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Abbreviations

HHRA	human health risk assessment
LAA	local assessment area
PDA	project development area
PM_{10}	particulate matter ranging in diameter from 2.5 to 10 micrometres
$PM_{2.5}$	particulate matter less than 2.5 micrometres in diameter
RAA	regional assessment area
TSS	total suspended solids
VC	valued component

15.0 ASSESSMENT OF POTENTIAL EFFECTS ON PUBLIC HEALTH

The protection of public health is important to Alberta Transportation, provincial and federal regulators, Indigenous groups, stakeholders, and the public. Alberta Transportation is committed to operating the Project in a manner that prioritizes and protects the health, safety, and the well-being of the local population.

Public health in the context of this assessment refers to the physiological health of a population resulting from exposure to chemicals or other hazards in the environment.

The assessment of public health is based upon the conclusions described in the human health risk assessment (HHRA) technical data report (Volume 4, Appendix O). The HHRA characterizes the health risk to people from their exposure to chemical hazards associated with the Project. These chemical hazards include those in the air, water, and country foods.

The assessment of public health is also linked to other valued components (VC) through either the integration of information from other VCs or by providing information that supports other VCs. This assessment is linked to the following VCs:

- air quality and climate (see Volume 3B, Section 3)
- surface water quality (see Volume 3B, Section 7)
- traditional land and resource use (see, Volume 3B, Section 14)

During flood operations, flood waters diverted into the off-stream reservoir will reduce the degree of flooding in the City of Calgary. This is expected to reduce the number of injuries and fatalities that would be directly attributable to a flood in the city. By preventing a flood or reducing its severity, the Project prevents or reduces the severity of the following public health and public safety issues in the period during and after a flood:

- scarcity of food, clean drinking water, and medical supplies
- decline in sanitation (due to garbage, industrial waste, sewage)
- water-borne communicable diseases and infections
- increase in disease transmission (e.g., cold, flu) between people due to reduced sanitation and sheltering of large groups of people in close quarters
- high numbers of pests such as rodents and insects (especially mosquitoes due to stagnant pools of water that provide breeding habitat)
- vector-borne diseases (e.g., diseases transmitted by mosquitoes)

- health risk from direct exposure to chemical contaminants in the water and food (e.g., chemical burns, rashes, food poisoning)
- looting and theft
- loss of electricity and communication services
- access and availability of transportation infrastructure and health-related infrastructure
- contamination of agricultural land used for food production
- contamination of buildings due to mold growth, which may trigger asthma or other respiratory issues
- anxiety, depression and post-traumatic stress disorder, or exacerbation of existing mental health problems

Although these issues are not considered in the assessment of public health, diverting flood waters to the off-stream reservoir benefits multiple other determinants of health that extend beyond those health aspects considered in this assessment.

15.1 SCOPE OF THE ASSESSMENT

This assessment of public health considers the potential change in health risk to the population that may result from changes in air quality, water quality, and country foods during flood and post-flood operations. The potential for these changes to interact with public health is assessed using HHRA methods for assessment of exposure pathways. Potential changes in noise levels are described in acoustic environment (Volume 3B, Section 4) and, therefore, are not discussed further in this section.

Regulatory and policy setting, boundaries, residual effects characterization and significance definitions are presented in Volume 3A, Section 15.1. The temporal boundary for flood and post-flood operations is indefinite, since the Project is a permanent installation.

15.1.1 Engagement and Key Concerns

Statements of concern were received following consultation and engagement with Indigenous groups, the public and regulators. Concerns related to the Project for flood and post-flood operations included the potential contamination of flood waters and flooded land, which could affect drinking water quality. The concern is that flood waters in the reservoir could contain contaminants, and these contaminants would eventually be released back into the Elbow River, which flows into the Glenmore Reservoir that supplies municipal water to residents of Calgary.

Concerns were also raised that the retention of flood waters in the off-stream reservoir could convert naturally occurring inorganic mercury in the soil to methylmercury. This might result in increased levels of methylmercury in fish in the Elbow River. People who consume these fish could be exposed to increased levels of methylmercury.

Local Indigenous groups made statements of concern regarding the loss of available land and reduced harvesting opportunities through the changes in road access. Although this does not affect the quality of country foods, it could affect access and availability of country foods.

Concerns were also expressed about wind erosion of dry sediments in the off-stream reservoir after a flood. The concern is that high winds can erode dry sediments in the reservoir and produce particulates in the air, which are a health concern when inhaled. Such a scenario could occur after a flood during dry climate and high wind conditions.

These concerns are addressed in this assessment of public health.

As of January 1, 2018, no project-specific intangible concerns were identified with respect to public health.

15.1.2 Potential Effects, Pathways and Measurable Parameters

Table 15-1 describes the potential environmental effect, the effect pathway and the measurable parameter applicable to the assessment of public health.

Table 15-1 Potential Effects, Effects Pathways and Measurable Parameters for Public Health

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change to human health	• Water that is diverted from Elbow River to the reservoir and subsequently released back into the Elbow River may contain contaminants that adversely affect the quality of water entering Glenmore Water Treatment Plant. • Fish may be exposed to methylmercury when water in the reservoir is released back into Elbow River. Methylmercury concentrations may increase in the tissues of fish, and people may be exposed if they consume these fish. • Periods of high winds after a flood event may cause wind erosion to dry sediments that deposit in the off-stream reservoir. These particulates may be inhaled by people.	• Exposure Ratio (unitless)

15.2 EXISTING CONDITIONS FOR PUBLIC HEALTH

Existing environmental data can be used to characterize current environmental conditions in the study area. These data are then used in the HHRA to characterize the health risk for baseline conditions.

Existing conditions also includes a discussion of the current health status in the region. For the HHRA, the description of the current health status relies on publicly available data, and range from the large geographic area (i.e., Calgary Zone) to the local geographic area (i.e., Cochrane-Springbank).

15.2.1 Air Quality

The air quality for baseline conditions (and applicable Project phases) are based on the results of the air quality dispersion modelling, which is part of the assessment of air quality and climate. Technical details about the modelling methods (e.g., model software, model inputs and assumptions) and the modelling results are described in Volume 3B, Section 3 and Volume 4, Appendix E, Dispersion Modelling Technical Data Report. The air dispersion model included predictions of ground-level concentrations of particulate matter to address dust concerns in post-flood operations, where high winds during dry periods can cause wind erosion and dust can be transported to nearby areas.

