



# WEBEQUIE SUPPLY ROAD FINAL ENVIRONMENTAL ASSESSMENT REPORT / IMPACT STATEMENT

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## SECTION 23: Accidents and Malfunctions



WEBEQUIE FIRST NATION

AtkinsRéalis



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# 23. Accidents and Malfunctions

## 23.1 Introduction

Accidents and/or malfunctions are unplanned events, which are not indicative of the intended activities associated with construction or operation of the Webequie Supply Road ('WSR', or the 'Project'). An accident is an unexpected occurrence or unintended action, such as human error or natural events, which present the potential for negative (adverse) effects on the environment. A malfunction is defined by the failure of an engineered device or system (e.g., a device, piece of equipment, infrastructure) that must function as intended to prevent negative (adverse) effects on the environment. For any well designed and planned development project, unintended accidents and malfunctions are a rare event; however, the potential occurrence must be considered and prepared for. By analysing plausible accident and malfunction scenarios for the Project, risk factors, potential environmental effects and preventative planning can reduce the severity of such an event if it were to occur, thereby increasing readiness and assurance of assessed environmental predictions.

In accordance with Tailored Impact Statement Guidelines (TSIG; Impact Assessment Agency of Canada [IAAC], 2020) issued for the Project, these unplanned events must be considered within the context of the Environmental Assessment Report / Impact Statement (EAR/IS) due to the potential for adverse effects to environmental, economic, social, cultural or health values and/or effects to Indigenous interests. The analysis will consider plausible accident and/or malfunction scenarios across the entire lifespan of the Project, in addition to Project components, pathways of environmental interactions and risk factors that may contribute to an event.

Predicated upon safe design principles, the Project was developed in alignment with federal and provincial design standards developed to eliminate or reduce potential effects related to structural damage from severe weather conditions on roads and structures used for municipal roads and provincial highways. The design standards for the Project are consistent with those used by the Ontario Ministry of Transportation (MTO) for similarly classified roads in the northeast and northwest regions of the province and will be classified as a Rural Collector Undivided facility upon opening. These standards also provide guidelines for the design of roads and structures to ensure that vehicle safety is incorporated. Specific standards that were incorporated in the Project design is provided in EAR/IS Section 4 (Project Description, 4.2.1 Applicable Design Criteria and Standards).

In addition to safe design, the Project also incorporates mitigation commitments within each Value Component (VC) section of the EAR/IS. The VC sections rely on technical analysis to identify and predict Project effects and suitable commitments to reduce risk to the environment. These mitigation measures identify preventative and readiness mechanisms such as management plans, training, safety equipment or other actions that can control or reduce an unwanted accident or malfunction. A comprehensive list of Project mitigation commitments is presented in Appendix E.

After accounting for safe design and mitigation measures, accidents or malfunctions still present realistic likelihood of occurrence. In this section of the EAR/IS, an assessment of the potential effects on VCs from an accident or malfunction during construction and/or operations of the Project will be undertaken by using a hazard identification and risk assessment approach. The section identifies scenarios for accidents or malfunctions that have potential to take place after rigorous application of safety design principles, mitigation measures, and emergency response procedures. Each scenario was characterized by a



defined pathway involving Project components or factors of environmental interaction, temporal bounds, potential consequences (e.g., contaminant release, rate, quantity etc.) and potential effects. In addition, each scenario included a narrative related to mitigation measures, including standard management practices and the Project's emergency response planning, to quickly and effectively manage an accident or malfunction. Following the considerations for mitigations, adverse effects were characterized to inform an evaluation of risk and potential net effects.

The assessment of accident and malfunctions is presented in the following manner:

- Scope of the Assessment – regulatory setting, engagement considerations, EAR/IS setting;
- Assessment Approach – assessment definitions and risk matrix;
- Description of Potential Accidents and Malfunctions;
- Potential Pathways of Effects – Accident and Malfunction interaction with VCs;
- Assessment of Accidents and Malfunctions – application of risk matrix:
  - Description of adverse effects (after considering mitigation);
  - Risk evaluation;
  - Significance of net effects; and
  - References.

## 23.2 Scope of Assessment

Project related accidents and malfunctions assessed in this section of the EAR/IS was based on the identification of plausible accidents and malfunctions, identification of relevant mitigations, identification of pathways of effects for VCs, risk assessment and characterization of net effects for VCs associated with an event. Accident and malfunction scenarios were identified based on publicly available information, professional experience and judgment of Project team members, including professional engineers, technical experts, and industry stakeholders familiar with existing road construction and operations. The assessment was scoped based on the relevant regulatory setting and with influence from Project engagement and consultation feedback.

### 23.2.1 Regulatory and Policy Setting

The assessment of accidents and malfunctions was undertaken in accordance with the requirements of the *Impact Assessment Act*, the Tailored Impact Statement Guidelines for the Project (Appendix A-1), the *Ontario Environmental Assessment Act*, the provincial approved EA Terms of Reference (ToR) (Appendix A-2), and EA/IA guidance documents. Applicable provincial and federal legislation, regulations and policies were considered for potential effects associated with accident and malfunction events, and can be referred to in Section 6 to 20 of the EAR/IS. Specific environmental and emergency management legislation, regulations, guidelines and/or policy relevant to the accidents and malfunctions assessment are provided in **Table 23-1**.



**Table 23-1: Key Regulation, Legislation and Policy Relevant to the Assessment of Accidents and Malfunctions**

Regulatory Agency	Regulation, Legislation, and Policy	Project Relevance
<b>Federal</b>		
Impact Assessment Agency of Canada (IAAC)	<i>Impact Assessment Act</i>	The Project is subject to the federal <i>Impact Assessment Act</i> Section 22 (1). The Tailored Impact Statement Guidelines issued by IAAC (2020) for the Project were used to identify requirements for the assessment of accidents and malfunctions, including the Project requirements involving elements of technical risk analysis to support the EAR/IS.
Transport Canada	<i>Transportation of Dangerous Goods Act and regulations</i>	Accidents or malfunctions that may relate to the use, storage, handling, disposal and/or result in emergency response clean up for dangerous goods.
Natural Resources Canada	<i>Federal Explosives Act (1985)</i>	Accidents or malfunctions that may relate to the management, use, handling, storage, discharge and/or disposal of explosives for Project blasting activities.
	<i>National Fire Code of Canada</i>	Accidents and malfunctions related to spill prevention, contingency and emergency response and planning for fires and release of contaminants to air, land, and water were considered in relation to the National Fire Code of Canada, NFPA, <i>Emergency Preparedness Act</i> and <i>Emergency Response Planning Guide</i> .
	<i>National Fire Protection Association (NFPA)</i>	
	<i>Emergency Preparedness Act</i>	
<i>Emergency Response Planning Guide, published by the Canadian Centre for Occupational Health and Safety (2004).</i>		
<b>Provincial</b>		
Ministry of the Environment, Conservation and Parks (MECP)	<i>Ontario Environmental Assessment Act</i>	The Project is subject to the Ontario Environmental Assessment Act. The ToR (Webequie First Nation, 2020), which was approved by the MECP on October 8, 2021, were used to identify requirements for emergency response arising from accidents and malfunctions and/or risk assessments.
	<i>Ontario Environmental Protection Act (EPA, the Act)</i> <i>O.Reg 224/07 – Spill Prevention and Contingency Plans</i> <i>O.Reg 406/19 – On-site and Excess Soil Management</i> <i>Ontario Water Resources Act (WRA)</i> <i>Clean Water Act (CWA)</i>	Accidents and malfunctions related to spill prevention, contingency and emergency response associated with release or discharge of contaminants to air, land, and water were considered in relation to the Ontario EPA, WRA and CWA and related regulations.

Regulatory Agency	Regulation, Legislation, and Policy	Project Relevance
Ministry of Natural Resources (MNR)	<i>Forest First Prevention Act Regulation 207/96 Industrial Operations Protocol Crown Forest Sustainability Act</i>	All activities of the Project are required to meet Ontario's fire prevention and preparedness regulations to prevent and mitigate the effects of wildland fire.
	<i>Public Lands Act O. Reg 239/13 O. Reg 975 O. Reg 973</i>	Accidents and malfunctions that involve public lands, shoreland, roads or land use, will be considered where adverse affects may implicate the regulatory jurisdiction under the <i>Public Lands Act</i> requirements.
	<i>Aggregate Resources Act</i>	Blasting and quarry activities related to aggregate production will adhere to environmental and safety obligations of the <i>Ontario Aggregate Resources Act</i> .
Ministry of Labour, Immigration, Training and Skills Development	<i>Occupational Health and Safety Act (OHSA) O. Reg 351/91 Critical Injury O. Reg. 357/91 Workplace Hazardous Information System O. Reg. 297/13 Basic Occupational Health and Safety Awareness Training O. Reg 385/96, amended 19/09 Joint Health and Safety Committees</i>	All activities of the Project are required to meet OHSA requirements. Accidents and malfunctions related to job site safety and work injury were considered in relation to the OHSA.
<b>Other</b>		
Webequie First Nation	<i>Webequie First Nation Community Based Land Use Plan</i>	Accidents and malfunctions related to potential effects on planned land use.

## 23.2.2 Consideration and Influence of Input Received During Engagement and Consultation Activities

Comments and input related to accidents and malfunctions was received during Project engagement and consultation activities for the EA/IA. Feedback themes are summarized in **Table 23-2**, with further detail to indicated how this input was addressed, as relevant to accident and malfunction. This input includes concerns raised by Indigenous communities and groups, the public, government agencies and stakeholders prior to the formal commencement of the EA/IA, during the Planning Phase of the EA/IA. The Project Team considered the comments received on the Draft EAR/IS in finalizing the EAR/IS. Details of responses and how the comments have been addressed are provided in the Record of Engagement and Consultation.

**Table 23-2: Summary of Accident and Malfunction Input Received During Engagement and Consultation**

Common Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community or Stakeholder
Concerned about assessing the worst-case scenarios for accidents and malfunctions during migration periods, nesting and spawning periods, and sensitive seasonal	<b>Section 23.3.1</b> describes the approach to establishing the worst-case scenarios that were assessed. <b>Section 23.5</b> has characterized potential accidents or malfunction events by their	Wildlife Conservation Society Canada



Common Theme	How the Comments are Addressed in this EAR/IS	Indigenous Community or Stakeholder
periods for wildlife. Also malfunctions of culverts needs to consider impacts on freshwater, fish biodiversity, health, and movement.	potential to cause an adverse effect on a VC, after taking into consideration features of safety design and mitigation.	
Concerned about consideration of the potential for increased traffic accidents as a result of the Project.	<b>Section 23.5.4</b> has outlined potential effects arising from collisions, which can occur between construction equipment, vehicles, and wildlife (considering interactions with different VCs) during the construction and operation phases of the Project.	Long Lake #58 First Nation
Concerned about consideration of feedback from public consultation and historical flooding incidents when developing emergency response preparedness measures.	<b>Table 23-5</b> has outlined mitigation measures related to structure failure of a bridge, culvert or road surface due to a flooding event. These measures include design considerations, building materials and methods and emergency response plans. The description of mitigation measures (including incorporation of the design standards of 1:25-, 1:50-, or 1:100-year flood events based on various sizes of watercourse crossings) and interaction of flooding events with different valued components is provided in <b>Table 23-5</b> with further discussion in <b>Section 23.5.3</b> .	Friends of the Attawapiskat River

### 23.2.3 Valued Components

Potential effect pathways arising from an accident or malfunction are assessed in this section by considering interactions with VCs, after implementation of mitigation measures to reduce the likelihood, consequence and/or risk, if the event were to occur. These events are presented in **Section 23.3.1** and **Table 23-5**, in addition to the narratives for potential effects for relevant VCs, which are presented in **Section 23.5**.

## 23.3 Assessment Approach

To assess accidents and malfunctions, hazard identification was undertaken. The hazards and risks were captured through accident and malfunction scenarios that were evaluated using a risk rating system supported by the *ISO 31000 Risk Management Standard*. In alignment with the VC assessments presented in Sections 6 to 20 of the EAR/IS, the risk evaluation considered:

- Temporal and spatial bounds;
- Sensitivity mapping;
- Site specific conditions;
- Receptors; and
- Worst-case scenarios related to environmentally sensitive time periods (e.g., bird nesting, migration).



