.70E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.58E+01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	7.58E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	7.58E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	7.58E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.52E+00	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	6.17E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	6.11E-01	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.48E-01	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	8.45E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	8.45E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.44E-07	=bhconc*DCi
weighted internal dose	Gy/y	Di	7.33E-07	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.03E-11	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	7.33E-07	=Di+De

Sr-90

Estimate of Effects of Radionuclides on Birds - Bufflehead – Cooling Tower

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.00E-03	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	1.82E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	1.05E-02	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.95E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	1.85E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	1.40E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.87E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	7.89E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	7.74E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	2.44E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.65E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	9.75E-03	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	6.45E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	2.84E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.71E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.26E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	4.00E-02	=wconc*Qwatbh*flocbh

Estimate of Effects of Radionuclides on Birds - Bufflehead – Cooling Tower

intake of benthos	Bq/d	Ibi	4.41E+00	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	1.21E-02	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	1.95E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	4.48E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	3.90E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	5.80E-06	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	7.20E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.00E-02	=wconc*Qwatbh*flocbh
intake of benthos	Bq/d	Ibi	4.07E-02	=biconc(FW)*Qffwbh/1000*fbibh*flocbh
intake of aquatic veg	Bq/d	Iav	4.03E-03	=avconc(FW)*Qffwbh/1000*favbh*flocbh
intake of sediment	Bq/d	Ised	2.34E-02	=sedconc(DW)*Qsdwbh/1000*flocbh
total intake	Bq/d	Itot	7.82E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
bufflehead concentration	Bq/kg (FW)	bhconc(FW)	3.44E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.63E-07	=bhconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.21E-06	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) - Mallard – Cooling Tower

Information on Mallard			
water intake	L/d	Qwats	0.06
total food intake (FW)	g (FW)/d	Qffws	250
fraction that is benthos	-	fbis	0.75
fraction that is aquatic veg	-	favs	0.25
sediment intake	g (DW)/d	Qsdws	6.4
fraction of time in area	-	flocs	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	4.37E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.61E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.37E+00	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	2.66E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	4.01E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	3.41E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	8.65E-06	=malconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from	Gy/y	De	7.67E-12	=wconc*Dce-w*flocs

Estimate of Effects of Radionuclides on Birds (Large) - Mallard – Cooling Tower

water				
total dose	Gy/y	Dt	8.65E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.58E+01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	7.58E+01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	7.58E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	7.58E+01	Sediment-Lake
intake of water	Bq/d	Iwat	2.27E+00	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	7.11E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	2.37E+00	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	2.43E-01	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	1.20E+01	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
mallard concentration	Bq/kg (FW)	malconc(FW)	1.20E+01	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	3.47E-07	=malconc*DCi
weighted internal dose	Gy/y	Di	1.04E-06	=Di_uw*RBE
external DC from water	Gy/y per Bq/kg	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.03E-11	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.04E-06	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.30E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.09E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	4.06E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	3.20E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	2.16E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	1.65E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.22E-07	=malconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	9.25E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	1.60E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	9.35E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	1.20E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	1.12E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal

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				irradiation
internal dose	Gy/y	Di	3.54E-07	=malconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.76E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	1.60E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	9.35E-02	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	4.11E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	1.12E-06	=malconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	2.61E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	1.50E+00	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	6.00E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	5.07E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of aquatic veg	Bq/d	Iav	4.69E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	3.20E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	5.21E+00	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	4.53E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.75E-06	=malconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	8.15E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
aquatic plant concentration	Bq/kg (FW)	aqconc(FW)	5.00E-01	from aq plant calculation
benthic invert. concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.50E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	4.69E-02	=biconc(FW)*Qffws/1000*fbis*flocs