15.2.2 Water Quality

Baseline environmental data for water quality is based on water samples collected at the Glenmore Water Treatment Plant, which supplies residents of the City of Calgary with municipal tap water. Samples of treated drinking water at the plant and in the distribution system are routinely tested for quality and the results are compared to the Canadian drinking water quality guidelines (Health Canada 2017a). Table 15-2 includes a list of drinking water quality parameters, guidelines, and the range of measured results from water samples taken from the Glenmore Water Treatment Plant in 2015 and 2016 (City of Calgary 2017, personal communications for 2015 records).

The water treatment process at the Glenmore Water Treatment Plant includes water filtration and disinfection before entering the municipal water distribution system (City of Calgary 2016a). The drinking water treatment is not designed to remove dissolved metals.

Table 15-2 Drinking Water Quality for the Glenmore Water Treatment Plant, 2015 and 2016

Parameter	Water Quality Guideline	Measured Water Quality Range	
		2015	2016
Treated Water in from Glenmore Water Treatment Plant			
Temperature (°C)	≤15 [b]	0.8 to 20.0	5.0 to 20.2
pH	7.0 to 10.5 [c]	7.3 to 8.1	7.3 to 7.9
Turbidity (nephelometric turbidity unit)	<0.15 [c]	<0.05 to 0.14	<0.05 to 0.08
Total dissolved solids (mg/L)	≤500 [b]	152 to 300	254 to 297
Colour (True Color)	≤15 [c]	<2	<2
Nitrate as Nitrogen (mg/L as N)	10 [a]	0.0023 to 0.231	<0.005 to 0.248
Nitrite as Nitrogen (mg/L as N)	1 [a]	<0.003	<0.003
Sulphate (mg/L)	≤500 [b]	37 to 81	70.8 to 90.2
Fluoride (mg/L)	1.5 [b]	0.09 to 0.28	0.19 to 0.27
E. coli (per 100mL)	0 [a]	<1	<1
Total coliform (per 100 mL)	0 [a]	<1	<1
Aluminum (mg/L)	0.1[cd]	0.091 to 0.1	0.0528
Arsenic (mg/L)	0.01[a]	<0.0005	<0.0005
Barium (mg/L)	1[a]	0.027 to 0.079	0.0639 to 0.0877
Cadmium (mg/L)	0.005[a]	<0.0005	<0.0005
Chromium (mg/L)	0.05[a]	<0.0005 to 0.0023	<0.0005 to 0.0020
Copper (mg/L)	≤1.0[b]	<0.0005 to 0.0007	<0.0005 to 0.0008
Iron (mg/L)	≤0.3[b]	<0.05	<0.05 to 0.015
Lead (mg/L)	0.01[a]	<0.0005	<0.0005
Manganese (mg/L)	≤0.05[b]	<0.0005 to 0.0007	<0.0005 to 0.0012
Mercury (mg/L)	0.001[a]	<0.000002	<0.000002
Sodium (mg/L)	≤200[b]	2.5 to 10.1	5.79 to 9.30
Zinc (mg/L)	≤5.0[b]	<0.003	<0.003
Treated Water in Municipal Distribution System			
E. coli (present/absent)	0 [a]	Absent	Absent
Total coliform (present/absent)	0 [a]	Absent	Absent

NOTES:
[a] Health guideline
[b] Aesthetic guideline
[c] Operational guideline
[d] Added to the water supply as part of the water treatment process

Drinking water quality from the Glenmore Water Treatment Plant is considered very good, and met the applicable health-related guidelines for the parameters tested. This indicates that the exposure ratio for health-based parameters is less than 1.0 for existing conditions. The water was in compliance with the aesthetic and operational water quality guidelines except for water temperature. The natural range of water temperature was occasionally higher than the aesthetic guideline. Higher temperatures can indirectly influence water disinfection processes and promote biofilm formation under certain conditions. However, no information was found to suggest that these potential effects occurred at the Glenmore Water Treatment Plant at a time when the water temperature was higher than the guideline.

15.2.3 Country Foods Harvesting

The existing conditions for country foods harvesting were described previously in Volume 3A, Section 15.2.3 for terrestrial country foods harvest by local Indigenous groups.

In addition to that information, survey records from Alberta Environment and Parks, and fishing regulations, indicate there are various species of trout (e.g., Brook trout, cutthroat trout, rainbow trout), and mountain whitefish (Alberta Environment and Parks 2016a) that are harvestable. Burbot, pike and suckers are also harvested from the Elbow River as indicated by local Indigenous groups. Alberta Environment and Parks publishes recommended fish consumption limits for fish harvested in various waterbodies in the province. For 2016, fish consumption limits were set for various types of fish harvested from 61 waterbodies in Alberta, which did not include advisories for the Elbow River (Alberta Environment and Parks 2016b). There are no current advisories related to mercury in fish harvested from the Elbow River.

15.2.4 Current Health Status

The available health data were described previously in Volume 3A, Section 15.2.

15.3 PROJECT INTERACTIONS WITH PUBLIC HEALTH

Table 15-3 identifies the interactions between project components with public health. Health may be affected from direct (e.g., inhalation) and indirect (e.g., ingestion of country foods) exposure to chemicals emitted from Project activities and physical works. Activities that are not expected to generate any (or nominal) amounts of emissions during flood or post-flood, are not expected to interact with public health. If a project interaction is present, a description of the nature of this interaction is provided and the potential effect is assessed. If a project interaction is not present, the pathway is not assessed and a rationale is provided after this table to explain the absence of an interaction.

Table 15-3 Project-Environment Interactions with Public Health during Flood and Post-flood Operations

Project Components and Physical Activities	Environmental Effects for Public Health
	Change to Human Health
Flood and Post-Flood Operations	
Reservoir filling	✓
Reservoir draining	✓
Reservoir sediment partial cleanup	–
Channel maintenance	–
Road and bridge maintenance	–

NOTES:
✓ = Potential interaction
– = No interaction

The potential for the Project to result in a change in human health uses standard HHRA methods. The HHRA TDR (Volume 4, Appendix O) identified two types of receptors (i.e., hypothetical people of all age groups): residential receptors and Indigenous receptors. Both residential and Indigenous receptors are assumed to have the opportunity to gather, harvest and consume local foods from the LAA including garden produce, wild plants, berries, and fish from Elbow River. Human receptors also include visitors, tourists, and recreational users. However, these people would only be in the area temporarily and they are expected to have a lower exposure to Project-related COPCs compared to residential and Indigenous receptors who also participate in recreational and traditional activities in the area.

The following provides a rationale for the absence of project interactions with human health for both residential and Indigenous receptors through exposures to air, water, and traditional country foods (terrestrial foods).