The accident and malfunction assessment involved the following overall approach to meet requirements as outlined in **Section 23.1** of the TISG for the Project:

- Description of plausible accident and malfunction events, with reference to Project components, activities, mitigation commitments, worst-case conditions and mechanism of release;
- Identification of how each potential accident or malfunction event may interact with the human or natural environment via VC pathways of effects;
- Evaluation of risks, taking into account the accident and malfunction event and potential effect pathways of effects via application of the likelihood, consequence and risk rating matrix of occurrence;
- Description of the proposed mitigation measures that reduce the consequence of interaction to applicable VCs following a potential accident or malfunction event; and
- Description of potential net effects on VCs (after considering mitigation measures) following a potential accident or malfunction event;

### 23.3.1 Description of Accidents and Malfunctions

Plausible accident and malfunction scenarios were identified for the Project by considering development components, activities, conditions or mechanisms of release, known risks for similar scale highways, and various assessments of risk prepared for the EAR/IS. Project components and activities were based on Section 4: Project Description of the EAR/IS, which were used to identify plausible worst-case scenarios and mechanisms of release for accidents and malfunctions. Event scenarios were also based on knowledge of the Project and past professional experience regarding road engineering, construction practices, and performance for road developments of a similar standard, size and scale. Lastly, plausible event scenarios were required to have measurable pathways of effects to assess relevant VCs of the EAR/IS. Event scenarios associated with potential adverse or net effects following an accident or malfunction were further qualified by whether the Project had jurisdiction and mandate to directly manage or mitigate outcomes.

Each accident or malfunction scenario was then described based on factors such as Project use, potential mechanisms of release, quantity, rate, contaminant characteristics, greenhouse gases and climate change, as applicable. Relevant mitigation commitments, such as the road design, engineering approach, safety design, management plans, or construction specifications, were also identified as key factors that would proactively reduce the severity of potential effects. Descriptions of Project related accidents and malfunctions were prepared to identify materials likely to be released or spilled into the environment during these scenarios and any potentially adverse environmental, health, social or economic effect.

The following events were considered plausible for the assessment of Project accidents and malfunctions:

- Accidental releases of hazardous materials;
- Fires and explosions;
- Structural failure; and
- Vehicle or equipment accidents.

A summary of the accidents and malfunction events and key mitigation commitments that were assessed are presented in **Section 23.4** and **Table 23-5**.



## 23.3.2 Temporal and Spatial Boundaries

The temporal and spatial bounds for the assessment of accidents and malfunctions considered the definitions presented in EAR/IS Section 5 Environmental Assessment Approach. To have a comparative assessment of magnitude and duration for VC pathways of effects, the temporal and spatial boundaries were aligned with VC definition, as presented in Section 6 to 20 of the EAR/IS.

## 23.3.3 Identification of Potential Effects and Pathways

Potential accident and malfunction events were further described by identifying the pathways of effects for relevant VCs. A Project effect pathway refers to the cause–effect linkage between Project activities and components with either the human or natural environment. Based on the description of each potential event, effect pathways were presented to describe the relationship between the event and relevant VCs. Discussion related to potential pathways of effects included VC-specific criteria for net effects, as presented in Sections 6 to 20. In addition, the pathways of effects focused on discussion related to magnitude and duration of Project related accidents and malfunctions based on the worst-case scenarios. Potential pathways of effects for each accident and malfunction are presented in **Section 23.5**.

## 23.3.4 Risk Evaluation – Likelihood and Consequences

Collectively, the description of the accident or malfunction event, mitigation measures and potential pathways of effects were used to substantiate risk evaluation scoring. The risk-based assessment approach for potential accidents and malfunctions is based on the definitions provided in **Table 23-3** and includes categories of likelihood and consequences, which are aligned with guidance from the ISO 31000 Risk Management Standard. For the purposes of the overall accident and malfunction assessment, the likelihood and consequence scoring were applied to each event relative to the assessment of effects on VCs and considered the risk of the accident or malfunction scenario with existing Project mitigation measures in place.

Based on the likelihood and consequence rating for each event, an overall risk rating determination for each event and relevant VC was prepared using the risk evaluation matrix presented in **Table 23-4**. If the overall event risk rating for a VC was found to be ‘low’, then no further action is required, and mitigation measures were deemed adequate. If the overall risk rating for a VC is found to be ‘medium’, ‘high’ or ‘very high’, then the event is considered likely to occur and further assessment regarding the sustainability of the VC was provided.

**Table 23-3: Definitions for Categories of Likelihood and Consequence**

Category	Rating	Description
Likelihood	Almost Certain	Incident is very likely to occur.
	Likely	Incident is likely to occur.
	Unlikely	With appropriate practices and procedures, incident is unlikely to occur.
	Not anticipated	Incident is highly unlikely to occur.
Consequence	Catastrophic	The consequence is very severe, resulting in human fatality and long-term environmental damage with regional adverse effect.
	Major	Incident results in high magnitude of effects to a VC(s) with possible effects beyond incident area.



Category	Rating	Description
	Moderate	Incident results in moderate magnitude of effects to a VC(s) with possible effects beyond incident area.
	Minor	Incident results in low magnitude of effects to a VC(s) with localized effects within incident area.

**Table 23-4: Risk Evaluation Matrix**

		Consequence			
		Catastrophic	Major	Moderate	Minor
Likelihood	Almost Certain	Very high	Very high	High	Medium
	Likely	Very high	High	High	Medium
	Unlikely	High	Medium	Medium	Low
	Not anticipated	Medium	Low	Low	Low

## 23.4 Description of Accident and Malfunctions and Mitigation Commitments

Mitigation commitments were developed and incorporated into the Project design and execution plan. The plausible accident and malfunction scenarios attributed to the Project are summarized in **Table 23-5**, and are further described in connection to mitigative actions that can reduce, prevent, manage, control or eliminate an adverse effect if the event were to occur. The analysis of potential effects arising from accidents and malfunctions are considered after the application of mitigation measures.

## 23.4.1 Mitigation Commitments for Accident and Malfunctions

Table 23-5: Potential Accident or Malfunction Scenarios

Potential Accident or Malfunction	Description	Project Mitigation Measures
Spills of Hazardous Materials	<p>Accidental release of a hazardous material due to on-site storage, handling, dispensing, and/or disposal activities, resulting in an unintended release to the terrestrial or aquatic environment.</p> <p>Accidental release of a hazardous material due to on-site use of motor vehicles and equipment, resulting in an unintended release of hazardous materials contained within the vehicle or equipment.</p> <p>Mechanisms of release include human error, motor vehicle or equipment collision, and/or equipment or storage component failure (e.g., ruptured hose, valve failure, containment failure).</p>	<p><b>Preventive Measures</b></p> <p><i>Spill Prevention Plans</i></p> <ul style="list-style-type: none"> <li>▪ A Spill Prevention and Emergency Response Management Plan will be developed within the Construction Environmental Plan (CEMP) and Operational Environmental Management Plan (OEMP) to provide measures to eliminate and reduce the potential for a spill or release of petroleum or other hazardous materials and procedures to be followed in the event of unanticipated emergency situations that may occur during construction of the Project and will be adapted for continuation throughout the operations phase of the Project. The plan will adhere to regulatory requirements including <i>Ontario Occupational Health and Safety Act</i>.</li> <li>▪ It will be ensured that due care and caution are taken to prevent spills at all times.</li> <li>▪ An updated on-site spill response and containment plan for each dangerous good/hazardous waste will be maintained in the work area at all times.</li> <li>▪ On-site Emergency Spill Response Coordinators will be designated at construction sites during the construction phase.</li> <li>▪ All contractors working during the construction and maintenance phases of the Project will be thoroughly familiar with provincial/federal spill response compliance procedures and will prevent fuel, lubricants, or compounds from being released.</li> </ul> <p><i>Proper Storage</i></p> <ul style="list-style-type: none"> <li>▪ Appropriate materials for containment and cleanup of any spill of dangerous goods or hazardous wastes will be available on-site when such materials are present in the work area.</li> <li>▪ All Aboveground storage tanks will be registered and comply with the Canadian Council of Ministers of the Environment (CCME) Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products (CCME, 1994).</li> <li>▪ All petroleum handling and storage will comply with Ontario <i>Technical Standards and Safety Act</i>.</li> <li>▪ The transportation, storage and handling of fuels will be in compliance with the Ontario <i>Technical Standards and Safety Act</i> and Canada's <i>Transportation of Dangerous Goods Act</i>.</li> <li>▪ Construction, installation, and removal of petroleum storage tank systems will occur under the supervision of a registered licenced petroleum technician.</li> <li>▪ Storage sites for petroleum products will be secured and signs including hazard warnings, who to contact in case of a spill, access restrictions and under whose authority the access is restricted will be posted.</li> <li>▪ All designated areas used for petroleum product storage shall be a minimum distance of 50 m from any waterbody.</li> </ul> <p><i>Training</i></p> <ul style="list-style-type: none"> <li>▪ All personnel handling petroleum or hazardous materials will be trained in best practices for transportation, handling, and on-site response and containment plan, including Workplace Hazardous Materials Information System (WHMIS) training.</li> <li>▪ Designated personnel and first responders will be familiar with the storage location and proper application of hazardous materials.</li> </ul> <p><i>Secondary Containment</i></p> <ul style="list-style-type: none"> <li>▪ Designated storage areas for equipment, hazardous materials, and wastes will be underlain with at least 30 centimeters of impermeable soil or an approved alternative and lined with an impermeable groundsheet to contain spills.</li> <li>▪ Fuelling and storage areas will include appropriate drainage controls with secondary containment of at least 110% of the capacity of the total number of containers.</li> <li>▪ Hydrocarbons will be captured and separated before releasing rainwater runoff.</li> <li>▪ Petroleum product storage areas will be located at least 50 meters from any waterbody, with topsoil stripped and underlain with impermeable soil or an approved alternative. These areas will be dyked to contain leakage or spillage, retaining not less than 100% of the capacity of the total number of containers or 110% of the largest container, whichever is greatest. The stripped topsoil will be stored and used for site restoration.</li> <li>▪ Absorbent pads, or high-density polyethylene (HDPE) groundsheet, will be used to contain the fuel and prevent fuel spills onto the ground.</li> <li>▪ Dedicated petroleum storage areas will provide spill containment and facilitate clean up through measures such as: <ul style="list-style-type: none"> <li>▫ Maximum separation from environmentally sensitive features;</li> <li>▫ Clear identification of the materials present;</li> <li>▫ Access restricted to authorized vehicles and employees;</li> <li>▫ Impervious bermed storage areas; and</li> <li>▫ Dedicated spill response equipment.</li> </ul> </li> <li>▪ Only aboveground storage tanks will be used for bulk petroleum products, equipped with overfill protection and spill containment through perimeter dykes or secondary containment. Containment areas will be dewatered after snowmelt or rainfall events, with containment water disposed of.</li> <li>▪ Bulk waste oil will be stored in aboveground tanks with secondary containment and weatherproof covers.</li> </ul>