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intake of aquatic veg	Bq/d	Iav	1.56E-02	=avconc(FW)*Qffws/1000*favs*flocs
intake of sediment	Bq/d	Ised	3.84E-02	=sedconc(DW)*Qsdws/1000*flocs
total intake	Bq/d	Itot	1.16E-01	=Iwat+Ibi+Iav+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
mallard concentration	Bq/kg (FW)	malconc(FW)	5.10E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	9.83E-07	=malconc*DCi
external DC from water	Gy/y per Bq/m3	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.53E-06	=Di+De

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe – Cooling Tower

Information on Pied-Billed Grebe

water intake	L/d	Qwats	0.03
total food intake (FW)	g (FW)/d	Qffws	173.0
fraction that is benthos	-	fbis	0.5
fraction that is fish	-	favs	0.5
sediment intake	g (DW)/d	Qsdws	0.7
fraction of time in area	-	flocs	0.5

C-14

water concentration	Bq/L	wconc	2.50E-01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	2.78E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	3.66E+01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	8.30E+00	Sediment-Lake
intake of water	Bq/d	Iwat	3.75E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	1.20E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	2.91E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	1.58E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	2.79E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	8.50E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.37E+01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.54E-07	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.03E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	6.13E-11	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	7.67E-12	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	6.03E-06	=Di+De

H-3

water concentration	Bq/L	wconc	7.58E+01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	7.58E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	7.58E+01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	7.58E+01	Sediment-Lake
intake of water	Bq/d	Iwat	1.14E+00	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	3.28E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	2.65E-02	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	3.28E+00	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	7.72E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	1.00E+00	assumed
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	7.72E+00	Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.89E-08	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di_uw	2.23E-07	=sconc*DCi
weighted internal dose	Gy/y	Di	6.70E-07	=Di_uw*RBE
external DC from water	Gy/y per	Dce-w	2.72E-13	FASSET (2003) Table 4-8 Freshwater DCCs for external

Estimate of Effects of Radionuclides on Birds (Large) -Pied-Billed Grebe – Cooling Tower

	Bq/kg			irradiation
external dose from water	Gy/y	De	1.03E-11	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	6.70E-07	=Di+De

Sr-90

water concentration	Bq/L	wconc	5.00E-02	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	2.23E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-04	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	9.64E-01	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	3.50E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	9.90E-01	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	7.60E-02	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	7.53E-02	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	5.61E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.22E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-08	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-09	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	4.24E-07	=Di+De

Co-60

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.31E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	3.15E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	7.28E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	9.64E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	2.41E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	3.14E-06	=Di+De

Cs-134

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	5.00E+00	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	1.75E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.25E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.31E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	2.72E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	6.27E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	5.96E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.49E-06	=wconc*Dce-w*flocs

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total dose	Gy/y	Dt	2.12E-06	=Di+De

I-131

water concentration	Bq/L	wconc	2.00E+00	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	5.41E+01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	1.31E+01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.00E+01	Sediment-Lake
intake of water	Bq/d	Iwat	3.00E-02	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.34E+00	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	3.50E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	5.64E-01	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	2.94E+00	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	8.70E-01	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.56E+00	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.49E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	3.81E-06	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	1.40E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	1.40E-06	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	5.21E-06	=Di+De