15.3.1 Air Quality and Public Health

As described in the air quality and climate assessment (see Section 3), there will be no emissions of criteria air contaminants or other air pollutants when the reservoir is filling and draining during flood and post-flood operations. There will be emissions of criteria air contaminants (e.g., sulphur dioxide, nitrogen dioxide, and $PM_{2.5}$) during reservoir cleanup, channel maintenance, and road and bridge maintenance from vehicles and machinery associated with these activities. However, the short-term, transient nature of these emissions and the low number of vehicles and equipment required to perform these activities do not produce criteria air contaminants to a level that could reasonably change the local air quality in a manner that could affect the health of the population.

Coarse dust, characterized as particulate matter referred to as PM_{10} (i.e., particulate matter ranging in diameter from 2.5 to 10 micrometres) or larger, may also be produced during wind erosion; the composition of this dust would be soil and silt, which is inert crustal material. When inhaled, coarse dust is trapped in the upper respiratory passages (e.g., mouth, nasal cavity, pharynx) which are subsequently swallowed (by contrast, $PM_{2.5}$ can penetrate deep into the lungs, bronchioles and alveoli). Federal and international health regulatory agencies (e.g., Health Canada, World Health Organization) recognize that health risk from dust inhalation is primarily associated with fine particulate matter ($PM_{2.5}$), rather than coarse particulate matter (PM_{10}). For example, Health Canada reviewed studies that indicated, "…only limited evidence that crustal coarse particulate matter from Asian dust storm events has an effect on mortality, in spite of the extremely high levels of PM_{10} from dust storms".

In contrast, traffic-related $PM_{2.5}$ had a stronger demonstrable relationship with adverse health effects (Health Canada 2016c). The World Health Organization notes that, "the effects of long-term particulate matter exposure on mortality seem to be attributable to $PM_{2.5}$ rather than coarse particles" (World Health Organization 2006).

Consequently, coarse dust from wind erosion is discussed in the air quality and climate assessment (see Volume 3B, Section 3), but it is not a factor related to public health.

15.3.2 Drinking Water Quality and Public Health

There are no project interactions with public health related to changes in water quality except increases in TSS and the conversion of naturally occurring inorganic mercury in the soil to methylmercury when the reservoir is filled.

The PDA does not overlap with a known or suspected contaminated site and, therefore, there is no reason to suspect that activities for flood and post-flood operations could mobilize contaminants and affect water quality in Elbow River or downstream at Glenmore Reservoir. Consequently, the changes in water quality is discussed in the context of a focus on TSS and the potential conversion of existing inorganic mercury in the soil to methylmercury.

15.3.3 Country Foods and Public Health

With respect to terrestrial country food and public health, the potential for dustfall to affect vegetation was considered. Dust generated by wind during post-flood operation is essentially inert earthen material and would have a similar chemical composition as the surrounding soil. Dust deposition to the surrounding plants would only apply occur after a flood during dry climate and high wind conditions. Dust on plants would be removed by precipitation and wind on a regular basis. Since dustfall does not introduce chemicals into the environment, and there is a low probability that the PDA can provide a substantial amount of terrestrial country foods for local harvesters, there are no project interactions with public health related to changes in terrestrial country food quality during post-flood operations.

Project interactions with fish in Elbow River are considered in relation to the potential for methylmercury accumulation in fish tissues. If methylmercury concentrations increase during post-flood operations, it may bioaccumulate and biomagnify in the aquatic food chain. People who harvest and consume fish from the Elbow River could be exposed to higher concentrations of methylmercury in fish tissue.

15.4 ASSESSMENT OF RESIDUAL ENVIRONMENTAL EFFECTS ON PUBLIC HEALTH (FLOOD AND POST-FLOOD OPERATIONS)

15.4.1 Analytical Assessment Techniques

15.4.1.1 Human Health Risk Assessment Methodology

The HHRA is an evaluation process used to describe the nature and magnitude of the risk associated with the exposure of human receptors to a potential hazard (e.g., methylmercury in fish). An HHRA combines information on potential receptors with exposure data and identified hazards (i.e., toxicity) to determine the relative level of risk resulting from an operation.

The HHRA TDR (Volume 4, Appendix O) is composed of the following major components: site characterization, problem formulation, exposure assessment, toxicity assessment, and uncertainty assessment. Additional details on each of these components are provided in the HHRA TDR and a summarized in Volume 3A, Section 15.4.

15.4.1.2 Project-Related Contaminants

For changes in drinking water quality, the surface water quality assessment (Volume 3B, Section 7) identifies potential increases in TSS and methylmercury in the water retained in the off-stream reservoir, which would be released back into the Elbow River when the reservoir is drained. TSS and methylmercury are evaluated for their potential to affect public health by comparing the estimated water quality changed with the Canadian drinking water quality guidelines.

For changes in country food quality (i.e., fish), potential changes in methylmercury content in the aquatic environment are estimated in the surface water quality assessment and the results are used here.

For changes in $PM_{2.5}$ in the air, the air quality and climate assessment (Volume 3B, Section 3; Volume 4, Appendix E, Dispersion Modelling TDR) included air dispersion modelling that simulated the conditions that could result in wind-blown dust during post-flood operations. The results of the modelling are presented in full within the HHRA TDR (Volume 4, Appendix O, Section 6.4) and summarized in this section.

15.4.1.3 Human Receptors and Receptor Locations

The human receptors and receptor locations were described previously in Volume 3A, Section 15.4.1.3, and therefore only a high-level summary is provided here. Human receptors are people within the assessment areas (LAA and RAA) who could be exposed to contaminants, while human receptor locations are the places where they are likely to be present. Two types of receptors were considered for the evaluation of risks to human health: a residential receptor and an Indigenous receptor.

Human receptor locations are important when the exposure to a contaminant is dependent on the location of the person, such as $PM_{2.5}$. Table 15-4 lists the 58 human receptor locations along with their coordinates and a description of the location. The human receptor locations are illustrated in Volume 3A, Figure 15-2.