Potential Accident or Malfunction	Description	Project Mitigation Measures
		<p><i>Regular Inspections</i></p> <ul style="list-style-type: none"> <li>All petroleum storage containers and tank vehicles will be inspected daily for leaks and spillage. Damaged or leaking fuel storage containers will be promptly removed from site.</li> <li>All petroleum handling and storage areas will be kept clear of snow and materials to allow clear access and routine inspection and leak detection.</li> </ul> <p><b>Vehicle and Equipment-Specific Measures</b></p> <p><i>Maintenance</i></p> <ul style="list-style-type: none"> <li>Tank vehicles used to deliver or move fuel around the worksite will meet the requirements for highway tanks for the shipment of dangerous goods by road, as set out in Standard CSA B620-20: Highway Tanks and TC Portable Tanks for the Transportation of Dangerous Goods.</li> <li>Construction equipment and vehicles will be regularly maintained to minimize leaks.</li> </ul> <p><i>Emergency Kits</i></p> <ul style="list-style-type: none"> <li>Spill kits will be deployed to at risk areas within the Project Footprint and on vehicles/equipment, with further detail related to kit types and contents in the Project Spill Contingency Plan.</li> <li>Rest areas or respite areas along the road will include a maintenance area for spill management materials.</li> <li>Equipment in construction camps that presents risk of leaks or spill will be protected using appropriate methods (e.g., spill containment systems for oils, fuels and chemical storage and transfer areas, and spill containment systems under stationary equipment, such as generators, pumps and compressors).</li> <li>Materials required for spill containment and cleanup will be available at all sites where construction related activities occur.</li> <li>All vehicles hauling fuel will carry materials and equipment for emergency spill containment.</li> <li>Emergency spill kits will be available near fuel and hazardous materials handling locations (e.g., spill kits at temporary laydown areas and/or temporary construction camps) and in vehicles.</li> </ul> <p><i>Safe Refuelling Practices</i></p> <ul style="list-style-type: none"> <li>All fuel transfers will follow safety procedures to prevent leaks and drips. Spill response kits will be available on all vehicles used to transport fuel.</li> <li>Vehicles will generally be fuelled at the camps. If fuelling is required at the site, it will not be permitted within 50 m of a permanent waterbody, unless a spill prevention plan is in place.</li> <li>Fuel barrels will be securely fastened to the vehicle during transport and if possible, during refuelling operations.</li> <li>Fuelling procedures will be posted where fuelling occurs.</li> <li>All fuel transfers must occur with an absorbent pad and/or oil catcher placed underneath to catch spills. After fuelling – all drips will be caught on the absorbent pad, and a rag or an absorbent pad will be used to wipe off the nozzle.</li> </ul> <p><b>Emergency and Risk Response</b></p> <p><i>Immediate Containment</i></p> <ul style="list-style-type: none"> <li>In the event of a spill onto the ground surface from equipment, (e.g., broken hydraulic hose), the affected area will be cleaned up and contaminated soil will be disposed of at a licenced soil recycling facility. If contaminated soil is stored on-site, it will be kept in a designated storage area to prevent secondary contamination.</li> <li>Accidental spills will be cleaned up immediately using the procedures outlined in Section 5.3 of Appendix E (Spill Prevention and Emergency Response).</li> </ul> <p><i>Cleanup Procedures</i></p> <ul style="list-style-type: none"> <li>As petroleum storage and equipment servicing areas are taken out of service, remediation will be conducted, including the appropriate disposal of contaminated material.</li> <li>Contaminated soils resulting from releases will be remediated or disposed of.</li> <li>Used absorbent pads will be discarded in a designated spill disposal container.</li> <li>All empty containers from equipment refuelling and servicing will be removed to a licenced disposal site.</li> <li>Diesel and gasoline will be stored and handled in accordance with the National Fire Code of Canada (2020), 1990 (Ontario), the <i>Energy Act</i>, 1990 (Ontario), and <i>Fire Marshals Act</i>, 1990 (Ontario).</li> <li>Hazardous substances will be stored in compounds located at laydown areas and in accordance with applicable federal and provincial regulations.</li> <li>Quantities of hazardous substances will be limited to amounts required for efficient use and maintenance of machinery during construction and operation with the largest quantities associated with storage of diesel fuel and gasoline.</li> <li>Employees, contractors, and subcontractors will be trained and equipped to provide initial response for spills of fuel or other hazardous materials.</li> <li>Employees, contractors, and subcontractors will be trained in the appropriate communication and notification protocols for a spill of fuel or other hazardous materials.</li> <li>Hydraulic or petroleum-fuelled equipment used adjacent to water will have a drip pan, secondary containment, or other preventative measure to prevent release to the water body.</li> <li>Minimum 50 m setbacks will be applied around water bodies and sensitive areas before construction, for the storage of hazardous materials, and for designated re-fuelling and heavy equipment maintenance areas.</li> <li>Maintenance work will be confined to a designated location (whether on-site or off-site) with facilities to prevent spillage from entering the ground or drainage system.</li> <li>In the unlikely event of a hazardous materials spill, actions will be initiated to protect human safety as a priority. Once the area is deemed to be safe, measures will be taken to control the source of the spilled material and contain the spill to prevent further migration.</li> </ul>

Potential Accident or Malfunction	Description	Project Mitigation Measures
Fires and Explosions	<p>An accidental fire or explosion originating from Project motor vehicle or equipment malfunction (e.g., sparking, overheating) leading to change in the terrestrial, aquatic and/or atmospheric environment.</p> <p>An accidental fire or explosion originating from Project vehicle or equipment collision (e.g., fuel tank explosion) leading to change in the terrestrial, aquatic and atmospheric environment.</p> <p>An accidental fire or explosion originating from human error during blasting (e.g., misfire, accidental detonation) leading to change in the terrestrial, aquatic and atmospheric environment.</p> <p>An accidental fire or explosion causing injury to people leading to change in human health (social) environment.</p> <p>An accidental fire or explosion originating from human error at camp with kitchen activity / cooking leading to change in the terrestrial, aquatic and atmospheric environment.</p>	<p><b>General Mitigation Measures</b></p> <p><i>Compliance with Regulations</i></p> <ul style="list-style-type: none"> <li>Petroleum products will be transported in accordance with the federal <i>Transportation of Dangerous Goods Act</i> and <i>Ontario Dangerous Goods Transportation Act</i>.</li> <li>All petroleum handling and storage will comply with Ontario <i>Technical Standards and Safety Act</i>.</li> <li>Blasting will be conducted in accordance with Ontario Provincial Standard Specification (OPSS) 120 General Specification for the Use of Explosive.</li> </ul> <p><i>Safety Awareness</i></p> <ul style="list-style-type: none"> <li>Signage indicating current fire hazard potential, updated regularly, will be posted along all roads at adequate intervals during construction and operations.</li> </ul> <p><i>Proper Labeling and Storage</i></p> <ul style="list-style-type: none"> <li>Petroleum products will be labeled as to their contents and stored and handled within designated areas.</li> <li>Fuelling from unregistered tanks will not be permitted.</li> <li>Combustible materials such as fuel and/or other hazardous substances will be stored in a safe manner.</li> </ul> <p><i>Explosives Management</i></p> <ul style="list-style-type: none"> <li>Explosives will be stored in secured containers meeting provincial and federal standards. Storage areas will be close to blasting sites to minimize transportation distance.</li> <li>A Construction Blasting Management Plan for the Project will be prepared prior to initiation of blasting activities which will outline best practices and regulatory requirements for the safe transportation, handling, storage and use of explosives.</li> <li>Storage facilities for explosives at quarry sites will meet the federal standards and licensing requirements as specified in the <i>Explosives Act</i> as well as provincial standards and licensing requirements as specified in the Ontario Regulation 213/91 – Construction Projects, under the <i>Occupational Health and Safety Act</i>.</li> </ul> <p><b>Vehicle and Equipment – Specific Measures</b></p> <p><i>Fuel Transportation and Storage</i></p> <ul style="list-style-type: none"> <li>Fuel (diesel and gasoline) will be transported by tanker trucks, drums, or approved containers. Fuel storage areas will have barricaded double-walled aboveground storage tanks (ASTs) or other suitable tanks with secondary containment measures.</li> <li>Bulk waste oil will be stored in aboveground oil tanks, which will have secondary containment and a weatherproof cover.</li> </ul> <p><i>Fire Suppression and Safety Equipment</i></p> <ul style="list-style-type: none"> <li>All petroleum product storage sites and mobile transportation units will, at all times, be equipped with appropriate categories of equipment and volumes of fire suppression products.</li> <li>Petroleum storage tanks will be grounded, and the dispensing tank will be attached with a bonding cable to an appropriate location on the receiving tank prior to commencing fuelling to prevent buildup of static electricity which can potentially lead to fires.</li> <li>At this time no PFAS-containing foams for fire suppression are proposed due to health and environmental concerns of these chemicals' persistence in the environment and potential links to various health problems.</li> </ul> <p><i>Construction and Installation</i></p> <ul style="list-style-type: none"> <li>Construction, installation, and removal of petroleum storage tank systems will occur under the supervision of a registered licenced petroleum technician.</li> </ul> <p><i>Collision Prevention</i></p> <ul style="list-style-type: none"> <li>Concrete barriers will be installed around all petroleum storage tanks to prevent collisions.</li> </ul> <p><b>Operational Measures – Fuelling and Handling</b></p> <ul style="list-style-type: none"> <li>There will be no smoking and no open flames at the petroleum storage area at any time.</li> <li>All combustible engines will be shutdown during fuelling.</li> </ul> <p><b>Burning Management Measures</b></p> <ul style="list-style-type: none"> <li>Where piling and burning is prescribed for vegetation, it will be conducted on-site in accordance with the Ontario <i>Forest Fires Prevention Act</i> and <i>Regulation 207/96 Outdoor Fires</i> under this Act.</li> <li>Safety precautions will be taken to keep the fire under control when burning of cleared tress. Burn piles will be monitored, to ensure that subsequent fire hazards are not present. Upon completion of the burn, burn piles will be completely extinguished.</li> <li>No fires will be started without first taking sufficient precautions to ensure that the fire can be kept under control.</li> <li>Burning will be avoided during the dry season (April 1 to October 31).</li> <li>Active fires will be monitored by staff for the duration of the burning activities. No fires will be left unattended.</li> <li>Burning or smoldering matter will not be placed where it may cause a fire to spread.</li> <li>Flammable materials such as leaves, brush, dead limbs, and fallen trees will be cleared from the area regularly.</li> </ul>

Potential Accident or Malfunction	Description	Project Mitigation Measures
		<p><b>Emergency and Risk Response</b></p> <ul style="list-style-type: none"> <li>▪ In the event that a wildfire occurs an evacuation and emergency preparedness plan will be implemented prior to commencing construction.</li> <li>▪ The CEMP and OEMP will include plans for Health and Safety Management, Petrochemical Storage and Handling, and Spill Prevention and Emergency Response Management.</li> <li>▪ Emergency response management will incorporate an evacuation protocol that includes: <ul style="list-style-type: none"> <li>▫ Emergency escape routes, assembly points and shelter areas.</li> <li>▫ Emergency procedures to manage incidents including the use of fire suppression.</li> <li>▫ Emergency response training for facility employees.</li> <li>▫ Contact information for facility emergency responders and other individuals who must be notified of an emergency situation.</li> <li>▫ Contact information for external emergency responders.</li> <li>▫ Protocol to handle petrochemical spills and emergency situations.</li> <li>▫ Facility data and contact information for external emergency responders and support agencies such as ambulance and police.</li> <li>▫ Information about chemical hazards and safety data sheets.</li> <li>▫ Site map (or site plan).</li> <li>▫ Maintain on-site fire suppression equipment when working under high fire hazards.</li> <li>▫ Establish procedures to close the road due to proximity to wildfires.</li> <li>▫ Establish a blast zone and safety zone for worker safety.</li> <li>▫ Obtain all necessary permits and comply with the laws, rules and regulations of Ontario and federal agencies in connection with the use, transportation, storage, and safe handling of all explosives, the federal Explosives Act and the Explosives Regulations.</li> <li>▫ Post warning signs and have recognizable audible warning signals for blast activities.</li> <li>▫ Use of blast mats, soil, or other similar material to cover blast area to prevent fly rock.</li> <li>▫ Contractor and blaster will inspect blast areas before construction crews enter to continue work.</li> </ul> </li> </ul>
Structural Failure	<p>Failure of a bridge, culvert or road surface due leading to sediment discharge or deposit of deleterious substance (e.g., aggregate, sediment) to a watercourse, leading to a change in the aquatic or terrestrial environment.</p> <p>Failure of a bridge, culvert or road surface due creating unsafe driving conditions and potential human injury, leading to a change in the human health (social) environment.</p>	<p><b>General Mitigation Measures – Structural Integrity</b></p> <p><i>Construction Phase Mitigation Measures</i></p> <ul style="list-style-type: none"> <li>▪ All culverts and bridges have been designed with hydraulic openings that exceed the minimum MTO Drainage Design Standards to mitigate the risk of potential failures due to extreme weather events, such as flooding.</li> <li>▪ Engineering controls and monitoring program will be developed to verify that peat consolidation is occurring as predicted, including risk management strategies to reduce potential for fill to cause shear stress.</li> <li>▪ Qualified environmental inspector(s) will be appointed to guide implementation, monitor, and report on the effectiveness of the construction procedures and mitigation measures.</li> <li>▪ An Erosion and Sediment Control Plan will be developed and implemented within the CEMP and OEMP.</li> <li>▪ Post-Construction Measures – Operations and Maintenance.</li> <li>▪ An Inspection, Maintenance and Repair/Rehabilitation of Road and Supportive Infrastructure Plan will be developed within the CEMP and OEMP and it will include: <ul style="list-style-type: none"> <li>▫ Procedures for periodic inspection and regular maintenance of the Project including the road ROW, road surface, drainage systems, culverts, and bridges.</li> <li>▫ Procedures for documentation and records for maintenance activities to provide knowledge and information pertaining to maintenance operations, contract controls, expenditures and possible liability action.</li> <li>▫ Maintenance Quality Standards in general conformance with MTO Maintenance Manual (2003). This may include but not limited to: vegetation control, groundcover restoration, road patrol, debris and waste management, inspection/maintenance of rest area and maintenance areas, inspection/maintenance of ditches, culverts, bridges, structure cleaning, removal of obstructions to water flow at bridges/culverts, additional erosion control measures, monitoring/removing ice jamming at bridges, signs, fencing, guide rails, winter maintenance level of service, operations and resources.</li> <li>▫ Annual inspections in accordance with MTO Maintenance Quality Standards for culverts and bridges will be conducted to identify any defects and action plan, where applicable and where a structural integrity or safety issue is suspected.</li> <li>▫ Project components will be inspected and repaired as required following a flooding event or vehicle collision.</li> <li>▫ Operational monitoring and maintenance procedures will be implemented for waterbody crossing structures.</li> <li>▫ Road patrols and inspection of the road will occur with their frequency being adjusted to address specific situations such as during spring break-up, during and after heavy wind or rain events, and emergencies (e.g., accidents, fires, stranded motorists, wildlife mortality from collision with vehicles).</li> <li>▫ Erosion and sediment control measures will be inspected by the Proponent’s Contractor on a regular basis and after every major rain or spring melt event; and necessary repairs will be made immediately after deficiencies are identified. Inspections will be confirmed by the Proponents, including opportunities for Indigenous Monitors to participate in the monitoring program.</li> <li>▫ Design the Project in accordance with codes and standards described in Section 12.2 and detailed in Section 4.2.1.</li> </ul> </li> </ul>

