9.0 Accidents, malfunctions and unplanned events

9.1 Overview

Accidents, malfunctions, and unplanned events are events or conditions that are not planned as a part of routine Project activities during any Project phase. Even with the planning and application of mitigation, accidents, malfunctions, and unplanned events could occur during any phase of the Project. These could occur as a result of abnormal operating conditions, human error, equipment failure, and other possible causes. Many accidents, malfunctions, and unplanned events are either preventable or can be readily addressed by good planning, design, equipment selection, hazards analysis and corrective action, emergency response planning, and mitigation.

In this section, the potential accidents, malfunctions, and unplanned events that could occur during any phase of the Project and potentially result in significant adverse environmental effects are described, discussed, and assessed. The focus is on credible accidents that have a reasonable probability of occurrence, and for which the resulting residual environmental effects could be major without careful management.

It is noted that accidents, malfunctions, and unplanned events are evaluated individually, in isolation of each other, as the probability of a series of accidental events occurring in combination with each other is very minimal. These possible events, on their own, generally have a very low probability of occurrence and thus their environmental effects are of low likelihood. They have an even lower probability or likelihood of occurring together – thus their combination is not considered credible, nor of any measurable likelihood of occurrence.

Accidents, malfunctions, and unplanned event scenarios have been conservatively selected that represent higher consequence events that would also address the consequences of less likely or lower consequence scenarios. The accidents, malfunctions, and unplanned events that have been selected based on experience and professional judgment are as follows:

- Workplace accident/electrocution: workers or wildlife accidents, including electrocution, may occur in the vicinity of the Project during either construction or operation, and may result in harm, injury, or death;
- Failure of erosion protection and sediment control measures: may result in materials entering watercourses;
- Interconnection of aquifers: during foundation installation;

- Fire: consists of a fire in a Project component. The focus is on the consequence, and not the mechanism by which it occurs;
- Hazardous materials spill: spills of fuel, petroleum products, and/or other chemicals used on site or in Project components;
- Release of insulating gas;
- Vehicle accident: Project-related vehicle accidents that could occur on the road transportation network; and
- Tower collapse and/or power outage.

9.2 Effects analysis

9.2.1 Workplace accident/electrocution

9.2.1.1 Summary of effects

A workplace accident has the potential result in harm, injury, or death to workers, wildlife and potentially members of the public that come into contact with the Project components. The largest consequences are likely associated with electrocution, through human or animal contact with a live wire or electrical equipment. While unlikely, electrocution could also occur if an aircraft were to collide with live wires or if collision of farm equipment with towers resulted in contact with live wires. From a public safety perspective, the threat of electrocution would be of greatest concern during the operations phase if flooding or storm conditions damaged infrastructure and resulted in live wires coming in contact with the ground. Electrocution of humans and most wildlife (i.e., other than birds) from regular operation of the transmission line is not likely due to the height and grounding of the towers and transmission lines. Birds could be at risk of electrocution during normal operational conditions if they perch and connect two electrified line phases (i.e. two lines). Bird electrocutions are not anticipated due to the large spans between two electrified transmission line phases (even a very large bird could not stretch wide enough to touch two electrified parts simultaneously). Application of design standards and the nature of 230kv and larger electrical components also having large separation distances between phases will also reduce the risk of bird electrocutions at stations.

Electrocution during the construction phase of the Project is not likely as the conductors will be grounded as per grounding safe work procedures and will not be energized until the commissioning phase of construction. Any testing of electrical equipment required during commissioning would be conducted by qualified personnel under controlled conditions following Manitoba Hydro safe work procedures. Stations and other ground

level equipment will be fenced and secured. Manitoba Hydro has public information campaigns (company website and media commercials) regarding contact with power lines or downed power lines and safe vehicle exit to educate the public.

9.2.1.2 Mitigation

Protection measures incorporated into Project design are designed to detect an abnormal event or disturbance within the power system (e.g., a short circuit in a transformer) and disconnect the faulted piece of equipment within a fraction of a second. Protection equipment monitors for abnormal voltages and currents and if it determines that there is an abnormality, de-energizes the faulty equipment at the station by tripping power circuit breakers. In the event that protection equipment identifies a problem with the transmission line, instead of tripping all three phases, only one phase (i.e. the faulted phase) will be tripped and re-energized to allow the two other phases to continue to distribute electricity.