Table 15-4 Human Receptor Locations for Air Quality

Receptor ID	Zone 11 UTM Coordinates		Land Use, Occupancy (Receptor Location Description)	Approximate Distance to PDA (m)	Indigenous Receptor	Special Receptor
	Easting (m)	Northing (m)				
SR1	676781	5661332	Residential, Permanent (rural residence 1,000 m from intersection of Highway 1 and Highway 22)	22	-	-
SR2	678048	5662120	Residential, Permanent (rural residence 750 m from intersection of Highway 1 and Highway 22)	457	-	-
SR3	678552	5662111	Residential, Permanent (rural residence 450 m south of Highway)	730	-	-
SR4	679819	5660801	Residential, Permanent (rural residence adjacent to Springbank Road)	44	-	-
SR5	680547	5660634	Residential, Permanent (rural residence 255 m from intersection of Springbank Road and Range Road 40)	231	-	-
SR6	681210	5661082	Residential, Permanent (rural residence adjacent to Range Road 40)	924	-	-
SR7	682145	5661010	Residential, Permanent (rural residence adjacent to Range Road 35)	1,457	-	-
SR8	683263	5660233	Residential, Permanent (rural residence adjacent to Springbank Road)	1,619	-	-

Table 15-4 Human Receptor Locations for Air Quality

Receptor ID	Zone 11 UTM Coordinates Easting (m)	Zone 11 UTM Coordinates Northing (m)	Land Use, Occupancy (Receptor Location Description)	Approximate Distance to PDA (m)	Indigenous Receptor	Special Receptor
SR9	677002	5660074	Residential, Permanent (rural residence 520 m from intersection of Springbank Road and Highway 22)	202	-	-
SR10	676827	5659179	Residential, Permanent (rural residence adjacent to Highway 22)	616	-	-
SR11	677449	5658688	Residential, Permanent (rural residence adjacent to Highway 22)	96	-	-
SR12	680518	5660339	Residential, Permanent (rural residence 260 m from intersection of Springbank Road and Range Road 40)	19	-	-
SR13	680670	5660343	Residential, Permanent (rural residence 110 m from intersection of Springbank Road and Range Road 40)	103	-	-
SR14	680684	5660190	Residential, Permanent (rural residence 245 m from intersection of Springbank Road and Range Road 40)	62	-	-
SR15	681089	5660001	Residential, Permanent (rural residence 545 m from intersection of Springbank Road and Range Road 40)	53	-	-
SR16	682288	5658906	Residential, Permanent (rural residence adjacent to Range Road 35)	59	-	-

Table 15-4 Human Receptor Locations for Air Quality

Receptor ID	Zone 11 UTM Coordinates Easting (m)	Zone 11 UTM Coordinates Northing (m)	Land Use, Occupancy (Receptor Location Description)	Approximate Distance to PDA (m)	Indigenous Receptor	Special Receptor
SR17	683867	5659435	Residential, Permanent (rural residence adjacent to Range Road 34)	1,589	-	-
SR18	677183	5658120	Residential, Permanent (rural residence adjacent to Highway 22)	215	-	-
SR19	677141	5657024	Residential, Permanent (rural residence adjacent to Township Road 242)	53	-	-
SR20	677303	5656696	Residential, Permanent (rural residence adjacent to Township Road 242)	35	-	-
SR21	679639	5656961	Residential, Permanent (rural residence adjacent to Elbow River)	1,008	-	-
SR22	680364	5657431	Residential, Permanent (rural residence in wooded area adjacent to Elbow River)	565	-	-
SR23	681065	5657451	Residential, Permanent (rural residence in wooded area adjacent to Elbow River)	893	-	-
SR24	682806	5658065	Residential, Permanent (rural residence in wooded area adjacent to Elbow River)	307	-	-
SR25	677400	5657051	Commercial, Permanent (commercial premises adjacent to intersection of Township Road 242 and Highway 22)	179	-	-
SR26	676700	5654151	Residential, Permanent (rural residence in wooded area adjacent to Elbow River)	301	-	-

Table 15-4 Human Receptor Locations for Air Quality

Receptor ID	Zone 11 UTM Coordinates Easting (m)	Zone 11 UTM Coordinates Northing (m)	Land Use, Occupancy (Receptor Location Description)	Approximate Distance to PDA (m)	Indigenous Receptor	Special Receptor
SR27	677250	5653751	Residential, Permanent (rural residence in wooded area)	866	✓	-
SR28	677250	5653751	Recreational, Permanent (Entheos Conference and Retreat Centre)	845	✓	-
SR29	677500	5653751	Residential, Permanent (rural residence in wooded area)	923	✓	-
SR30	677500	5654001	Residential, Permanent (rural residence in wooded area)	755	-	-
SR31	677500	5654001	Residential, Permanent (rural residence in wooded area)	732	-	-
SR32	677750	5654251	Residential, Permanent (rural residence in wooded area)	750	-	-
SR33	678000	5654501	Residential, Permanent (rural residence in wooded area)	933	-	-
SR34	678250	5654751	Residential, Permanent (rural residence in wooded area)	1,041	-	-
SR35	678250	5654751	Residential, Permanent (rural residence in wooded area)	1,020	-	-
SR36	682450	5659251	Residential, Permanent (rural residence adjacent to Range Road 35)	355	-	-

Table 15-4 Human Receptor Locations for Air Quality

Receptor ID	Zone 11 UTM Coordinates Easting (m)	Zone 11 UTM Coordinates Northing (m)	Land Use, Occupancy (Receptor Location Description)	Approximate Distance to PDA (m)	Indigenous Receptor	Special Receptor
SR37	681250	5657501	Residential, Permanent (rural residence in wooded area adjacent to Elbow River)	965	-	-
SR38	677800	5656551	Recreational, Temporary (Camp Gardner)	640	-	-
SR39	677350	5655701	Recreational, Temporary (Kamp Kiwanis)	200	-	-
SR40	676400	5657101	Residential, Permanent (rural residence adjacent to Township Road 242	217	-	-
SR41	676750	5657001	Residential, Permanent (rural residence adjacent to Township Road 242	69	-	-
SR42	676250	5663001	Residential, Permanent (rural residence 1,250 m from intersection of Highway 1 and Highway 22	1,105	-	-
SR43	678000	5662751	Residential, Permanent (rural residence 600 m from intersection of Highway 1 and Highway 22	944	-	-
SR44	685500	5660501	Educational, Permanent (Springbank Community High School and Springbank Park for All Seasons)	3,893	-	✓
SR45	685000	5662001	Educational, Permanent (Springbank Middle School and Elbow Valley Elementary School)	4,318	-	✓