Potential Accident or Malfunction	Description	Project Mitigation Measures
		<ul style="list-style-type: none"> <li>▪ Implement erosion protection and sediment control as required.</li> <li>▪ Emergency Response Plans for the project construction and operations will include response procedures for a flooding event, sediment discharge, or a hazardous material spill.</li> </ul>
Vehicle or Equipment Accidents	<p>Vehicle accident while transporting construction staff to and from Project site causing injury to people, leading to a change in the human health (social) environment.</p> <p>Vehicle accident between Project operational / maintenance vehicles and a public road user causing injuries to people, leading to a change in the human health (social) environment.</p>	<p><b>Construction Phase Mitigation Measures</b></p> <ul style="list-style-type: none"> <li>▪ A construction Traffic Management Plan will be developed as a part of the CEMP to manage traffic and mitigate impacts created by construction traffic.</li> </ul> <p><b>Post-Construction Measures – Operations and Maintenance</b></p> <ul style="list-style-type: none"> <li>▪ During the operations phase, safety incidents relating to the Project will be recorded and monitored such as traffic collisions, emergency transport calls, and damages/faults to the road that can result in injury or death. These records will be used to identify hazards and implement mitigation measures (e.g., placing more road signs, reducing speed limits, increasing safety patrols along roads, adding barriers to deter wildlife from crossing or using the road). Traffic data (number of vehicles on the road, number of traffic incidents, number of vehicle-wildlife interactions, locations of traffic incidents, etc.) will be collected to determine the efficacy of mitigation measures after being implemented.</li> <li>▪ Road patrols and inspection of the road will occur with their frequency being adjusted to address specific situations such as during spring break-up, during and after heavy wind or rain events, and emergencies (e.g., accidents, fires, stranded motorists, wildlife mortality from collision with vehicles).</li> <li>▪ Project managers and site supervisors will review hazard and incident reports daily and update Safety Management Plans to prevent the incident from re-occurring or reduce the likelihood reoccurrence (e.g., updating personal protective equipment requirements).</li> <li>▪ Signage or reduced speed limits will be considered for implementation over bridges to reduce the risk of vehicle accidents.</li> </ul> <p><b>Emergency Preparedness and Response</b></p> <ul style="list-style-type: none"> <li>▪ Health and Safety Management Plan will be developed for both construction and operation phases in compliance with the Ontario <i>Occupational Health and Safety Act</i> and will include identification of potential hazards and associated risks, training requirements, incident reporting procedures and frequency, and incident and emergency management plans (e.g., for floods, fires, or medical events).</li> </ul> <p><b>Supportive Measures</b></p> <ul style="list-style-type: none"> <li>▪ Partnerships with Kiikenomaga Kikenjigewen Employment &amp; Training Services (KKETs) will be established to offer driver's education and licensing to community members interested in improving safety and overcoming related barriers.</li> <li>▪ The CEMP and OEMP will include a Health and Safety Management Plan and training program.</li> <li>▪ Drivers accessing the construction site will be trained in safe driving procedures and will be required to adhere to strict driving safety precautions (e.g., defensive driving training, speed limit adherence) as per the Construction Traffic Management Plan that will be developed and implemented for the Project.</li> <li>▪ The transport and handling of any hazardous materials will comply with the <i>Transportation of Dangerous Goods Act</i>.</li> <li>▪ All machinery and heavy equipment will be regularly maintained according to manufacturer and mechanic recommendations.</li> </ul>

### 23.4.1.1 Management Planning and Mitigation

Management plans will be developed for the construction and operation phases of the Project. These plans will include several mitigation measures that will be applicable to all accident and malfunction scenarios. Construction and operational phases of the Project will rely on the Construction Environmental Management Plan (CEMP) and the Operation Environmental Management Plan (OEMP) to congregate applicable environmental and safety legislation by providing criteria, standard protocols, and mitigation measures to eliminate, reduce, and/or off-set potential adverse effects identified in the EAR/IS. Management planning also aims to increase overall readiness and organizational leadership which can enhance emergency response and/or reduce the severity of environmental effects arising from accident and malfunction events. Further details regarding the framework related to the CEMP and OEMP are provided in Section 4.6 – Project Description; Management Plans, and Appendix E. Specific subcomponents of the CEMP or OEMP that have relevance to mitigation for potential accident and malfunction scenarios, are summarized as follows:

- **Waste Management Plan:** Requirements and mitigation for safe storage, handling, transfer and disposal of hazardous and non-hazardous wastes.
- **Spill Prevention and Emergency Response Management Plan & Petrochemical Storage and Handling Plan:** Requirements and mitigation for spill prevention, readiness, response and contingency planning for spill risks, including containment, inspections, training, notifications, roles and responsibilities and remediation protocols.
- **Blasting Management Plan:** Requirements and mitigation for the safe use, storage, manufacture, transportation, detonation of explosives for drill and blast activities.
- **Health and Safety Management Plan:** Requirements and mitigation for worker safety and compliance with regulatory and legislative compliance.
- **Traffic Management Plan:** Requirements and mitigation for traffic flow and road safety to reduce risks or project effects related to vehicle and/or equipment accidents.
- **Community Readiness Plan:** Requirements and mitigation for community related risks related to indirect project effects that arise from accidents and malfunctions.



Indigenous community members will have an active role in developing and implementing environmental management plans.



An Environment Committee will be established to facilitate communication and engagement during construction and operations of the Project. Committee members will include Webequie First Nation Elders and Knowledge Holders, other First Nations with interest in participating, and appropriate project representatives, to: facilitate communication and engagement during construction and operations of the Project; facilitate use of Indigenous Knowledge in project activities; facilitate evaluation of land use information; and facilitate development of appropriate monitoring programs, protocols and management plans for potential Project related accidents and malfunctions.

## 23.4.2 Spills of Hazardous Material

Construction activities require the use of vehicles or equipment, temporary camps and Project related use, storage, handling and dispensing of hazardous materials. The Project will utilize four (4) temporary construction camps with laydown areas for the storage of equipment, fuel (e.g., gas and diesel), sewage, hazardous waste and other supplies potentially containing hazardous substances (e.g., hydraulic fluid, solvents, grease, oily rags, paint etc.). Vehicle and equipment operation also presents spill potential due to the risk of accidents (e.g., collisions) and malfunctions (e.g., tank or line rupture, leaks), where an unintended release of fuel or other hazardous substances could occur. In addition, the Project will require the use of a temporary aggregate pits, with storage area(s) for explosives. During construction, the Project will require storage and/or use of explosives, which contain contaminants that may harm the environment if release or runoff is not controlled (e.g., ammonium nitrate prill, ammonium nitrate – fuel oil [ANFO]). Due to the requirement for on-site storage, management, handling, dispensing or disposal activities to manage hazardous materials, potential for uncontrolled release can occur.

During operations, the Project will also require vehicles and equipment to maintain the roadway and/or permanent support infrastructure related to storage, handling and dispensing of hazardous materials. Vehicle and equipment operation presents spill potential due to the risk of accidents (e.g., collisions) and malfunctions (e.g., tank or line rupture, leaks), where an unintended release of fuel or other hazardous substances could occur. The presence of public road users during operations phase adds additional risk of spills resulting from collisions. In addition, a permanent Maintenance and Storage Facility (MSF) will be created, which is anticipated to involve the storage of equipment or vehicles, fuel, waste and other supplies containing hazardous substances (e.g., hydraulic fluid, solvents, grease, oily rags, paint etc.). Lastly, the Project will require the use of a permanent aggregate pit (ARA-4), with storage area and/or use of explosives. Both the MSF and permanent aggregate pit represent active components of the development where spills of hazardous material are likely to occur.

For road development, taking into consideration mitigation actions (**Table 23-5**) the worst-case and/or most likely spill scenario for the Project, during both construction and operations, is anticipated to arise from either a fuel delivery truck or on-site fuel storage vessel / fuel transfer, which could result in a release of 1,000 gallons of fuel or more, depending on the size of fuel truck selected for the Project. Project activities related to the use of vehicle or equipment during construction or operational phases will require fuel storage and fuel dispensing. Accidental release of fuel could occur due to human error during refuelling or fuel handling during deliveries. Collision or rollover accidents involving vehicles and/or equipment (including fuel delivery trucks), could also result in an accidental release. Similarly, a malfunction related to storage vessels (e.g., valve failure) could result in an uncontrolled release of fuel.

## 23.4.3 Fires and Explosions

Construction activities could generate a fire or explosion. For example, through motor vehicle or equipment collision / malfunction, equipment sparks, hot works, human error during blasting, and/or human error in the temporary camp (e.g., cooking). The impact of an accidental collision can result in engine or fuel tank ignition, which could then result in an explosion or fire at the collision scene. Furthermore, the use of equipment, machinery and/or motor vehicles also carries risk related to unintended sparking or overheating, leading to an ignition source due to component malfunction. Other examples of hot works and related equipment for activities such as welding, grinding, cutting of materials present risk of fire or explosion. Human error during blasting (e.g., misfired round, improper clean of spilled ANFO, overloaded hole) could lead to a fire and/or uncontrolled explosion. Uncontrolled explosions create unintended risks related to fly rock, air pressure change, noise / vibration, and atmospheric emissions.



Lastly, a fire could be caused by the temporary camp kitchen infrastructure. Camp kitchens typically use cooking oil, and if ignited, can create conditions for a structural fire.

During operations and maintenance activities, the use of equipment, machinery and/or motor vehicles will be required to maintain the roadway. Collisions or malfunctions between Project vehicles and/or equipment is a risk that can generate a fire, similar to construction activities. During operations and maintenance, Project vehicles and/or machinery may also encounter public road users creating an additional risk for fire and explosions. Fire can ignite during collision impact due to the presence of flammable material (e.g., engine fire, or tank ignition). Additionally, maintenance repairs to road infrastructure could also require hot works activities, although it would occur at a reduced activity level compared to construction, where sparks and ignition could ignite fire. Lastly, due to the use of a permanent aggregate pit to support roadway maintenance, aggregate operations will involve the use of blasting. The same type of risk and release mechanisms for fire and explosion in association with blasting operations will be present during operations phase of the Project, although at a lesser degree due to reduced activity/need for blasting during operations.

A fire or explosion is considered unlikely to occur during construction and/or operations and maintenance phases for the Project. For a road development, taking into consideration mitigation actions (**Table 23-5**) the worst-case and/or most likely fire or explosion scenario for the Project, during both construction and operations, is anticipated to be characterized by injury or loss of life to humans and/or wildfire that extends beyond the Regional Study Area (RSA). Due to extensive mitigation and design features (e.g., speed limits, ROW vegetation clearing, fire emergency response, and safety protocols) it is very likely to prevent the spread of Project related fire to the surrounding terrestrial environment.

## 23.4.4 Structural Failure

During construction, bridges, culverts and road surfacing will be implemented and used by construction staff. These new components could result in unintended structural failures. Climatic circumstances such as flooding, erosion, and frost/thaw cycles can result in failure of key road structures and/or erosion control mitigation structures used during construction. The structural failure can result in deposition of sediment and/or aggregate in aquatic and/or terrestrial environments. Sudden failure could also result in unsafe driving conditions leading to loss of motor vehicle or equipment control.