Maintenance and repair activities will be carried out by qualified personnel following corporate safe work procedures. All workers will be properly trained in practices to prevent workplace accidents including Workplace Hazardous Materials Information System (WHMIS), first aid, and other applicable training programs. These procedures are designed to prevent serious injury to staff and the general public as well as to minimize the occurrence of unplanned events and minimize any potential damage to the environment. Effects will be mitigated through compliance with health and safety legislation, safety by design, and implementation of environmental management measures aimed at protecting human health. Safety risks to workers will be reduced by complying with the requirements of various governing standards including the federal Canada Labour Code, the federal *Transportation of Dangerous Goods Act*, the *Manitoba Workplace Health and Safety Act* and all associated regulations. Adherence to public safety codes and regulations will help the Project to be carried out in a safe manner to protect workers and the public.

Where conditions create the potential for electrocution, the likelihood of electrocution would be reduced through public notification and communication. Manitoba Hydro maintains an emergency contact number that is available 24 hours per day, seven days per week that can be used to report downed lines. Public education information on what to do if downed wires are encountered is available on Manitoba Hydro's website.

9.2.1.3 Assessment Conclusion

With the application of, and compliance with, these acts, regulations, and standards, including the application of safety and security measures that are known to effectively

mitigate the potential environmental effects, the potential environmental effects of a worker accident during construction and operation and maintenance of the Project are assessed as minor.

9.2.2 Failure of erosion protection and sediment control

9.2.2.1 Summary of Effects

While erosion protection and sediment control measures will be implemented on stream crossings and other erosion-prone slopes, as required, along the transmission line route, a possibility exists for failure during construction due to extreme precipitation events. Such failures could result in the release of sediment-laden runoff to receiving watercourses and the surrounding area. The failure of an erosion and sediment control structure would most likely be restricted to the stretch of the watercourse immediately adjacent to the failure and the effect would be the covering of fish habitat and degradation of water quality.

9.2.2.1 Mitigation

During Project construction, an Erosion Protection and Sediment Control Framework will be provided to guide each contractor (where applicable) in preparing an Erosion Protection and Sediment Control Plan. The plan will be in accordance with Canadian professional erosion and sediment control standards and guidelines to manage construction activities that have the potential to cause soil erosion and result in sediment releases to the aquatic environment. These include Manitoba Government Infrastructure and Transportation's Standard Construction Specifications (Government of Manitoba 2017c) and Field Guide for Erosion and Sediment Control (Government of Alberta 2011). An overview of the sediment control plan includes the following:

- The objective of the plan will be to reduce adverse environmental effects of sediment releases on the aquatic environment in accordance with provincial and federal legislation and guidelines, and corporate environment policies and guidelines.
- Environmental protection measures will be prescribed for erosion protection and sediment control including winter construction, establishment of buffer zones, and avoidance of sensitive areas and use of bioengineering techniques.
- Environmental inspectors will conduct regular inspections of construction activities including erosion protection and sediment control measures.
- The plan will be reviewed after each construction season. Results from the

reviews will be used to adjust plan provisions to ensure continued effectiveness.

- The Erosion Protection and Sediment Control Management Plan will be completed and implemented prior to the commencement of construction for each applicable component of the Project.

Manitoba Hydro's typical erosion protection measures include the use of geotextile fabric on sensitive slopes, silt fences and settling ponds as required. In the event of a failure of an erosion protection and sediment control structure during construction, the contractor's plan for such an occurrence will be implemented. Their plan, which will have been approved by Manitoba Hydro, will include the requirement for immediate notification of Manitoba Hydro who will be involved in the incident response. The response to an erosion/sediment control failure will include details on responder safety, assessment of the extent of damage, repair of the structure, and clean-up of the disturbed area, taking reducing further environmental effects into consideration.

While failure of an erosion and sediment control measure could occur over the course of Project construction, routine monitoring and inspection will aid in the rapid identification of such failure. Implementation of remedial action as required will serve to limit environmental effects.

Failure of erosion and sediment control measures are not a concern during long-term operation, as erosion and sediment control would be controlled via vegetative cover and other permanent measures such as riprap, gabions, and other treatments.

9.2.2.1 Assessment Conclusion

Erosion protection and sediment control structure will be primarily associated with stream crossings along the final preferred route. The extent of a failure would be small and the effects on fish and fish habitat, vegetation, wildlife habitat, heritage resources, traditional land use and other land uses are expected to be of a low magnitude. The small-scale incident of the failure of an erosion protection and sediment control structure would, given the mitigation measures, result in an environmental effect that is not significant on the affected VCs.