Table 15-4 Human Receptor Locations for Air Quality

Receptor ID	Zone 11 UTM Coordinates Easting (m)	Zone 11 UTM Coordinates Northing (m)	Land Use, Occupancy (Receptor Location Description)	Approximate Distance to PDA (m)	Indigenous Receptor	Special Receptor
SR46	685000	5662501	Recreational, Seasonal (Calaway Park)	4,653	-	-
SR47	685500	5662501	Commercial, Permanent (Commercial area adjacent to Highway 1)	5,310	-	-
SR48	683500	5664001	Industrial, Permanent (Springbank Airport)	5,133	-	-
SR49	684500	5663501	Educational, Permanent (The Edge School)	5,442	-	✓
SR50	687500	5657001	Recreational, Seasonal (Glencoe Golf and Country Club)	5,713	-	-
SR51	683250	5658001	Recreational, Seasonal (River Spirit Golf Club)	845	-	-
SR52	675750	5652751	Residential, Permanent (Redwood Meadows community)	2,132	✓	-
SR53	682000	5665001	Residential, Permanent (Harmony community)	5,521	-	✓
SR54	675000	5651501	Recreational, Seasonal (Curtis Field Park)	3,178	✓	-
SR55	674000	5650501	Recreational, Seasonal (Redwood Meadows Golf and Country Club)	4,639	✓	-

Table 15-4 Human Receptor Locations for Air Quality

Receptor ID	Zone 11 UTM Coordinates		Land Use, Occupancy (Receptor Location Description)	Approximate Distance to PDA (m)	Indigenous Receptor	Special Receptor
	Easting (m)	Northing (m)				
SR56	671500	5651001	Recreational, Seasonal (Wintergreen Golf and Country Club)	6,368	-	-
SR57	676750	5653751	Recreational, Seasonal (Bragg Creek Paintball)	689	✓	-
SR58	688500	5666001	Recreational, Seasonal (Springbank Links Golf Course)	8,850	-	-

NOTE:
Special Receptor Location - Location where sensitive sub-groups are more likely to be present, such as schools, hospitals, retirement complexes, and assisted care homes

15.4.1.4 Exposure Ratio and Exposure Limits

Two basic categories of contaminants are commonly recognized by regulatory agencies and applied when assessing human health risk. These are the “threshold” approach (typically used to evaluate non-carcinogens) and the “non-threshold” approach (typically used for carcinogenic compounds). It is common to use the concept of exposure ratio (ER) to facilitate comparison of risks associated with both classes of chemicals (Alberta Government 2011). For threshold COPC, the ER is the ratio of the estimated receptor exposure to the exposure limit (or toxicological reference value; TRV); for carcinogens, the ratio is equal to the estimated exposure concentration or dose to the risk-specific concentration or dose, respectively, where the latter are expressed in relation to the accepted target incremental lifetime cancer risk (i.e., 1 in 100,000) (Alberta Government 2011). The potential risk expressed as an ER is calculated as follows:

$$\text{Exposure Ratio (unitless)} = \frac{\text{Exposure Estimate}}{\text{Exposure Limit (or TRV)}}$$

For inhalation exposures to chemicals of potential concern (COPC), an ER that is less than 1.0 has a low or negligible health risk. An ER that is greater than 1.0 has a potentially unacceptable risk to human health; a more detailed evaluation may be required to characterize the potential health risk (Alberta Government 2011, Health Canada 2010a).

Exposure estimates are the predicted concentrations of airborne COPCs that are modelled in the air quality and climate assessment (see Section 3). The exposure limits, also known as toxicological reference values, are derived using a conservative approach intended to protect human health, including sensitive members of the population such as infants, children, the elderly and women of child-bearing age. These are described in more detail in Volume 4, Appendix O, HHRA TDR, Section 4.2).

15.4.2 Change to Human Health

15.4.2.1 Project Pathways

The assessment of hydrology (see Section 6.0) included TSS modelling to predict the dynamics of sediment transport and sediment suspension in the water column during the filling and draining of the reservoir.

During flood operations, the diversion channel would allow water from the Elbow River to flow into the reservoir. This water will be flowing at a high velocity and contain high concentrations of suspended solids originating from eroded upstream sediments and soil materials. Water in the off-stream reservoir will be retained for a period of days to weeks. During this retention period, debris and suspended solids in the water will settle to the bottom of the reservoir.

Under specific environmental conditions, naturally occurring inorganic mercury in the flooded soil and settled sediments can be converted to an organic form known as methylmercury. Methylmercury can pose a greater health concern because it is more easily absorbed into the body and it can also bioaccumulate in tissues and biomagnify in the food chain in animals such as fish.

When the threat of flood has subsided, the gates of the outlet structure would be opened to allow the retained water to drain back into the Elbow River. At full capacity, draining the off-stream reservoir would take approximately a month.

Dust and particulates may be generated from wind erosion of sediments remaining in the reservoir after draining. Such a scenario could occur after a flood and during dry climate and high wind conditions. Fine particulates can be inhaled by people, resulting in a change in human health. $PM_{2.5}$ is assessed for potential health effects during post-flood operations phase for short-term exposure durations only (1-hour and 24-hour). Long-term (chronic) annual exposure durations do not apply because areas of sediment deposition will be either seeded with native plant species and/or a tackifier applied to reduce erosion potential. The timing is seasonal.

15.4.2.2 Mitigation

There are no mitigation measures recommended for the protection of public health with respect to air quality, water quality or country food quality.

Mitigation measures with regards to air quality are already described in the air quality and climate assessment (Section 3.0). These mitigation measures include re-establishing vegetation cover (e.g., native grasses) after reservoir draining. This would be a naturally occurring process that would not require human intervention. Should wind erosion occur and natural revegetation prove to be ineffective, a tackifier will be applied where required. Tackifiers are a sprayable erosion control product that bonds with the soil surface and creates a porous and absorbent erosion resistant blanket that can last for up to 12 months. Areas of sediment deposition in the reservoir will be seeded with native plant species and/or a tackifier will be applied to reduce wind erosion. AEP would have an Operation, Maintenance and Surveillance Plan for the Project, which will include sediment stabilization and debris removal requirements.

Regarding water quality, the Glenmore Water Treatment Plant can manage high concentrations of TSS to produce safe drinking water. During the 2013 flood in Calgary, boil-water advisories were avoided for municipal waters from the Glenmore Reservoir due to earlier investments in water treatment infrastructure (Alberta Water Portal 2013). Therefore, a flood similar in magnitude to the 2013 flood in Calgary would have a very low probability of needing mitigation to protect the drinking water quality. The Project would further reduce the TSS load in the flood waters entering the Glenmore Reservoir.

15.4.2.3 Project Residual Effects

Total Suspended Sediment

Total suspended sediment (TSS) in water does not directly affect health, but may interfere with water treatment systems. As result, potential residential and Indigenous receptors would be limited to those who obtain potable water supplies from the Glenmore Water Treatment Plant.