Similarly, structural failure could also arise during operations phase of the roadway. During this time, road users will include the public and driving speed will be 80 km/hr, which increases the potential for human injury or loss of life related to structural failure of the roadway components. Structural failure of bridges, culverts and/or road surfacing can also result in unintended release of sediment and aggregate to aquatic and/or terrestrial environments.

Taking into consideration mitigation actions (**Table 23-5**) the worst-case and/or most likely structural failure scenario for the Project, during both construction and operations, is anticipated to be characterized by changes in the aquatic environment. It is anticipated that a severe (worst-case) event that results in sediment or aggregate deposit to an aquatic environment could result in 1.5 tons of aggregate deposited to an aquatic environment, or a 5-day duration of elevated downstream turbidity conditions.



## 23.4.5 Vehicle or Equipment Accidents

Activities to undertake construction of the Project will require the use of vehicles and/or equipment to construct works and transport staff to and from the Project site, and/or within the Project site. During operations, Project owned vehicles and/or equipment will be used to maintain works and will also be used to and from the Project site, and/or within the Project site. Operation of vehicles and equipment during construction of the Project have potential to be involved in accidents such as: collision between two or more Project owned vehicles or equipment on the Project site; collision of a Project vehicle with a private vehicle while on route to the Project site; Project vehicle or equipment collisions with large wildlife; and Project vehicle or equipment collisions due to loss of control due to adverse driving conditions, poor road-vehicle traction, or distracted driving. These accidents are also possible to occur duration operation of the Project; however, during this phase, the WSR is intended to be a publicly accessible roadway for public road users, whereas during construction access will be restricted for public safety. Project vehicles during operations phase may experience accidents with public road users. During operations, it is anticipated road user volume will be less than 500 vehicles per day, with approximately 25% being heavy trucks.

For a road development, taking into consideration mitigation actions (**Table 23-5**) the worst-case and/or most likely vehicle or equipment accident scenario for the Project, during both construction and operations, is anticipated to be characterized by changes in social environment. It is anticipated the most severe event would result in an injury or loss of life to humans. Vehicle and equipment accidents are also anticipated to create spills of hazardous materials and are discussed separately under **Section 23.4.1**.

## 23.5 Identification of Potential Effects and Pathways

Accident or malfunction events are characterized by their potential to cause an adverse effect on a VC, after taking into consideration features of safety, design and/or mitigation. **Section 23.4.1** presents a summary of Project mitigations for each accident or malfunction scenario, in addition to the components, activities and mechanism of release that define each scenario. The interaction between a potential accident or malfunction with the identified VCs can result in adverse effects and are summarized in **Table 23-6**. These interactions are then further discussed in **Sections 23.5.1 to 23.5.4** with descriptive narrative to define how the event may interact with a VC, thereby defining the relevant pathways of potential adverse effects arising from accidents and malfunction scenarios. The majority of Project effects are predicted to occur within construction or operational phases of the Project, unless otherwise described. Discussion related to an event's magnitude and duration are presented in alignment with the criteria and definitions presented for each VC in Sections 6 to 20. In cases where a VC may not have a relevant interaction to identify for an accident or malfunction scenario, it may be due to rationale such as but not limited to, effectiveness of Project design or mitigation measures to eliminate an effect to a VC, circumstances of that would prevent effect migration in-directly to another VC, or the unlikelihood of measurable effects.



**Table 23-6: Accidents and Malfunctions – Potential Interactions with Valued Components**

Potential Accident or Malfunction	Geology, Terrain and Soils	Surface Water Resources	Groundwater Resources	Atmospheric Environment	Fish and Fish Habitat	Vegetation and Wetlands	Wildlife and Wildlife Habitat	Species at Risk	Social and Economic Environment	Human Health	Visual Environment	Aboriginal and Treaty Rights and Interests	Cultural Heritage Resources
Spills of Hazardous Materials	✓	✓	–	–	✓	✓	✓	✓	–	✓	–	✓	✓
Fires and Explosions	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Structural Failure	–	✓	–	–	✓	✓	–	✓	–	✓	–	✓	–
Vehicle or equipment accidents	–	–	–	–	–	–	✓	✓	✓	✓	–	–	–

**Notes:**

- ✓ indicates a potential interaction
- indicates no interaction

## 23.5.1 Accidental Spills of Hazardous Materials

Hazardous materials that would be used during Project construction and/or operations activities is anticipated to include several classes or categories such as: gasoline, diesel, propane, sewage, hydraulic fluids, lubricating oils and greases, explosives, contaminated snow or soil, batteries, paints, etc. A spill has the potential to penetrate terrestrial, aquatic and human environments, with potential to affect several VCs. Small spills that are less than 100 L are considered manageable through the implementation or application of existing mitigation actions; however, a worst-case scenario of a fuel spill that exceeds 1,000 L arising from an accident or malfunction involving a fuel delivery truck or another form of storage. The following subsections explain how fuel may interact with relevant VCs after taking into consideration mitigation commitments, which could vary depending on the area where a spill occurs (land vs aquatic), the volume that is spilled, rate of dispersion or the speed of emergency response. Fuel spill risks will be reduced via the standard mitigation commitments outlined in **Table 23-5** and includes actions such as fuel storage; drip trays; containment; design specifications; routine inspections; fuel handling and storage/transfer setbacks; emergency response supplies; or training for material handlers and emergency response.

### 23.5.1.1 Interaction with Valued Components

**Geology, Terrain and Soils** – Potential direct effects to soil and terrain could result from spills to land. A worst-case spill accident of 1,000 L would include measurable changes at the upper limit or slightly in excess of baseline conditions and could relate to changes in soil properties (e.g., concentration of contaminants or pH) or quantity (e.g., loss of soil due to remediation / disposal, soil stability). Mitigation measures to prevent and reduce potential risks of a major unplanned spill event, and contingency measures for appropriate response if the event occurs, will be implemented. Rapid recovery of materials using spill kits and absorbents can effectively manage spilled material that is pooled on land. Removal of contaminated soil for remediation or off-site disposal can effectively resolve changes in soil properties



and prevent the migration of contaminants to other VCs. Soil confirmation testing can verify effective clean up. Aggregate or other clean fill can be used to replace lost terrain or soil volume. Exceedances of applicable soil guidelines could lead to a potential effect that is considered a moderate consequence; however, the rapid detection and emergency response will limit the extent and duration of the effects. Equipment and fuel spill risks could only occur within the Project Footprint and it is unlikely that contaminant migration beyond the Project Footprint (or immediate incident location) would occur due to the ability to address the event before measurable effects could be detected beyond the immediate event location. In addition, fuel storage and handling will be setback from the ordinary high watermark limiting the likelihood of a major spill to soils, terrain and geology in the vicinity of waterbodies. The potential event, if it were to occur, is predicted to be unlikely, with the magnitude being minor to moderate and duration being short-term, where effects are considered reversible via remediation, making the overall consequences low to medium. Due to the spill scenario being most likely contained and reversible, with fuel setback requirements from the ordinary high watermark, no measurable effect to groundwater via soil infiltration is anticipated.

**Surface Water Resources** – Potential in-direct effects to surface water resources could result from a land-based spill that migrates to a waterbody or riparian zone. A worst-case fuel spill of 1,000 L with indirect waterbody interaction could derive measurable changes in water and/or sediment quality and would be demonstrated by way of water quality objectives being exceeded following the fuel spill. Mitigation measures to prevent or reduce a potential major spill event and contingency measures for appropriate rapid response in the event of a spill will be implemented. On-site spill kits can effectively manage and adsorb spilled material to land before it reaches a waterbody. Should land-based spill response fail, response techniques can be deployed to effectively absorb visible fuel on the water surface. A large spill to a waterbody, or in the vicinity of a waterbody, is considered unlikely due to Project commitments to manage, store, transfer or dispense fuel in areas that are not near waterbodies and are setback from the ordinary high watermark. The potential event if it were to occur is predicted to be unlikely, with the magnitude being moderate to high within a localized area, and the duration being short-term, making the overall consequences low to medium.

**Fish and Fish Habitat** – Potential in-direct effects to fish and fish habitat could result from land-based spills that migrates to a waterbody or riparian zone. A worst-case fuel spill of 1,000 L would include likely measurable changes in water quality and could potentially exceed water quality objectives which can affect fish mortality, growth or survival. Mitigation measures to prevent and reduce potential risks of accidental spills and contingency measures for appropriate rapid response in the event of a major spill will be implemented. On-site spill kits can effectively manage and adsorb spilled material that is visible on the water surface. A major spill to land, with surface water interaction, is considered unlikely due to Project commitments to manage, store, transfer or dispense fuel in areas that are not near waterbodies or are setback from the ordinary high watermark. The potential event if it were to occur is predicted to be unlikely, with the magnitude being moderate to high within a localized area and the duration being short-term, making the overall consequences low to medium.

**Vegetation and Wetlands** – Potential direct effects to vegetation and wetlands could result from spills to land. A worst-case spill of 1,000 L could include measurable changes to vegetation or wetland communities and/or species composition due to clean up efforts that require vegetation and soil removal. Following the application of replacement soils, native vegetation is anticipated to naturally regenerate the area. Equipment or vessels containing large fuel volumes (e.g., fuel truck, fuel tank) will operate or be located within areas of the built roadway areas or laydowns, which is cleared of vegetation. In-direct contaminant uptake by vegetation and wetlands due to a spill is not anticipated to have a measurable effect due to rapid emergency response actions to remediate soil. It is not considered likely that a major



fuel spill will migrate beyond the immediate road, laydowns or ROW, which would maintain a localized effect. The potential event if it were to occur is predicted to be unlikely, with the magnitude being moderate to high within a localized area (particularly in the wetland scenario) and the duration being short-term, making the overall consequences low to medium.

**Wildlife and Wildlife Habitat** – Potential in-direct effects to wildlife and wildlife habitat could result from spills to land. A worst-case spill of 1,000 L could include measurable changes to wildlife habitat due to clean up efforts that require vegetation and soil removal. Furthermore, spilled fuel, if not addressed immediately, could allow for accidental wildlife interaction or increase risks with wildlife due to scent attraction. In alignment with the potential effects of a spill on the Vegetation and Wetlands VC, it is considered that spills from equipment or vessels containing 1,000 L would occur in areas with built roadway, laydowns or within the ROW, where wildlife habitat is anticipated to be cleared or discouraged for safer construction and highway operational conditions. The potential event if it were to occur is predicted to be unlikely, with the magnitude being minor to moderate and the duration being short-term, making the overall consequences low to medium.

**Species at Risk** – Potential in-direct effects to species at risk could result from a major land-based spill. In alignment with the potential effects noted for the aforementioned VCs, a worst-case event could include measurable changes to species at risk for similar risk factors. Specific mitigation measures will be implemented to increase employee or driver awareness of wildlife, while relying on-site investigations and procedures to allow for safe passage and/or relocation efforts to limit negative effects on species at risk. Factors such as low traffic volume and low driving speed limits are also likely to reduce measurable changes for species at risk. In addition, vegetation surveys are proposed prior to construction to identify and confirm sensitive vegetation and/or communities, with objective to reduce the potential for damage or measurable effects that could result from a major spill. The potential event if it were to occur is predicted to be unlikely, with the magnitude being minor to moderate and the duration being short-term, making the overall consequences low to medium.

**Aboriginal and Treaty Rights and Interest** – Potential in-direct effects to Aboriginal and Treaty Rights and Interests could result from spills to land. A worst-case spill of 1,000 L is not predicted to have a magnitude or duration of measurable change to biological VCs due to factors such as: spill response; clean up; and validation testing (monitoring) to verify that contaminants are not persisting in the environment. Indigenous and Treaty Rights related to hunting, fishing or gathering should not be changed by a major spill event to a degree greater than the existing Project predictions related to development. The Project will also implement community readiness planning to communicate and discuss spill events and effects on members of Webequie First Nation, allowing for dialogue and meaningful mitigation related to managing perceptions, well-being or practices related to Treaty Rights and cultural activities. Potential effects from a major spill are anticipated to be limited due to the efficacy of Project mitigation commitments that reduce long-term or high magnitude changes in the measurable health for biological and physical VCs. The potential event if it were to occur is predicted to be unlikely, with the magnitude being minor and the duration being short-term, making the overall consequences minor.