Given the expected small scale of the erosion and sediment control structures anticipated to be used, the likelihood of a significant effect is low.

9.2.3 Interconnection of aquifers

9.2.3.1 Summary of Effects

Normal tower foundation installation procedures may intercept an aquifer but are not expected to negatively affect groundwater resources in terms of either flow or quality. However, in areas with artesian (free flowing) wells or springs there is a potential risk of interconnection via pre-construction (specifically geotechnical drilling) or construction (foundation installations) boreholes if they are not sealed properly or quickly enough. In this situation, groundwater from a more pressurized aquifer will intrude into a less pressurized one resulting in groundwater chemistry changes. Intrusion of saline water into a freshwater aquifer may result in the local loss of groundwater resources.

Fish and aquatic habitat could be affected by the release of fresh water from a flowing groundwater well through habitat destruction or alteration. Grassland, Forest, Wetland, and agriculture VCs could be affected, depending on the timing and volume of a groundwater release, through erosion, submergence of agricultural crops or habitat alteration or destruction in the case of vegetation and wetlands. Traditional use of the land could be affected by the loss of fish and vegetation components. These VCs could also be affected by spills of hazardous materials that could affect groundwater quality. Similarly, the land and resource VC could be affected by spills of hazardous materials that could affect groundwater users.

9.2.3.1 Mitigation

The following activities will be conducted to reduce or preclude aquifer interconnection (or surface discharge) during drilling and foundation installations in areas of documented springs and artesian groundwater conditions:

- A qualified driller with appropriate experience will be contracted to work in areas affected by artesian conditions.
- Emergency response plans for sealing/grouting and pumping will be implemented as required.
- Follow up inspections of installed foundations will be undertaken to monitor for excess moisture.

Water levels will be monitored during drilling and foundation installation and an emergency grouting kit will be kept on-site. If a freshwater groundwater release were to occur, emergency response plans for sealing/grouting and pumping will be

implemented. Any hazardous materials spills would be addressed as outlined in the spill response plan. An emergency spill response kit will be kept on site.

Surficial discharge may have high ecological and social importance, depending on the quality and quantity of the discharging or groundwater. The geographic extent of any effect would likely be localized. Freshwater groundwater discharges could directly or indirectly affect other local environments (e.g., wildlife habitat, vegetation and wetlands) and these effects could potentially persist beyond the effects to groundwater or surface water. Similarly, spills of hazardous materials could directly or indirectly affect local environments and could affect groundwater users and require remediation.

9.2.3.1 Assessment Conclusion

Through the identification of environmentally sensitive sites, adherence to drilling protocols, the application of appropriate hazardous spill response procedures and groundwater monitoring, the likelihood of an unintended discharge is considered low, and the residual effect is anticipated to be not significant.

9.2.4 Fire

9.2.4.1 Summary of Effects

A fire at the Project location could interact with the atmospheric environment (smoke emissions), infrastructure and services (stress on services) communities (potential safety risks to workers), land use and property (potential for substantive loss or damage to property of resources), and the aquatic, wildlife and natural vegetation environments (potential contamination with sediment-laden water used in extinguishing the fire).

A fire may arise from Project heavy equipment or from natural causes such as a lightning strike. In the unlikely event that a fire occurred, the immediate concern would be for human health and safety. Local air quality conditions may deteriorate through the duration of the fire. Personnel will take the necessary precautions to prevent fire hazards when at the work site and will keep the site free of all flammable waste. Manitoba Hydro will ensure that personnel are trained in the use of fire-extinguishing equipment. In the unlikely event of a fire, local emergency response will be able to reduce the severity and extent of damage.

The emissions from a fire would likely consist mainly of smoke (particulate matter) and CO_2 but could also include CO, NO_2, SO_2, and other products of incomplete combustion. A large fire could create particulate matter levels greater than the ambient air quality standard over distances of several kilometers, but such situations would be of short

duration, infrequent, and are not expected to occur because of planned mitigation and prevention measures.

9.2.4.1 Mitigation

The primary objective of Manitoba Hydro's Fire Prevention and Protection Program is to prevent the loss of life and property resulting from fires. The Manitoba Hydro Fire Manual provides general rules, guidelines and standards for fire prevention and protection. A hazard analysis is carried out as part of the job plan prepared for any work carried out by Manitoba Hydro. Risk of fire would be covered under the Job Plan that is completed before every job. Manitoba Hydro personnel will take precautions to prevent fire hazards at the work site and will keep the site free of flammable waste. Manitoba Hydro will also provide training to personnel in the use of fire-extinguishing equipment. Stations have fire alarms that notify Manitoba Hydro's System Control Centre and emergency responders and fire response equipment present.