TSS modelling was conducted for three floods: 1:10 year flood, a 1:100-year flood and the design flood (the 2013 flood). The movement and deposition of TSS in the Elbow River and off-stream reservoir is modelled for each flood. The modelling results for the 1:100-year flood and design flood are applied in the assessment of public health because these two floods are the worst case with respect to the volume of sediment that is transported or deposited in the system. The modelling results indicate that when the diversion channel is opened, the TSS would reach a peak of approximately 90,000 mg/L during the initial 24 hours at the diversion inlet and in the reservoir. Within 48 hours, the TSS concentration would rapidly attenuate to less than 20,000 mg/L because water levels in the diversion channel and reservoir would be higher. The rising water level would create resistance to the incoming water, and reduce the water turbulence at the bottom of the reservoir, which would allow the suspended solids to settle. Within 1.8 to 3.75 days (for 1:100 year and design floods, respectively), the reservoir would be filled and the TSS concentrations in the diversion channel and reservoir would attenuate to less than 50 mg/L and remain at this level until the low-level outlet channel is opened to drain the reservoir. The model indicated a water retention time between 43 to 20 days (for 1:100 year and design floods, respectively), followed by reservoir draining for 39 or 38 days.

When water from the reservoir drains back into the Elbow River, the TSS in the outflowing water is the factor that could influence public health because this water would enter Glenmore Water Treatment Plant. The model indicates that when the low-level outlet is opened to drain the reservoir, water flowing into the Elbow River would contain a TSS concentration of less than 50 mg/L for the first 18 days (out of 38 or 39 days). From Day 19, the water level in the reservoir would recede to the point where water turbulence at the bottom of the reservoir would result in the resuspension of settled sediments. From Day 19, water draining into the Elbow River would rise from less than 50 mg/L up to 19,000 mg/L on day 38 or 39, after which the low-level outlet would be closed. The TSS concentration is predicted to dilute to 12,000 mg/L when the water from the reservoir dilutes with waters in the Elbow River.

The model indicates that the Project would result in a substantial decrease in TSS entering the Glenmore Reservoir and Glenmore Water Treatment Plant during a flood. For example, without diverting the flood water to the reservoir (i.e., without the Project), water from the Elbow River entering the Glenmore Reservoir would contain unmitigated concentrations of TSS. However, during the flood operations of the Project, TSS in the reservoir would settle to the bottom and only a fraction of the sediment would resuspend and re-enter the Elbow River. The model prediction indicates that for the design flood, 98% of the total sediment load would remain at the bottom of the reservoir, with 2% of the total sediment load re-entering the Elbow River.

The model prediction indicates that there would be a substantial benefit to the quality of the drinking water supplied to the City of Calgary during a flood by reducing the TSS load entering the Glenmore Water Treatment Plant.

Methylmercury in Water

The estimation of methylmercury formation during flood operations is included as part of the assessment of surface water quality (see Section 7). The estimation of methylmercury is based on literature for experimentally filled reservoirs in Ontario for upland forest environments. Methylmercury formation is a function of flooded surface area, duration of flooding, and the organic carbon content of the flooded soils. The current understanding of this conversion process indicates that inorganic mercury is converted to methylmercury from anaerobic microbial activity under anoxic (i.e., low oxygen) conditions. Therefore, most studies regarding methylmercury formation focus on water and hydro-electric reservoirs (St. Louis et al. 2004; Montgomery et al. 2000; Rasch and Frederickson 2015). The conditions at a reservoir that promote mercury methylation include newly flooded soils that serve as a source of inorganic mercury; the presence of organic matter (vegetation), and the formation of a deep lake that has a low water surface area and a high-water volume. The resulting low ratio of surface area to water volume results in anoxic conditions at the bottom of a hydro-electric reservoir because the surface area at the water surface is insufficient for oxygen to diffuse into the large volume of water. This allows anaerobic microbes at the bottom of a hydro-electric reservoir to convert the inorganic mercury from the flooded soil to methylmercury. Such reservoirs are permanently filled, although they are subject to periodic partial draw down and refill. The degree of mercury methylation is a function of time and may continue for many years.

The conditions of the proposed Project during the flood phase bears some similarities to the conditions present at a hydro-electric dam. These conditions include newly flooded soils during flood operations, the formation of a deep reservoir (i.e., 25 m maximum depth), and a large volume of retained water (i.e., 77,771,000 m^3 at design capacity). The water surface area at the design capacity is 789 ha. However, the duration of these conditions during flood operations is expected to last between 20 to 43 days only. During this period, water flowing into the off-stream reservoir would contain high concentrations of dissolved oxygen resulting from the strong water turbulence and mixing as the off-stream reservoir is filling. The flood operations duration of 20 to 43 days may be insufficient time for the dissolved oxygen to be consumed and create the anoxic conditions necessary to allow anaerobic microbes to proliferate and convert inorganic mercury to methylmercury.

Methylmercury concentrations in retained water are estimated to reach up to 0.002 µg/L for the duration of flood operations, which is the more conservative high estimate of methylmercury concentrations. In comparison, the Canadian drinking water quality guideline for total mercury is 1 µg/L, which applies to all forms of mercury. Given that the existing drinking water quality from the Glenmore Water Treatment Plant is below 1 µg/L, there is a low probability that the influx of water from the reservoir containing 0.002 µg/L mercury could substantially increase mercury concentrations in the drinking water supply, or have a long-term effect on the mercury concentration, particularly because the influx of water from the reservoir would occur for approximately 38 to 39 days only.

Methylmercury in Fish

In consideration that there have been no fish consumption advisories for methylmercury in the Elbow River recently, there is a low probability that a single water release from the off-stream reservoir after a flood could substantially change the viability of fish and, thereby, affect the health of residential receptors (such as anglers) or Indigenous receptors. Longer reservoir retention time appears to be associated with increased methylmercury concentrations in fish, but this process is typically observed over years (Rasch and Frederickson 2015). Specifically, the process of methylmercury uptake by lower trophic level aquatic organisms, followed by predators consuming these organisms in the food chain, and accumulating methylmercury in its tissues is a process that may take years for an observable effect. In contrast, methylmercury in the released water would be further diluted by Elbow River flows, and would last approximately one month.

There may be insufficient time for the bioaccumulation and biomagnification process to occur within the period of one month, assuming that anoxic conditions develop, and the concentration of methylmercury is sufficient for these processes to occur during flood operations. Based on these factors, it is unlikely that the long-term viability of fish from the Elbow River would be changed with respect to methylmercury content.

Consequently, there are no unacceptable risks to human health from exposure to methylmercury in fish harvested from Elbow River during post-flood operations. The overall health risk to people who harvest and consume fish from the Elbow River would remain the same as for the current conditions.