**Cultural Heritage Resources** – Potential indirect effects to the cultural heritage resources could result from spills to land. A worst-case spill of 1,000 L is not predicted to have a magnitude or duration of measurable change on indicators for this VC due to mitigation measures (e.g., cultural heritage evaluation report, heritage impact assessment, Stage 4 archaeological assessments) that would be implemented before construction and would be informed by Webequie Elders and Knowledge Holders and provincial guidelines. As a result, within the Project Footprint and ROW, cultural heritage resources should not be changed by a major spill event to a degree greater than the existing Project predictions related to



development. The cultural landscape could incur minor changes related to water-based travel routes or water-based harvesting areas, where surface water is noted as a possible vector for spill migration should land-based emergency response not be effective. The Project will also implement community readiness planning (refer to Appendix N of the EAR/IS) to communicate and discuss spill events and effects on members of Webequie First Nation, allowing for dialogue and meaningful mitigation related to managing perceptions, well-being or practices related to cultural landscape use. Potential effects from a major spill are anticipated to be limited due to the efficacy of Project mitigation commitments that reduce long-term or high magnitude changes on cultural heritage resources. The potential event if it were to occur is predicted to be unlikely, with the magnitude being minor and the duration being short-term, making the overall consequences minor.

## 23.5.2 Fires and Explosions

The potential risk of fires and explosions during construction and/or operations of the Project is anticipated due to accidents and malfunctions arising from activities such as: equipment use (e.g., portable heaters), machinery and vehicle use (e.g., sparking, overheating), hot works activities (e.g., welding, cutting of steel), ignition sources within buildings (e.g., kitchens), use of explosives for blasting, and/or other human errors that lead to ignition. A worst-case fire or explosion is characterized by human injury, loss of life and/or wildfire that extends beyond the Project Footprint and carries the potential to affect several VCs. An accidental fire or explosion associated with Project activities may have a measurable change on vegetation communities, organic soils, wildlife, riparian and/or aquatic environment, human health, Aboriginal and Treaty Rights and Interests and/or the cultural heritage resources.

The following section explains how fire may interact with relevant VCs, which could vary depending on the area, the ignition source, available fuel loadings for combustion, environmental conditions (e.g., drought, summer) and the speed of emergency fire response. Fire risks will be significantly reduced through emergency response planning and standard mitigation commitments outlined in **Table 23-5** that include actions such as ignition and fuel source management (e.g., safe fuel storage), setbacks from vegetation, procedures for hot works, blasting, kitchen safety; fire response suppression equipment, and/or training for emergency response. The following subsections describe the potential effects of fire and explosions to Project VCs.

### 23.5.2.1 Interaction with Valued Components

**Geology, Terrain and Soils** – Potential direct effects on the geology, terrain, and soil conditions could occur from wildfire. A worst-case occurrence of a wildfire that extends beyond the Project Footprint would primarily affect the organic soil horizon, which is characterized by nutrient rich decomposing materials (e.g., woody debris and leaves), leading to potential measurable changes in overall soil quality. Through combustion of organic soil constituents, the chemical properties and nutrient cycling of soil can be altered. Furthermore, the loss of surface soil (in conjunction with vegetation and forest litter loss) can reduce soil stability and is known to reduce insulative protection of discontinuous permafrost that is found in the Project Footprint. When the protective topsoil and vegetation are removed, permafrost although not known to be present in the LSA, may be exposed and become susceptible to thawing, potentially leading to soil erosion and changes in the terrain. Additionally, emergency response measures, such as the application of water to suppress fires, may also generate conditions for soil erosion. The extent of fire related impacts on soils and potential permafrost depends on the fire location, the intensity of the fire, the sensitivity of the affected terrain and soils, and the presence of permafrost in the impacted area. The risk of potential fires is greatly reduced through effective and safe design of the Project, such as a maintained



ROW to reduce woody debris from fuelling an ignition source. In addition, emergency response planning, training, fire suppression equipment, and strategic placement of camps and maintenance yards, will be implemented to lower the likelihood of a major fire event from spreading beyond the Project Footprint; however, localized erosion and changes in soil quality could compromise local soil conditions, soil formation processes, and soil functionality, as well as the physical and thermal integrity of permafrost. In the event of an explosion, localized change could be observed at the event site due to pressure or force movement of soils. Although most effects are considered reversible, recovery could represent the medium term and magnitude that is moderate, due to the potential effects on permafrost, if present. An uncontrolled wildfire event is considered unlikely due to Project mitigation and design features; however, effects on geology, terrain, and soils could be considered a moderate consequence in the event's occurrence due to the duration of recovery.

**Surface Water Resources** – Potential direct and in-direct effects to surface water resources are possible due to an unplanned wildfire or explosion occurrence. A worst-case wildfire event could include likely measurable changes in water and/or sediment quality and would be demonstrated through fluctuation of key physical or chemical parameters. Chemical or physical parameters of water can change due to ash deposition and bank instability (erosion) to waterbodies following vegetation die back. In addition, an explosion can eject coarse or particulate matter into the air, which may deposit in surface waterbodies. In both instances, it is unlikely that changes would exceed the upper limits of characteristic baseline conditions for surface water resources. Fire suppression activities may also require emergency water use to extinguish a fire, thereby affecting water quantity, which would be most observable for small waterbodies. The severity of these effects is dependent on the size and intensity of the fire, and the size or capacity of the receiving body to naturally attenuate fire related changes. Mitigation measures to prevent and reduce potential risks of a worst-case wildfire scenario focuses on fire prevention measures and rapid response. On-site fire suppression equipment and vegetation management in the ROW, can effectively prevent the spread of a fire beyond the Project Footprint. Due to Project design and mitigation commitments, the magnitude of effect is predicted to be low, with the duration of effect predicted within the short-term. The likelihood of a wildfire or explosion event is considered unlikely due to safe design and fire prevention or response planning. If the event were to occur, minor consequences are anticipated due to fast recovery in surface water conditions relative to baseline characterization.

**Atmospheric Environment** – Potential direct effects to atmospheric resources are possible due to wildfire and explosion emissions. Fires and explosions release particulate matter (smoke), carbon dioxide, and, in cases of incomplete combustion, carbon monoxide, nitrogen oxides, and sulfur dioxide. An explosion can create localized force movement of soil and particulates into the atmosphere. These particulates and/or pollutants can lead to temporary exceedances of ambient air quality standards. Additionally, changes in air quality can in-directly impact wildlife, native vegetation, wildlife habitat use in areas downwind of the fire or explosion. In the event of a fire or explosion, the prompt implementation of emergency response plans is expected to minimize both the duration, size, intensity and spreading of the event, which therefore would reduce the volume of pollutants released into the atmosphere. If a worst-case fire or explosion event were to occur, the magnitude of effect to the atmospheric environment would be minor to moderate and short-term in duration. Due to the Project design, the ROW itself is a primary prevention control for widespread fire or explosions, consequently the event is considered unlikely; however, the consequence on air quality if the event occurred would be considered moderate due to migration of smoke particulate emissions beyond the incident area.

**Fish and Fish Habitat** – Potential direct and in-direct effects to fish and fish habitat are possible due to wildfire and/or explosion effects on surface water potentially leading to habitat alteration via the chemical or physical water parameters, fish injury or mortality. While the likelihood of water chemistry is not anticipated to baseline conditions, wildfire can temporarily alter the physical parameters of shallow fish



bearing lakes, rivers or ponds, leading to localized fish or fish egg mortality. For example, shallow bodies of water may experience a temporary increase in water temperature. Additionally, fish can be affected by wildfire due to changes in water quantity. Fire response activities may require the use of water sources within or near the Project Footprint, which could result in water drawdown. In extreme fire events, due to fire suppression or loss of vegetation, banks can become less stable and vulnerable to erosion, leading to sedimentation and changes in water turbidity. In addition, explosions associated with Project activities could generate vibrations and pressure changes that may harm fish, particularly if such events occurred near waterbodies. These effects are expected to remain localized within the Project Footprint. The severity of these effects would vary based on the size of the waterbody and the location, size or intensity of fire or explosion. If the worst-case event were to occur, the magnitude of change for fish and fish habitat is predicted to be low, with short-term duration. It is unlikely that a fire or explosion associated with the Project would occur due to strong prevention planning, safe design features, and ROW area that would limit the spread of a wildfire. The consequence of wildfire or explosion on fish and fish habitat would be considered minor due to the localization of measurable effects, and the unlikelihood that effects would permanently alter fish populations or fishery sustainability.

**Vegetation and Wetlands** – Fires or explosions can have direct effects on vegetation and wetlands leading to changes in species diversity, composition, and potentially affecting locally rare vegetation communities. While wildfires are a natural and integral component of boreal forest ecosystems in the study area, an increase in wildfire activity driven by human disturbance could disrupt natural balance of ecosystems. The extent of potential effect depends on the size and spread of the fire, which could result in the partial or complete loss of vegetation in affected areas. Factors such as wind, forest structure and composition, tree age, precipitation, topography, woody debris fuel loading, and moisture levels can influence the severity of fire events. A worst cast fire event is considered unlikely due to strong prevention planning, safe design features, and ROW area that would greatly reduce the risk of wildfire spread; however, if a fire event did occur and spread outside of the Project Footprint, the consequence is anticipated to be moderate. If the geographic extent of a fire were to occur beyond the Project Footprint, the reversibility would be limited to the rate of natural regeneration. As a result, the magnitude of change for vegetation and wetlands following an accidental fire event is predicted to be low, with medium term duration. The consequence, magnitude and duration for an explosion is not predicted to have measurable change on vegetation and wetlands.

**Wildlife and Wildlife Habitat** – Fires or explosions can have direct and in-direct effects on wildlife and wildlife habitat. As previously mentioned, wildfires are a natural feature of boreal forests, which can affect loss of vegetation, in-directly affecting wildlife through habitat loss or changes in the habitat structure and function. In addition, fire can also cause direct effects to wildlife through harm, injury or mortality. Wildfires from anthropogenic sources represent an unnatural event frequency that may lead to increases in habitat loss, habitat fragmentation or negative population changes, especially when effects spread beyond the Project Footprint to nearby forests. Fires can negatively impact breeding, nesting, rearing, and habitat availability for birds and other wildlife. In the event of an unplanned explosion, temporarily displacement of wildlife due to noise, light, pressure, vibration and/or odor can occur; however, most species are anticipated to return to the area once conditions stabilize.

While an accidental fire event may result in localized adverse effects to wildlife and wildlife habitat, it is unlikely to cause population decline due to habitat loss or mortality. Most wildlife species are expected to relocate temporarily to adjacent habitats, and habitat loss is anticipated to be reversible over the medium term. In addition, some species may benefit from post-fire landscape dynamics. Wetland songbirds are known to occupy new post-fire habitat, while moose or other ungulates may benefit from regenerating burnt areas due woody browse availability. Boreal forest wildlife species have evolved with natural landscape fire dynamics.



A worst case fire or explosion event is considered unlikely due to strong prevention planning, safe design features, and ROW area that would limit the spread of a wildfire or the occurrence of an unplanned explosion; however, if a fire or explosion event occurred, the consequence is anticipated to be moderate due to likely observable effects in vegetation and sound outside of the Project Footprint. The geographic extent of effect is likely to occur beyond the Project Footprint and reversibility of habitat effects would be limited to the rate of natural regeneration, while sound effects would be temporary. The magnitude of change for wildlife and wildlife habitat following an accidental fire is predicted to be low, with a medium-term duration.

**Species at Risk** – Potential in-direct and direct effects to species at risk could result from a worst-case unplanned wildfire or explosion event. In alignment with the potential effects noted for the aforementioned VCs, a worst-case event could include measurable changes to species at risk for similar risk factors. Habitat alteration and destruction, direct wildlife mortality, and disruptions to the sustained presence of wildlife populations or communities, particularly when caused by human disturbances. Fires can adversely affect breeding, nesting, rearing, and habitat availability for birds, bats and other wildlife. In the event of an unplanned explosion, temporarily displacement of wildlife due to noise, light, pressure, vibration and/or odor can occur; however, most species are anticipated to return to the area once conditions stabilize.

Caribou tend to avoid large-scale disturbances and prefer non-burned areas for habitat use (Skatter et al., 2017). Similarly, large wildfires are a primary disturbance to wolverine habitat (Jokinen et al., 2019). The impact of wildfires on bats is debated; some studies suggest increased bat activity in burned areas (Burns et al., 2019), while others report reduced activity (Jung et al., 2020). Bird species at risk, including upland forest birds, wetland songbirds, shorebirds, nightjars, and raptors, may experience habitat loss due to forest clearing following a wildfire. In the event of an explosion or blast, birds are expected to be temporarily displaced but likely to return after conditions normalize. Lake sturgeon, on the other hand, are not anticipated to be affected by fires or explosions, as there is limited evidence linking wildfires to significant impacts on lake habitats (McCullough et al., 2019).