There is no requirement for a burning permit under The Wildfires Act if the activity occurs from November 16 to March 31. If burning is required outside of those dates (i.e., between April 1 and November 15) a burning permit application will be made to the local Manitoba Sustainable Development office.

In the unlikely event of a fire, the System Control Center would be notified and would follow policies and procedures outlined in Manitoba Hydro's Corporate Emergency Management Program (CEMP) and Fire Manual. Local emergency response teams will also be contacted and their assistance will help to reduce the severity and extent of damage.

9.2.4.1 Assessment Conclusion

The residual effects of a fire will depend on its location, timing and severity. A small-scale fire that is brought under control and extinguished in a timely manner is not expected to have a significant effect on the environmental or socio-economic VCs. A larger fire has the potential to result in significant effects if it:

- diminishes the capacity of critical habitat to provide for the recovery or survival of species at risk or threatens the long-term viability of wildlife populations or plant species;
- results in the loss of agricultural land and operations such that the existing levels cannot continue;
- land use and traditional land use cannot continue as it has been; and

- the landscape changes from undisturbed to disturbed, and visual quality is an important planning objective.

If these conditions are met, a fire as a result of the Project could have a significant effect on wildlife and wildlife habitat, vegetation and wetlands, agriculture, land and resource use, traditional land and resource use, and visual quality. The likelihood of a large fire from the Project occurring is low, as Manitoba Hydro has not had such an event in it operational history. The potential residual environmental effects of a fire are therefore assessed as minor.

9.2.5 Hazardous materials spill

9.2.5.1 Summary of Effects

A hazardous material spill may interact with the atmospheric environment, groundwater resources, aquatic resources, wildlife, vegetation and agricultural land use. Hazardous materials could potentially be released into the air, soils, surface water or groundwater as a result of an accidental spill of solvents, fuels, herbicides etc., during construction or operation and maintenance activities. Project activities including marshaling yard development and use, the presence of material and equipment and vegetation and infrastructure maintenance have the potential to contaminate surface-water quality through the release of deleterious substances (e.g., fuel spills, releases of other potentially toxic materials).

The most common potential deleterious chemical substances entering watercourses from Project activities tend to be hydrocarbons and herbicides. In general, spilled hydrocarbons have the potential to affect freshwater organisms both directly (through physical and toxicological processes), and indirectly, (through habitat effects, nutrient-cycling disruptions, and alterations in community and trophic relationships). Direct biological effects to fish include damage to fish gill membranes, fish mortality, irregular behavior, and impaired reproduction from contact with spilled hydrocarbons while indirect effects include substantial decreases in invertebrate populations. Effects to fish habitat include the loss/alteration of riparian vegetation (resulting from post-spill macrophyte cutting and oil-induced effects on vegetation stands) and the loss/alteration of spawning habitat and food sources by sinking particulates clogging substrate interstitial spaces. Implementation of a detailed spill response plan and a well-designed EnvPP will ensure minimal potential effects to aquatic resources through accidental releases to watercourses.

Fuel and oil leakage or other debris from equipment staging may cause soil contamination, which can cause direct mortality of natural vegetation. If soil

contaminants flow to wetlands in the area, there may be direct mortality of wetland plants.

A spill of fuel, oil, lubricants, or other hazardous materials may occur during construction or operation and maintenance activities, through damage to vehicles, and leaks from Project components. Any spill is usually highly localized and easily cleaned up by on-site crews using standard equipment. Large quantities of hazardous materials will not be used by or stored as part of the Project, therefore a large spill is not considered to be a possibility.