Air Quality

Modelled changes in $PM_{2.5}$ concentrations in a dust erosion scenario are reported in the air quality and climate assessment (Section 3). The model predicts the 1-hour and 24-hour concentrations of $PM_{2.5}$ over a six month period following a design flood. The concentration of $PM_{2.5}$ is compared to the exposure limit to calculate the exposure ratios at the 58 human receptor locations (see Table 15-5).

The Base Case represents the existing conditions.

The Project Case represents the contribution of $PM_{2.5}$ from wind-blown dust (originating from the off-stream reservoir), and excludes Base Case and background concentrations of $PM_{2.5}$.

The Application Case is the combined Base Case, Project Case, and background concentrations of $PM_{2.5}$, and represents the conditions during conditions of wind-blown dust. Overall, the Application Case exposure ratios are less than 1.0 at all human receptor locations. This indicates that there are no unacceptable risks to either residential or Indigenous receptors from inhalation exposures to $PM_{2.5}$ from wind-blown dust during post-flood operations.

Table 15-5 Exposure Ratios for $PM_{2.5}$ at Human Receptor Locations during Post-Flood Operations

Human Receptor Location	Exposure Ratio (unitless)					
	1-hour $PM_{2.5}$			24-hour $PM_{2.5}$		
	Base Case	Project Case	Application Case	Base Case	Project Case	Application Case
SR01	1.7E-01	4.9E-04	1.7E-01	4.2E-01	1.0E-05	4.2E-01
SR02	1.8E-01	2.1E-03	1.9E-01	4.3E-01	1.3E-04	4.3E-01
SR03	1.8E-01	2.4E-03	1.8E-01	4.3E-01	2.7E-04	4.3E-01
SR04	1.5E-01	1.2E-02	1.7E-01	4.1E-01	8.6E-04	4.1E-01
SR05	1.6E-01	5.5E-02	2.2E-01	4.2E-01	3.9E-03	4.2E-01
SR06	1.6E-01	3.5E-03	1.6E-01	4.2E-01	1.4E-04	4.2E-01
SR07	1.6E-01	6.7E-03	1.6E-01	4.2E-01	3.2E-04	4.2E-01
SR08	1.6E-01	1.4E-02	1.8E-01	4.2E-01	2.5E-03	4.2E-01
SR09	1.7E-01	5.9E-04	1.7E-01	4.2E-01	5.6E-07	4.2E-01
SR10	1.6E-01	1.1E-04	1.6E-01	4.2E-01	6.3E-07	4.2E-01
SR11	2.1E-01	4.5E-05	2.1E-01	4.8E-01	5.8E-07	4.8E-01
SR12	1.6E-01	1.2E-01	2.8E-01	4.1E-01	3.0E-02	4.4E-01
SR13	1.6E-01	1.1E-01	2.7E-01	4.2E-01	2.2E-02	4.4E-01
SR14	1.6E-01	1.6E-01	3.2E-01	4.1E-01	4.4E-02	4.6E-01
SR15	1.6E-01	1.2E-01	2.8E-01	4.2E-01	3.4E-02	4.5E-01
SR16	1.5E-01	3.6E-02	1.9E-01	4.1E-01	2.0E-02	4.2E-01
SR17	1.5E-01	1.7E-02	1.7E-01	4.1E-01	6.6E-03	4.2E-01
SR18	1.8E-01	3.2E-05	1.8E-01	4.3E-01	1.1E-07	4.3E-01

Table 15-5 Exposure Ratios for $PM_{2.5}$ at Human Receptor Locations during Post-Flood Operations

Human Receptor Location	Exposure Ratio (unitless)					
	1-hour $PM_{2.5}$			24-hour $PM_{2.5}$		
	Base Case	Project Case	Application Case	Base Case	Project Case	Application Case
SR19	1.7E-01	5.2E-04	1.7E-01	4.2E-01	9.1E-08	4.2E-01
SR20	1.8E-01	9.6E-04	1.8E-01	4.3E-01	9.0E-08	4.3E-01
SR21	1.6E-01	8.5E-03	1.6E-01	4.1E-01	5.7E-04	4.1E-01
SR22	1.5E-01	1.1E-02	1.6E-01	4.1E-01	1.3E-03	4.1E-01
SR23	1.5E-01	1.1E-02	1.6E-01	4.1E-01	1.6E-03	4.1E-01
SR24	1.5E-01	2.3E-02	1.7E-01	4.1E-01	5.2E-03	4.1E-01
SR25	1.9E-01	7.9E-04	1.9E-01	4.4E-01	8.9E-08	4.4E-01
SR26	1.7E-01	6.7E-04	1.7E-01	4.2E-01	9.4E-08	4.2E-01
SR27	1.8E-01	7.9E-04	1.8E-01	4.3E-01	7.8E-07	4.3E-01
SR28	1.8E-01	7.9E-04	1.8E-01	4.3E-01	7.8E-07	4.3E-01
SR29	1.8E-01	8.5E-04	1.8E-01	4.2E-01	2.8E-06	4.2E-01
SR30	2.1E-01	9.3E-04	2.1E-01	4.6E-01	2.0E-06	4.6E-01
SR31	2.1E-01	9.3E-04	2.1E-01	4.6E-01	2.0E-06	4.6E-01
SR32	1.9E-01	1.1E-03	1.9E-01	4.4E-01	6.1E-06	4.4E-01
SR33	1.7E-01	1.2E-03	1.7E-01	4.2E-01	1.1E-05	4.2E-01
SR34	1.7E-01	1.3E-03	1.7E-01	4.2E-01	2.0E-05	4.2E-01
SR35	1.7E-01	1.3E-03	1.7E-01	4.2E-01	2.0E-05	4.2E-01
SR36	1.5E-01	3.2E-02	1.8E-01	4.1E-01	1.7E-02	4.2E-01
SR37	1.5E-01	1.1E-02	1.6E-01	4.1E-01	1.7E-03	4.1E-01
SR38	1.8E-01	1.4E-03	1.8E-01	4.3E-01	3.5E-07	4.3E-01
SR39	1.9E-01	9.7E-04	1.9E-01	4.3E-01	1.0E-07	4.3E-01
SR40	1.6E-01	1.3E-05	1.6E-01	4.1E-01	6.0E-09	4.1E-01
SR41	1.6E-01	8.6E-05	1.6E-01	4.1E-01	9.3E-08	4.1E-01
SR42	2.0E-01	6.7E-04	2.0E-01	4.5E-01	9.1E-06	4.5E-01
SR43	2.6E-01	1.8E-03	2.6E-01	5.4E-01	1.2E-04	5.4E-01
SR44	1.7E-01	8.7E-03	1.7E-01	4.3E-01	1.1E-03	4.3E-01
SR45	1.6E-01	2.8E-03	1.6E-01	4.1E-01	1.1E-04	4.1E-01