Cs-137

water concentration	Bq/L	wconc	5.00E-01	SW-Lake
benthos concentration	Bq/kg (FW)	biconc(FW)	5.00E-01	from benthos calculation
fish concentration	Bq/kg (FW)	fconc(FW)	5.00E-01	from fish-pelagic calculation
sediment concentration-dw	Bq/kg (DW)	sedconc(DW)	1.20E+01	Sediment-Lake
intake of water	Bq/d	Iwat	7.50E-03	=wconc*Qwats*flocs
intake of benthos	Bq/d	Ibi	2.16E-02	=biconc(FW)*Qffws/1000*fbis*flocs
intake of sediment	Bq/d	Ised	4.20E-03	=sedconc(DW)*Qsdws/1000*flocs
intake of fish	Bq/d	Ifish	2.16E-02	=fconc(FW)*Qffwc/1000*ffc*flocc
total intake	Bq/d	Itot	5.50E-02	=Iwat+Ibi+Ifish+Ised
transfer factor	d/kg (FW)	Tfbird	4.40E+00	CSA, 2008, Table G3
Pied-Billed Grebe concentration	Bq/kg (FW)	sconc(FW)	2.42E-01	=Itot*Tfbird
internal DC	Gy/y per Bq/kg	DCi	1.93E-06	FASSET (2003) Table 4-7 Freshwater DCCs for Internal irradiation
internal dose	Gy/y	Di	4.66E-07	=sconc*DCi
external DC from water	Gy/y per Bq/kg	Dce-w	2.19E-06	FASSET (2003) Table 4-8 Freshwater DCCs for external irradiation
external dose from water	Gy/y	De	5.48E-07	=wconc*Dce-w*flocs
total dose	Gy/y	Dt	1.01E-06	=Di+De

APPENDIX F.4

SENSITIVITY ANALYSIS
INHALATION

F.4 Sensitivity Analysis - Inhalation

The following discussion provides an illustration for selected biota of the potential effect of the inhalation pathway. The inhalation transfer factors are provided in Table F.4-1, and the maximum predicted air concentration at the existing DN site are provided in Table F.4-2.

Table F.4-1 Inhalation Transfer Factors

Element	Mammal Inhalation TF (m^3/kg fw)		
	Deer	Rabbit	Reference
C-14	0.00E+00	0.00E+00	CSA, 2008, Table A.13
H-3	2.33E+00	2.33E+00	CSA, 2008, Table A.13
Sr-90	6.55E-01	1.73E-01	CSA, 2008, Table A.13
Co-60	3.69E-01	3.08E-01	CSA, 2008, Table A.13
Cs-134	1.70E+00	6.93E+01	CSA, 2008, Table A.13
I-131	3.63E-01	2.90E-01	CSA, 2008, Table A.13
Cs-137	1.70E+00	6.93E+01	CSA, 2008, Table A.13

Table F.4-2 Maximum Predicted Air Concentration (Bq/m^3)

Element	Maximum Predicted Air Concentration – DN Site
C-14	2.00E-02
Tritium	2.46E+00
Sr-90	2.31E-08
Co-60	1.67E-07
Cs-134	4.42E-08
I-131	1.85E-06
Cs-137	6.91E-08

Multiplying the transfer factors by the predicted air concentration for each element, the biota concentration due to the inhalation pathway can be estimated (Table F.4-3).

F.4-3 Estimated Biota Concentration Due to Inhalation (Bg/kg)

Element	Estimated Biota Concentration	
	Deer	Rabbit
C-14	0.00E+00	0.00E+00
Tritium	5.73E+00	5.73E+00
Sr-90	1.51E-08	3.99E-09
Co-60	6.18E-08	5.15E-08
Cs-134	7.52E-08	3.07E-06
I-131	6.70E-07	5.35E-07
Cs-137	1.18E-07	4.79E-06

Table F.4-4 provides the estimated biota concentration due to the ingestion pathways. Comparision of Table F.4-3 to Table F.4-4 shows that with the exception of tritium in small mammals (e.g. meadow vole) the contribution of the inhalation pathway to dose is negligible.

F.4-4 Estimated Biota Concentration Due to Ingestion (Bg/kg)

Element	Estimated Biota Concentration		
	Deer	Rabbit	Meadow Vole (based on Rabbit TF)
C-14	3.72E+02	1.32E+02	6.37E+00
Tritium	5.93E+03	1.43E+02	6.98E+00
Sr-90	3.96E+00	4.71E-01	2.25E-02
Co-60	1.07E-01	3.55E-02	1.81E-03
Cs-134	1.33E+00	2.17E+01	1.11E+00
I-131	4.46E+00	1.54E+00	7.54E-02
Cs-137	1.42E+00	2.65E+01	1.19E+00

APPENDIX F.5

REFERENCES

F.5 References

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