9.2.5.1 Mitigation

The following activities will be conducted to reduce the potential for hazardous materials spills and potential effects should a spill occur:

- An Emergency Preparedness and Response Plan will be prepared by Manitoba Hydro and/or the Contractor, approved by the Construction Supervisor prior to construction or work activities and updated annually. The plan will cover major contingencies, provide a communication and notification protocol, and provide procedures for responses to emergencies.
- Emergency Preparedness and Response Plans and procedures will be communicated to all Project staff and a copy will be made available at the Project site.
- The Emergency Spill Response Coordinator will be notified of hazardous materials releases immediately in accordance with the Emergency Preparedness and Response Plan.
- Environmental accident reporting and handling and management of hazardous wastes resulting from emergencies will be in accordance with Provincial regulation.
- Spill response and clean up materials and equipment will be available at construction sites, marshaling yards, fuel storage facilities and standby locations.
- Spill response and clean up equipment will be capable of containing and recovering the largest release possible and be suitable for the site location.
- All heavy equipment and vehicles working on Project or work sites will carry spill kits for containment and clean-up of petroleum product leaks and spills.
- Spills of petroleum products or hazardous materials must be immediately reported, the site secured against further hazards including ignition, the spill contained, and clean up procedures implemented.

- Reasonable precautions will be taken to prevent fuel, lubricant, fluids or other products from being spilled during equipment operation, fueling and servicing.
- Spill response and clean up equipment will be available for responding to releases at a site location.
- A hazardous materials incident report form will be completed when reporting a spill.
- Project emergency response and evacuation procedures will be adhered to in the event of forest or worksite fires.

Construction equipment will be cleaned and maintained in good working condition, with visual inspections of equipment performed on a regular basis. Petroleum products such as gasoline, diesel fuel, and oil will be properly labeled in accordance with the appropriate legislation and regulations. Maintenance of equipment, as well as storage of hazardous materials, will be conducted in a designated and contained area(s). Servicing of equipment (e.g., oil changes and hydraulic repairs) will be completed off-site when possible. Vehicles and equipment will be equipped with spill containment and cleanup materials.

Personnel handling fuels and hazardous wastes will have WHMIS training and will be qualified to handle these materials in accordance with the manufacturer's instructions and applicable regulations. Hazardous waste and storage area(s) will be clearly marked and secured. Industrial waste will be reused or recycled on a priority basis. Where reuse or recycling opportunities are not available, industrial waste will be collected and disposed of at an approved facility. Garbage receptacles for solid non-hazardous wastes will be available. These wastes will be collected on a regular basis or as they are generated and will be disposed of at approved locations.

9.2.5.1 Assessment Conclusion

With these mitigation measures and emergency response procedures implemented, and because of the low likelihood of such events, the potential residual environmental effects of a hazardous material spill on groundwater resources, aquatic environment, and terrestrial environment during construction and operation and maintenance of the Project are assessed as minor.

9.2.6 Release of insulating gas

9.2.6.1 Summary of Effects

Insulating gas has been used by Manitoba Hydro since the 1980s, replacing the use of oils and air as interrupting and insulating mediums in high voltage equipment. Insulating gases are handled in their pure state or mixed for use in gas-insulated equipment (GIE). Sulphur hexafluoride (SF6) is the primary insulating gas and, due to the low operating temperature requirements, GIE is designed to be mixed with either carbon tetrafluoride (CF4) or nitrogen (N2) gas. Insulating gas is not used directly on a conventional air-insulated transmission line but is used in the electrical equipment located outdoors in the terminal switchyard at each end of the line, for example, in circuit breakers, gas insulated switchgear (GIS) and circuit switchers.

SF6 and CF4 are both potent greenhouse gases (GHGs) and Manitoba Hydro makes every effort to minimize or eliminate releases to the atmosphere. There has been mandatory GHG reporting of SF6 and CF4 releases to the atmosphere by Environment Canada since 2004.

SF6 and CF4 are both heavier than air, and if released, will collect in low areas; displacing oxygen. Insulating gas that is subject to high heat, primarily from normal arcing inside a circuit breaker interrupter, or due to a flashover, will develop SF6 arc by-products that are toxic. Flashover events are very rare, with one flashover event occurring on a 66 kV circuit breaker in 2014 being the only such event within Manitoba Hydro’s transmission line business unit over the last 25 years.

Under normal circumstances, minor releases of insulating gas may occur during testing and handling processes or from leaking GIE. The majority of GIE manufacturers have a documented leak rate of 0.05% per year and not all equipment is expected to leak.

The infrastructure and services VC could be affected by the release of insulating gas, as a leak would result in GIE being taken out of service to make repairs. A flashover event affecting GIE could lead to a line outage. Human Health could be affected through a line outage resulting from GIE leaks, or failure. Members of the public could potentially be exposed to insulating gas, which would be a health risk, if a motor vehicle accident occurs during transport of the insulating gas to facilities.