Table 15-5 Exposure Ratios for $PM_{2.5}$ at Human Receptor Locations during Post-Flood Operations

Human Receptor Location	Exposure Ratio (unitless)					
	1-hour $PM_{2.5}$			24-hour $PM_{2.5}$		
	Base Case	Project Case	Application Case	Base Case	Project Case	Application Case
SR46	1.7E-01	1.4E-03	1.7E-01	4.2E-01	2.9E-05	4.2E-01
SR47	1.8E-01	1.5E-03	1.8E-01	4.3E-01	4.4E-05	4.3E-01
SR48	1.7E-01	4.6E-04	1.7E-01	4.2E-01	5.2E-06	4.2E-01
SR49	1.9E-01	4.6E-04	1.9E-01	4.4E-01	4.3E-06	4.4E-01
SR50	1.5E-01	9.5E-03	1.6E-01	4.0E-01	2.4E-03	4.0E-01
SR51	1.5E-01	1.7E-02	1.6E-01	4.0E-01	5.0E-03	4.1E-01
SR52	1.7E-01	2.5E-04	1.7E-01	4.1E-01	9.6E-08	4.1E-01
SR53	1.6E-01	8.5E-05	1.6E-01	4.1E-01	3.9E-06	4.1E-01
SR54	1.7E-01	1.8E-04	1.7E-01	4.1E-01	6.5E-08	4.1E-01
SR55	1.7E-01	1.5E-04	1.7E-01	4.2E-01	8.6E-09	4.2E-01
SR56	1.5E-01	7.4E-06	1.5E-01	4.0E-01	1.9E-10	4.0E-01
SR57	1.9E-01	6.2E-04	1.9E-01	4.4E-01	1.3E-07	4.4E-01
SR58	1.5E-01	8.3E-05	1.5E-01	4.0E-01	6.6E-07	4.0E-01

NOTES
Shaded cell indicates a ER greater than 1.0
Base Case (existing conditions)
Project Case (project emissions only; Base Case and background emissions excluded)
Application Case (post-flood operations conditions)

15.4.3 Summary of Project Residual Effects

Table 15-6 summarizes the residual environmental effects on public health.

Table 15-6 Project Residual Effects on Public Health During Flood and Post-Flood Operations

Residual Effect	Residual Effects Characterization								
	Project Phase	Timing	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological and Socio-economic Context
Change to Human Health	F	S	A	L	LAA, RAA	ST	IR	R	R

KEY
See Volume 3A, Table 15-2 for detailed definitions

Project Phase
F: Flood
PF: Post Flood Operations

Timing Consideration
S: Seasonal
T: Time of day
R: Regulatory

Direction:
P: Positive
A: Adverse
N: Neutral

Magnitude:
N: Negligible
L: Low
M: Moderate
H: High

Geographic Extent:
PDA: Project Development Area
LAA: Local Assessment Area
RAA: Regional Assessment Area

Duration:
ST: Short-term;
MT: Medium-term
LT: Long-term

N/A: Not applicable

Frequency:
S: Single event
IR: Irregular event
R: Regular event
C: Continuous

Reversibility:
R: Reversible
I: Irreversible

Ecological/Socio-Economic Context:
R: Resilient
NR: Not Resilient

15.5 DETERMINATION OF SIGNIFICANCE

As defined in Section 15.1.6, the significance criteria for public health may occur when the exposure ratio is greater than 1.0, with consideration of the context in which the health risk exists.

For effects on human health from changes in drinking water quality, the Project would reduce the TSS load in the Elbow River and Glenmore Reservoir during flood operations because approximately 97.6% of the sediment load contained in the diverted flood water would remain in the off-stream reservoir after draining. The Glenmore Water Treatment Plant is capable of removing the expected levels of TSS in municipal water after a flood, given that it was able to remove very high TSS loads during the 2013 flood in Calgary, which was within its normal operating capacity.

For changes in methylmercury concentration in the water, the predicted increase in methylmercury concentration of up to 0.002 µg/L in water drained from the reservoir is negligible relative to the Canadian drinking water quality guideline of 1 µg/L for total mercury. The estimated concentration of methylmercury in the water is also less than the water quality guideline for the long-term protection of freshwater aquatic life of 0.004 µg/L. The results for TSS and methylmercury suggest that the potential residual effect to public health during the flood phase is not significant.

The conclusion is further supported by the short-term duration that the Project would alter the water quality during flood operations. The short-term influx of less than 0.002 µg/L of methylmercury into the Elbow River from the drained reservoir would not influence the long-term viability of the drinking water supply. Health-based drinking water guidelines are also derived using conservative assumptions assuming long-term consumption of the drinking water. Therefore, if the short-term increase in methylmercury in the water is below the drinking water guideline, there is a low probability of both short-term or long-term health effects to consumers of water from the Glenmore Reservoir.

It is unlikely that the long-term viability of fish from the Elbow River would be changed with respect to methylmercury content. Consequently, there are no unacceptable risks to human health from exposure to methylmercury in fish harvested from the Elbow River in during post-flood operations. The overall health risk to people (including Indigenous receptors) who harvest and consume fish from the Elbow River would remain the same as the current conditions.

15.6 PREDICTION CONFIDENCE

The prediction confidence for public health is high. The high level of prediction confidence is the result of water quality modelling conducted to predict the water quality conditions during flood operations: the change in water quality too low and of too short a duration to result in a substantial change to human health.

15.7 CONCLUSIONS

For drinking water quality, the proposed Project would reduce the TSS entering the Glenmore Water Treatment Plant during a flood and improve the water quality with respect to TSS, compared to there being no Project.

Methylmercury that is formed in the reservoir and released back into the Elbow River upon draining the water would be at concentrations that are below the Canadian drinking water quality guidelines. There would be no unacceptable risk to human health for people drinking municipal water.

The health risk to people who harvest and consume fish from the Elbow River would remain the same as the current conditions with respect to methylmercury exposure.

For exposure to $PM_{2.5}$ during post-flood operations from wind-blown, mitigation measures such as natural revegetation of the dry reservoir and the application of tackifiers can manage dust concentrations during high wind periods. There would be no unacceptable risk to human health from exposure to $PM_{2.5}$ during this period.

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