While wildfires may have detrimental effects, it is unlikely that habitat loss or mortality will result in significant population level impacts. In addition, effects from an explosion are anticipated to be temporary and limited to the duration that sound alters habitat use. Most species are expected to relocate to adjacent areas temporarily. Although vegetation clearing causes habitat loss for many species at risk, habitat recovery is anticipated over time. Specific mitigation measures will be implemented to for emergency response and emergency prevention. The potential event if it were to occur is predicted to be unlikely; however, if the event did occur, the consequences would be moderate due to potential effects being observed beyond the Project Footprint. The magnitude of effect for species at risk would be low due to unanticipated population changes, and the duration being short-term.

**Social and Economic Environment and Visual Environment** – Potential in-direct effects to the social and economic could result from a worst-case wildfire or explosion event caused by the Project. The extent of in-direct effects depends on the fire location, the intensity, and the sensitivity of area where burning occurs. During construction, personnel and equipment will be available for initial first response to a fire. In addition, the temporary camps will include a medical station and evacuation procedures where a fire or explosion results in injury or treatment for personnel. Comparatively, during operations, a fire event that extends beyond the Project Footprint could result in a temporary road closure delaying community or local business' road use for transportation of goods and services. During operations, community services may also experience pressure during fire response, where local services for gasoline or airstrip landing could be required if Project resources are exhausted. In extreme cases, a forest fire could result in loss or damage to buildings and critical infrastructure. A forest fire and/or loss of forests could have a negative



effect on the landscape viewed or other tourism values, in addition to land use related to recreation or other non-traditional activities. While fire is generally deemed to generate negative alteration of social and economic interest related to the forest, post-fire forest succession can create opportunities for the Indigenous economy related to the harvest of damaged trees, harvest of wildlife attracted to browse, and/or gathering for mushrooms or berries. The potential event if it were to occur is predicted to be unlikely due to effective design and safety measures; however, if the event did occur, the consequences would be minor due to the social and economic resources being sustained by other nearby areas. The magnitude of effect for the social and economic environment would be low due to unanticipated change in activity for the social and economic environment relative to baseline conditions, and the duration of effect would be short-term.

**Human Health** – Fires or explosions can have direct and in-direct effects on human health if a worst-case event were to occur. Human health could be adversely affected if a fire were to spread from the Project Footprint into surrounding forests. Under specific meteorological conditions, the rapid spread of a fire in proximity to the community of Webequie could create health risks. Smoke from a fire would reduce air quality due to the release particulate matter, carbon monoxide, and volatile organic compounds, into the atmosphere. Poor air quality can affect vulnerable persons (e.g., children, elderly, immune-compromised) with existing health issues such respiratory conditions. An unplanned explosion is unlikely to cause physical harm to those outside of the acute event radius; however, it may cause psychological harm due to fear or curiosity regarding sound travel from the incident. Within the immediate event radius of an unplanned explosion, it is possible that injuries or fatality are possible.

In the event of a Project caused fire that encroaches on the community of Webequie, community members may need to be temporarily displaced. Comprehensive emergency response plans for both the Project and the community of Webequie will be developed to ensure alignment for evacuation, communications and emergency response. In response to an unplanned explosion, humans may be restricted from accessing the event area until safety risks are cleared. These plans will also include communication protocols with local authorities to facilitate coordinated and efficient responses, minimizing risks to human health and safety. In release to fire response and/or evacuation, negative effects on mental health could be observed. Stress and trauma are commonly associated with community evacuations due to property loss, financial hardship, uncertainly related to food and accommodations, and/or uncertainly related to returning home. Emergency response planning will consider planning for mental health risks.

A high magnitude effect for human health includes injury or loss of life, which can occur due to uncontrolled fire and/or explosions; however, it is very improbable that humans will experience decline in health from fire or explosion due to emergency planning, safety protocols, emergency interventions and safety precautions that will be implemented before a measurable health impact occurs. The potential effects on human health from fires or explosions is characterized as a low magnitude of effect due to the short-term duration of effects relative to baseline conditions. Due to safe design and emergency response planning, the likelihood of the event is anticipated to be unlikely; however, if a fire event were to occur beyond the Project Footprint, the size of fire is most likely to cause moderate consequences for human health due to temporary change in local air quality.

**Aboriginal and Treaty Rights and Interests** – The communities of Webequie First Nation, Marten Falls First Nation, and Weenusk First Nation have contributed Indigenous Knowledge and Land and Resource Use information to inform the EAR/IS. Wildfires can cause potential in-direct effects on Aboriginal and Treaty Rights and Interests, particularly if a fire were to spread from the Project Footprint into surrounding forests, leading to the loss of traditional land and resources. Wildfires can alter landscapes and habitats, disrupting access to hunting, foraging, and fishing activities, which are essential to the exercise



Treaty Rights. Additionally, wildfires may disrupt seasonal cycles, which Indigenous communities heavily rely upon for their traditional practices. An unplanned explosion is likely to cause temporary disruption to wildlife and fish due to sound, pressure and vibration in the immediate incident area. Safety planning and emergency response procedures are designed and intended to reduce the risk of wildfire spread or unplanned explosions from affecting areas and VCs beyond the Project Footprint, which reduces the prediction of effects for Treaty Rights and interests.

The potential effect of a worst-case fire or explosion event on Aboriginal and Treaty Rights and Interests is characterized as a low magnitude, as the temporary loss or alternation of lands and resources following a fire is not predicted to have a measurable change in bio-physical VCs within the Study Areas relative to baseline conditions. While the event is considered unlikely due to safe design safety and emergency response readiness, the consequence is considered moderate due to a worst-case fire being likely to extend outside the Project Footprint into undisturbed forest land. The duration of recovery for the fire-affected area is considered reversible in the medium term.

**Cultural Heritage Resources** – A potential wildfire poses potential risk to sacred sites and cultural landscapes due to the potential for damage or alteration. Prior to Project initiation, all cultural sites and landscapes will be identified, protected or mitigated for to prevent Project effects within the Project Footprint, making explosions very unlikely to alter the cultural heritage resources. Potential effects on cultural use and heritage resources related to fire will depend on the location, scale, and severity of the event. The WSR is situated in a landscape of great significance to Webequie First Nation, with hunting, trapping, fishing, and habitation areas that are deeply tied to specific family groups and clans, as outlined in Section 20. A fire that spreads to forested areas outside of the Project Footprint could alter land use in the affected regions; however, mitigation measures are in place to limit the risk of fire spreading and increasing readiness for fire suppression response. Culturally sensitive values outside of the Project Footprint can be identified by First Nation communities with MNR fire response teams, within community or Project emergency response planning, and can be further protected through fire smart landscaping. The loss of a cultural value represents a moderate magnitude effect due to most community members being likely affected, with a duration that may be permanent due to low reversibility for some cultural sites. Uncontrolled wildfire could damage a cultural site with moderate consequences; however, the likelihood of such an event occurring is low when considering proactive mitigation planning and implementation.

### 23.5.3 Structural Failure

During Project construction and/or operations, structural failure of project components can occur due to events beyond the control of standards that dictate structural safety. Such worst-case events may include failure of a bridge or culvert resulted from a flooding event, flooding or failure of sediment control measures leading to sediment discharge or heaving or shifting due to environmental factors. A worst-case event is a release of 1.5 tonnes of aggregate or building material to a receiving environment. These accidental or malfunction events may lead to compromised structural safety of Project components and/or deposits of deleterious substances to the receiving environment.

Structural failures will be greatly reduced via design compliance with provincial road and/or engineering safety standards outlined in **Table 23-5**. The Project design, as described in Section 4 (Project Description), has incorporated the CSA S6, TAC Geometric Design Standards (e.g., design standards of 1:25, 1:50, or 1:100-year flood events based on various sizes of watercourse crossings) that are expected to mitigate potential effects of flooding. The Project utilizes 1 in 100-year flow, which adds conservative margins for added structural safety related to flooding and/or climate change. Contingency measures to reduce the



effect of accidental building material release due to failure of sediment control measures include mitigative actions to use clean rock / granular material, and filter fabric during construction. Contingency measures to address structural failure because of a traffic accident associated with the Project include those in the Emergency Response Plan. The following subsections explain how structural failure accidents may interact with relevant VCs after taking into consideration mitigation commitments. Project effects arising from structural failure incidents could vary depending on the area where the event occurs (land vs aquatic), and whether deleterious substances are released to the receiving environment.

### 23.5.3.1 Interaction with Valued Components

**Surface Water Resources** – Potential direct effects to surface water resources could result from structural failures due to the addition of deleterious substances to water. Severe environmental events that generate sudden flooding can washout a culvert, bridge footings or compromise the efficacy of sediment control features. The Project utilizes aggregate to develop the surface and subsurface of the highway, which means that the forces of floodwater can migrate the aggregate or other material to the aquatic environment, resulting in measurable changes in water and/or sediment quality. Following a structural failure event, water quality objectives may be exceeded (e.g., Turbidity, Total Suspended Solids). Sediment quality may also reflect changes in the physical composition because of aggregate or other fine material that would deposit via natural settling processes. Mitigation commitments such as the use of clean rock, granular material, and filter fabric available on-site are intended to reduce long-term changes in water and sediment quality. Engineering design standards take into consideration the likely risk for major flooding events that could lead to a structural failure; however, if the event were to occur, effects would be low in magnitude with short-term effects that would likely resolve quickly via natural settling. While minor erosion and maintenance work is anticipated for bridges, culverts and erosion control structure, the risk for a major structural failure that results in a large deposit of a deleterious substance to water is considered unlikely with the current design standards for the Project. If a major structural failure were to occur, measurable changes to surface water and sediment would be moderate due to the migration of Total Suspended Particulates (TSP) and turbidity outside of the immediate localized event area.

**Fish and Fish Habitat** – Potential in-direct effects to fish and fish habitat could result from structural failures due to the addition of deleterious substances to water. A structural failure event involving culvert, bridge footings or sediment control features is anticipated to cause measurable changes in surface water and sediment quality due to migration washout of aggregate or other material to the aquatic environment. As a result, fish and fish habitat may be temporally effected by these measurable changes in TSP and turbidity. Depending on the location of an event, and the volume of aggregate that is deposited, changes to spawning substrates could potentially occur in the immediate area of the event. Mitigation commitments such as safe design, erosion control, the use of clean rock, granular material, and filter fabric available on-site are intended to reduce long-term changes in water and sediment quality and is therefore also protective of fish and fish habitat. In alignment the accidental effects on surface water resources, if the event were to occur, effects would be low in magnitude with short-term effects that would likely resolve quickly via natural settling. The risk for a major structural failure that results in a large deposit of a deleterious substance to water is considered unlikely with the current design standards for the Project; however, if a major structural failure were to occur, measurable changes to surface water and sediment would be moderate due to the migration of TSP and turbidity outside of the immediate localized event area.



**Vegetation and Wetlands** – Potential direct effects to vegetation and wetlands could result from structural failures due to release of aggregate or other building materials being deposited to vegetated wetland areas within the Project Footprint or ROW. The Project design will clear the ROW of vegetation limiting effects to this VC from a failure event; however, the design is also dependent on vegetation for land or soil stability (e.g., grasses, small order shrubs). Deposit of aggregate or other building material may limit vegetation growth or alter growth in the immediate area of the failure event if it is not cleaned up or remediated. While severity is dependent on the location of an event, and the volume of material that is deposited, release of material following a structural failure to terrestrial areas is anticipated to be temporary and reversible via standard clean up or remediation efforts. In addition, natural forces to migrate aggregate or building materials beyond the Project Footprint or ROW is considered unlikely, and most vegetation will already be cleared as part of the Project design. Adherence to engineering design standards and mitigation commitments related to reducing the chances or severity of events that cause structural failure are intended to proactively reduce impacts associated with a failure event such as erosion and deposit of aggregate or building materials to the receiving environment. If the event were to occur, the magnitude of change is predicted to be low and short-term in duration. Structural failure impacts on vegetation and wetlands are therefore considered unlikely; and due to clean up and remediation practices, the event consequence is considered minor.