9.2.6.1 Mitigation

Outdoor GIE have low pressure alarms and, if there is a leak, the gas releases directly to the atmosphere. For terminal stations, GIE located inside of buildings are equipped with low pressure alarms monitored by System Control Centre (SCC) and the buildings

have ventilation systems that would exhaust any leaking gas to the outside environment, where it would dissipate rapidly into the atmosphere. All such buildings and GIE are located within secured facilities with restricted access, so the public would not be at risk.

As part of safety design, most GIE have a rupture disk that will release all gas in the event of an over pressure due to an internal flashover. The gas is compartmentalized with a rupture disk for each compartment so that if a flashover event does occur, the total amount of gas released is potentially minimized. Released gas would dissipate quickly into the atmosphere. SF6 arc by-products produced from arcing due to a flashover can be deposited as a powdery substance on equipment and must be decontaminated with a neutralizing solution by Manitoba Hydro staff using suitable personal protective equipment (PPE) and following established safe work procedures.

In the event that a leak of insulating gas is detected, the following procedures would occur:

- System Control Centre will notify the work area responsible and arrange an outage of the equipment;
- Work area will clear the equipment and prepare to refill the insulating gas;
- Work area will test the gas quality in the equipment, refill and attempt to locate the leak
- The quantity of insulating gas used to refill the equipment is documented and reported as a release; and
- The equipment is returned to service.

Insulating gas is stored and transported in pressurized cylinders following federal transportation of dangerous goods (TDG) regulations. Insulating gas is supplied as required for facilities located within a 2-hour driving radius of Winnipeg, out of Manitoba Hydro's Apparatus Maintenance Shop. For more remote facilities, insulating gas is stored on site in secured facilities. Cylinders are inspected and weighed on an annual basis to detect leaks. Manitoba Hydro staff entering a building containing GIE will be aware of the potential hazards and only qualified personnel will conduct testing and handling of insulating gas.

The risk of exposure to insulating gas is extremely low. Low pressure alarm systems will alert the SCC, which would notify the work area responsible and arrange an outage of the GIE, so that repairs could be made. This would make the GIE unavailable and, depending on the station design, might require a line outage.

A flashover event could result in a release of insulating gas to the environment and deposition of SF6 arc by-products, which would require decontamination and also might result in a line outage.

Line outages related to releases of insulating gas could affect infrastructure and services and community health and well-being as discussed in section 21.1 on power outages. These outages would be local and short term. The release of insulating gas to the environment could result in a localized pocket of SF6 arc by-products which could result in contamination of wildlife habitat or mortality. The rapid dissipation of GIE into the atmosphere, should there be a release, minimizes the likelihood of adverse effects on human health.

9.2.6.1 Assessment Conclusion

Adverse effects relating to insulating gas would be local and would persist until cleaned up by Manitoba Hydro personnel. Given the local extent and short duration of the residual effect it is classified as being not significant.

9.2.7 Vehicle accidents

9.2.7.1 Summary of Effects

There is a potential for vehicles, heavy equipment, farm equipment or aviation equipment to collide with transmission line towers, conductors, other vehicles, people or wildlife. The operation of vehicles and heavy equipment on highways, access roads and the ROW could result in human or wildlife mortality or injury. The potential for these types of collisions is influenced by traffic volumes and weather conditions. Wildlife incidents may affect both large and small animals including mammals, birds, reptiles and amphibians. Other wildlife-related incidents could occur as a result of vehicle travel over natural terrain (e.g., crushing nests or dens with young, or slow-moving animals). The potential for vehicle-wildlife interactions is influenced by the time of year, the surrounding habitat type, and the time of day.

A vehicle accident arising from Project-related activities may interact with atmospheric environment, infrastructure and services and communities. Note that the potential for a fire or hazardous material spill which could be associated with a vehicle accident or other means has been addressed above.

Frequency of vehicle traffic will be higher during Project construction, when there is more vehicle activity and more transportation of workers during hours of low visibility or higher wildlife activity; however, likelihood of motor vehicle collisions is expected to be low throughout the operation and maintenance phase of the Project.

During the operation phase, there is a potential for farm equipment, such as tractors and combines, to collide with transmission towers located in agricultural fields during cropping activities. There is also a potential for aviation equipment, such as airplanes, helicopters and aerial crop spraying equipment to make contact with conductors (i.e., transmission lines). The likelihood of aviation-related collisions is higher for activities that involve low-level flying, such as aerial crop spraying and airplane take-off or landing at strips located near transmission lines. There are no aerodromes or airstrips located directly in the vicinity of the Project. The nearest airport to the region is the Brandon Municipal Airport (YBR).

A vehicle collision from Project-related activities could interact with the Grassland or Forest VC through injury or mortality to wildlife species. The Health VC could be affected through collisions causing injury or death, or through involvement of emergency response services. The Agriculture VC could be affected as farm equipment and aerial spraying collisions conflict with agricultural activities.

9.2.7.1 Mitigation

The focus of incident prevention will be on prevention of collisions through compliance with traffic laws and regulations and compliance with Manitoba Hydro's corporate policy on use of corporate vehicles. Preventative measures to reduce the risk of collisions include reducing traffic to the communities and the Project site during construction. This will include the use of group transportation where possible. Project vehicles will follow posted speed limits and exercise caution in areas frequented by wildlife. During operations and maintenance, vehicle travel and any access onto the line is at a reduced speed regardless of time of year due to terrain, equipment and nature of work.

The routing, tower type, spacing and placement of transmission lines and towers on annual croplands is planned to reduce footprint areas, nuisance and impediments to equipment maneuverability. This includes reducing diagonal crossing of annual crop land, use of self-supporting towers in agricultural areas and routing the transmission line down half-mile lines in agricultural areas, where possible.

9.2.7.1 Assessment Conclusion

The potential for a vehicle accident to occur exists during construction and operation and maintenance phase of the Project. Worker traffic and truck traffic to and from the site, and the operation of heavy equipment on-site during construction have the potential to result in a vehicle accident during construction. The Project-related vehicles will observe all traffic rules and provincial and federal highway regulations. Trucking activity will observe speed limits and weight restrictions. Because the Project will comply

with all applicable traffic rules and regulations, the nominal increase in traffic volumes as a result of the Project, and because safety measures will be implemented during construction, the potential residual environmental effects of a vehicle accident are assessed as minor.

9.2.8 Tower collapse and/or power outage

9.2.8.1 Summary of Effects

A number of factors can cause power outages. These include equipment failure, wildlife or equipment contact with live wires, environmental events such as fires, tornado-like winds, and ice storms, automatic safety equipment deactivating the line, and staff temporarily taking the transmission line out of service either intentionally or accidently. While considered unlikely given the applied design standards, it is possible for a transmission tower to collapse during construction and operation as a result of, extreme weather, mechanical failure, intentional or unintentional human interaction. Outage durations typically last from one day or less, to several weeks.

A power outage can affect the socioeconomic VCs of Infrastructure and Services, Employment and Economy, Agriculture and Health. Effects on Infrastructure and Services consist of changes to community road traffic and transportation utility due of failure of traffic lights and interference with communication and radio signals with the loss of power to signal sources. Effects on Employment and Economy would result if the power outage resulted in a loss of productivity for businesses. Effects on Agriculture would occur if power was lost to agriculture operations such as hog barns. Effects on Health involve the changes in levels of stress and annoyance and change in capacity of health care services. The lack of power could affect the operation of health care facilities.

Tower collapse has the potential to affect wildlife habitat availability, change in community infrastructure and services and conflict with agricultural activities. While unlikely, there is also the potential for mortality to humans and wildlife if people or wildlife are present where a tower collapses. Line breaks due to the collapsed tower have the potential to cause fires, which could affect habitat, vegetation cover and agricultural land. Cultural sites or rare plant locations could be damaged or destroyed by a collapsed tower and access to lands used by First Nations and Metis and by other land users could be restricted. During repairs to collapsed towers, there is the potential for disturbance to wildlife along the access trails, roads and ROW and risk to public safety.

9.2.8.1 Mitigation

The likelihood of power outages occurring will be reduced through the application of sound engineering practice and regular maintenance of the transmission lines. The risk of tower failure will be reduced through application of sound engineering practice in the design of the towers and transmission lines for extreme loadings, the use of qualified construction contractors and regular maintenance.