**Species at Risk** – Potential in-direct effects to species at risk could result from structural failure that results in interactions with either the terrestrial or aquatic environment. In alignment with the potential effects noted for the fish and fish habitat and vegetation and wetland VCs, a worst-case event could include measurable changes to species at risk for similar risk factors as discussed in prior subsections. Project effects, likelihood of impacts and net effects related to species at risk due to the outcome of structural failures includes deposit of aggregate or building materials to terrestrial or aquatic ecosystems. Project engineering standards for the design of bridges and culverts are protective and developed to withstand the mostly likely risk of structure failure, which is flooring and erosion events. If the event were to occur, the magnitude of change is predicted to be low and short-term in duration. While an event is considered unlikely due to Project mitigation and safe design features, should an event occur, mitigation commitments related to the use of clean granular aggregate or the ability to perform clean up or remediation on deposits to land, allow for the consequences to be minor in nature, with the majority of likely effects being localized and quickly reversible.

**Human Health** – Potential direct effects to human health could result from structural failure that results in a sudden road safety issue. A structural failure of a bridge or culvert for drivable areas of the Project, could result in an unforeseen hazard for both project personnel or private road users. Unforeseen structural failure could create an unstable driving surface, contributing to loss of vehicle control and injuries to the driver and/or passengers. The structural engineering design, low speed limit and highway maintenance monitoring, in addition to many other mitigation commitments, are anticipated to greatly reduce structural failure risks to human health, making the event unlikely; however, if the event were to occur, the magnitude of effect is predicted to be low and short-term in duration. Should a failure event occur, consequences are anticipated to be moderate due to the potential for medical care. Further detail related to human health arising from vehicle or equipment accidents are described in **Section 23.5.4.1**.



## 23.5.4 Vehicle or Equipment Accidents

Vehicle or equipment accidents during Project construction and/or operations are anticipated to include a variety of accidents involving single or multi vehicle and/or equipment collisions, resulting from factors that could arise from human error, adverse driving conditions, mechanical failure, sudden wildlife encounters and/or distracted driving. During operations, additional Project accident potential is presented due to the presence of public road users.

Standard mitigation commitments are outlined in **Table 23-5** and includes safety actions related to: safe design features of the Project; speed limits; dust control; signage and warnings; restricted public access during; emergency response planning; safety training; and/or on-site first aid response for Project injuries. The Project is designed to minimize accidents and adhere to safe design practices. Design and operational features such as guardrails, line of sight visibility, sloping, and a low driving speed of 80 km/hr are anticipated to reduce the severity of vehicle and/or equipment accidents. In addition, the Traffic Management Plan and Spill Prevention and Emergency Response Plan will also mitigate the risk of driving accidents and enhance accident preparedness. The Project will also rely on environmental training, defensive driving, and environmental safety procedures related to wildlife. Procedures such as low driving speed during construction, radio call outs to alert Project personnel to wildlife in the Project site and suspending vehicle or equipment operation to allow for safe wildlife passage can contribute to reduced accident potential involving wildlife.

The worst-case and/or most likely vehicle or equipment accident scenario for the Project, during both construction and operations, is predicted to be characterized by changes related to injury or loss of life. The following subsections explain how human injuries or loss of life due to vehicle or equipment accidents interact with the relevant social or biological VCs, which could vary depending on the severity of event impact to a human after taking into consideration mitigation commitments.

### 23.5.4.1 Interaction with Valued Components

**Wildlife and Wildlife Habitat** – Potential direct effects to wildlife and wildlife habitat and could result from vehicle or equipment collisions that involve wildlife intercepting the road. The worst-case scenario from vehicle or equipment accidents is the injury or loss of life to humans, and such accidents may be attributed to sudden wildlife encounters. In a human injury or fatality accident, it is most likely that large mammal species such as bear, moose or caribou would be involved. In this event, it is likely that wildlife injury or mortality is also possible. Accidents involving wildlife may also generate scent attractant for carnivorous scavenger species at the roadside area leading to further accident potential.

Construction mitigations and safety procedures are anticipated to reduce the potential for a vehicle or equipment accident involving wildlife. Factors such as reduced operating speed, radio alerts for wildlife, the ability to stop for safe passage of wildlife greatly reduce the potential for wildlife and vehicle interactions. During operations, the roadway will include public road users and higher driving speed which can influence Project vehicle and/or equipment operator response when collision risk with wildlife arise; however, safety procedures, low driving speed, defensive driving, road maintenance, ROW maintenance are anticipated to lower these risks. Project effects related to wildlife due to injury and loss of life from vehicle or equipment collisions are assessed in the Wildlife and Wildlife Habitat assessment (Section 12). Due to low traffic volume and low mandated driving speed, it is considered that human injury or loss of life due to vehicle and equipment accidents with wildlife are unlikely. If the event were to occur, the consequences would be low for wildlife and short-term in duration when effects are considered at the population level relative to baseline. Predicted effects are not anticipated to persist beyond the localized area, making the consequence minor.



**Species at Risk** – Potential direct effects to species at risk could result from high-speed vehicle or equipment collisions that involve wildlife intercepting the roadway. In alignment with the potential effects noted for the wildlife and wildlife habitat VC, a worst-case event could include effects to species at risk for similar risk factors. Large wildlife species such as caribou are the main subjects of accident risk involving vehicle collisions. Due to low traffic volume and low mandated driving speeds during construction and operations, it is considered that Project owned vehicles and equipment accidents with wildlife are unlikely. If the event were to occur, the magnitude of effect would be low for species at risk and short-term in duration when effects are considered at the population level relative to baseline. Predicted effects are not anticipated to persist beyond the localized area, making the consequence minor.

**Social and Economic Environment** – Potential in-direct effects to the social and economic environment could result from Project owned vehicle or equipment accidents. The worst-case scenario from vehicle or equipment accidents is the injury or loss of life to humans, and such accidents have the potential to effect social and economic components of the environment. During construction, trained staff and supplies will be available for initial first response for site-based workers. In addition, the temporary camps will include a medical station for treatment of minor injuries. Off-set medical treatment may be required for serious injuries. Comparatively, during operations, an accident scene could result in a temporary road closure delaying community or local business' road use for transportation of goods and services. During operations, community services may also experience pressure, where local medical or emergency services (e.g., ambulance, police) or airstrip landing could be required for medical evacuation.

Due to the features of safe design and safety planning for both construction and operations, combined with the low predicted rate of driving fatality for comparable roads, it is considered that vehicle and equipment accidents that result in mortality will be unlikely to cause effects on the social and economic environment. If the event were to occur, the magnitude of effect would be low, with the duration being short-term. The consequences for the social and economic environment are anticipated to be moderate.

**Human Health** – Potential indirect effects to human health could result from Project owned vehicle or equipment accidents. The worst-case scenario from vehicle or equipment accidents is the injury or loss of life to humans, and such accidents have the potential to effect human health. In a human injury or fatality accident during construction, Project-based emergency response personnel would provide emergency care for minor injuries, and medivac would be used for major injuries and/or fatality event, which would avoid pressure on Webequie's medical services. During operations, accidents resulting in injury or fatality for either private road users or Project personnel, could result in increased pressure on community based medical or emergency services. In the event of a fatality event involving a community member, it is anticipated that community emotional well-being and mental health would be negatively affected due to the small population, family relations and/or closely-knit community dynamics.

Vehicle or equipment accidents that result in serious injury or fatality as a result of the Project would be considered a high magnitude of effect with permanent duration under the Human Health VC assessment. Conversely, the Project is not predicted to cause an increase above the current rates of occurrence for driving related injuries or fatality accidents on roads of a similar classification to the WSR. Due to the features of safe design and safety planning for both construction and operations, combined with the low predicted rate of driving injuries or fatalities for comparable roads, it is considered that vehicle and equipment accidents will not result in high magnitude or long-term changes for human health. The event was therefore scored as unlikely with moderate consequences.



## 23.6 Risk Summary and Evaluation

Potential accident and/or malfunction scenarios were based on the design and intended use of the Project. The plausible accident and/or malfunction scenarios and mitigations are described in **Table 23-5**. After considering the use of planned Project mitigations, potential effects to VCs were described for each accident or malfunction event and were assigned likelihood and consequence ratings, within the context of predicted magnitude and duration of effects. Identification of the accident or malfunction's interaction with VCs were informed by considering VC pathways of effects, the proposed Project design, engineering design and safety standards, mitigation commitments and professional opinion that is based on the performance of similar Projects. In addition, context and input from Indigenous Peoples was also included and is summarized in **Section 23.2.1**.

The Project will be designed, constructed and operated in a manner that prevents and reduces potential accident and/or malfunction risk for the safety and security of Indigenous communities and groups, the public, Project employees, property and the overall environment. The risk of an unplanned accident or malfunction event occurring during construction and operations is reduced through management plans and implementation of follow-up and monitoring programs, which are intended to reduce effects on VC after an event occurrence. In the unlikely event of an accident or malfunction during construction or operations, such unplanned events are effectively managed through implementing contingency measures from the CEMP and the OEMP, or through implementing the Project-specific and contractors' Emergency Response Plans.

Following construction, the WSR would become a public road, and the Government of Ontario would be responsible for road safety, enforcement, operations and stewardship, with the exception of the road within the Webequie First Nation reserve. In this context, the Government of Ontario holds the mandate for safe roads to the extent that due diligence can be managed through Ontario's intricate framework of legislation, regulations, policies, and enforcement tools. While public highways involve regulatory oversight, responsibilities and risks are shared between government and licenced drivers. It is expected that licenced drivers operate their vehicles safely, abide by rules of the road, have private insurance protection and exercise common sense to protect their self-interests. Absolute control to prevent all accidents and malfunctions for public use infrastructure is not always attainable due to factors that are outside the control of regulators or Project owners. Both drivers and regulators accept a certain level of risk within the aforesaid regulatory and enforcement framework and retain separate roles of accountability. The Project risk assessment for accident and malfunctions is therefore limited to, and substantiated on, precedented risk assignment that can be reasonably mitigated or managed through the Project.

A risk evaluation is presented in **Table 23-7** and provides a summary of findings from the accident or malfunction assessment, which is based on potential interactions with VCs and potential risk determination based on the matrix identified in **Table 23-3**. Adverse effects following accidents and malfunctions is possible; however, the implementation of proposed mitigation measures outlined in **Table 23-5** is aimed at the reduction of these risks for people and the environment. After taking into consideration Project design and safety measures and risk evaluation findings, there is low risk for accidents and malfunctions that could result in net effects on Project VCs.

**Table 23-7: Accident or Malfunction Event Likelihood, Consequence and Risk Evaluation Determination**

Value Component	Spills of Hazardous Material		Fires and Explosions		Structural Failure		Vehicle or Equipment Accidents	
	Likelihood / Consequence	Risk Evaluation	Likelihood / Consequence	Risk Evaluation	Likelihood / Consequence	Risk Evaluation	Likelihood / Consequence	Risk Evaluation
Geology, Terrain and Soils	Unlikely / Minor to Moderate	Low to Medium	Unlikely / Moderate	Medium	-	-	-	-
Surface Water Resources	Unlikely / Moderate to High	Low to Medium	Unlikely / Minor	Low	Unlikely / Moderate	Medium	-	-
Groundwater Resources	-	-	-	-	-	-	-	-
Atmospheric Environment	-	-	Unlikely / Minor Moderate	Low to Medium	-	-	-	-
Fish and Fish Habitat	Unlikely / Moderate to High	Low to Medium	Unlikely / Minor	Low	Unlikely / Moderate	Medium	-	-
Vegetation and Wetlands	Unlikely / Moderate to High	Low to Medium	Unlikely / Moderate	Medium	Unlikely / Minor	Low	-	-
Wildlife and Wildlife Habitat	Unlikely / Minor to Moderate	Low to Medium	Unlikely / Moderate	Medium	-	-	Unlikely / Minor	Low
Species at Risk	Unlikely / Minor to Moderate	Low to Medium	Unlikely / Moderate	Medium	Unlikely / Minor	Low	Unlikely / Minor	Low
Social and Economic Environment	-	-	Unlikely / Minor	Low	-	-	Unlikely / Moderate	Medium
Human Health	Unlikely / Minor	Low	Unlikely / Moderate	Medium	Unlikely / Moderate	Medium	Unlikely / Moderate	Medium
Visual Environment	-	-	Unlikely / Moderate	Medium	-	-	-	-
Aboriginal and Treaty Rights and Interests	Unlikely / Minor	Low	Unlikely / Moderate	Medium	-	-	-	-
Cultural Heritage Resources	Unlikely / Minor	Low	Unlikely / Moderate	Medium	-	-	-	-



## 23.7 References

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# AtkinsRéalis



**AtkinsRéalis**

191 The West Mall  
Toronto, ON M9C 5L6  
Canada  
416.252.5315

[atkinsrealis.com](http://atkinsrealis.com)

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