Manitoba Hydro adheres to the Reliability Standards Regulation of the Manitoba Hydro Act (Government of Manitoba 2012) and NERC/MRO/Manitoba Hydro reliability criteria. The design, construction and maintenance of the transmission line will follow industry standards and reflect Manitoba Hydro's experiences. To limit the effect of failure events on the line that could result in power outages, transmission line components are designed as part of a system, where failure of one component will not necessarily result in the failure of another. Engineering design will adhere to industry standards and reflect Manitoba Hydro's experience with similar projects. Design of the transmission line will be subject to two general design standards. The CSA C22.3 No. 1-10 "Overhead Systems" standard will be applied to determine all electrical and safety clearances. The Reliability Based Design Method will be used for designing the structural components following the CAN/CSA-C22.3 No. 60826-10 "Design Criteria of Overhead Transmission Lines" standard. Climatic design loads will be determined using a 200-year return period and statistical historical weather data. These standards document the engineering design for site-specific normal and extreme physical environmental conditions based on historical climate records and provide design criteria that the regulatory agencies consider satisfactory for withstanding the potential physical environmental conditions. These standards consider physical environmental criteria, such as temperature, wind, snow and ice loading, and drainage for historical climate conditions.

During the route selection process (chapter 6) the criteria related to system reliability included consideration of the influence of extreme weather (wind events, tornadoes, icing) and the amount of paralleling of other transmission lines. Probabilities of each proposed route and existing routes both being affected by severe weather were determined and scores were given based on the relative probabilities. These scores were entered into the selection of the preferred route. The influences of extreme weather conditions on the Project are discussed in chapter 8.

Manitoba Hydro subscribes to a weather monitoring service that monitors weather conditions that could affect system reliability. The system allows operators to monitor and model a variety of weather conditions including precipitation, icing, wind speed and direction, as well as real-time lightning strikes. The SCC receives severe weather

forecasts from professional meteorologists who monitor and provide detailed updates for the area covered by Manitoba Hydro's transmission system. This includes predications of storm severity and possibilities of the severity of line outages, or the potential for tower failures, based on current and predicted conditions. This allows operators to prepare contingency plans for rerouting power to limit the effect of power outages, should they occur (Manitoba Hydro 2007).

Tower failures are rare and tend to result from severe weather conditions. Transmission Line maintenance conducts annual patrols which visually inspects tower structures and foundations for deficiencies, this annual inspection has resulted in no major failure of a transmission tower as a result of condition deficiency. ROW width determination considers tower height so that in the event of a tower failure the structure is likely to stay within the ROW.

Responding to unplanned outages is among Manitoba Hydro's highest priorities. Unplanned outages are dealt with immediately. Manitoba Hydro's System Control Centre (SCC) monitors the entire transmission system on a constant basis to detect faults on the line or in a station that result in tripping (or opening) of a circuit breaker. As a result of integrated system planning a line or station fault may not necessarily result in a power outage experienced by customers. Manitoba Hydro maintains an emergency contact number, available 24 hours day, seven days a week, that can be used to report power outages. The corporate website also provides public information on what to do in the event of a power outage.

Manitoba Hydro responds to these types of events in accordance with policies and procedures outlined in the CEMP. The SCC would be aware of unexplained multiple line trips or lockout (a line that could not be re-energized) and would notify Line Maintenance who would initiate a special (emergency) patrol. The priorities are to ensure the safety of the public and Manitoba Hydro staff and to maintain system reliability. Once the cause of the line trip or lockout was determined, Line Maintenance would communicate the finding to SCC along with the estimated time it would take to mitigate the outage and re-establish system reliability. If the event was anticipated to be an extended outage the Emergency Operation Centre (EOC) would be initiated as per the Corporate Emergency Response Program. If injuries have occurred, emergency personnel would be contacted immediately. If fires were started due to downed lines, the local fire department would be contacted.

In the event of an outage, Manitoba Hydro's first priority is to ensure public safety. The restoration of service would be based on policies and procedures outlined in the Corporate Emergency Management Program for transmission and distribution systems

(Manitoba Hydro 2014). Manitoba Hydro will assess the total damage and work required to restore power.

A determination of the most feasible option to address the issue would be made. For example, if there is potential for a tower collapse to affect public safety, this would be communicated to the public by the EOC Incident Commander or the Line Maintenance Manager. In the unlikely event that damage is extensive or widespread Manitoba Hydro has mutual assistance agreements in place to obtain help from other utilities. In the case of a major emergency, the Line Maintenance Manager would activate the Transmission and Distribution Emergency Operation Centre and would act as the response manager.

Manitoba Hydro's Customer Service Operations Department operates the distribution and sub-transmission systems and Transmission Line Maintenance departments maintain the transmission system, both departments have emergency stocks of material rapid response. District and Line Maintenance staff are on standby outside regular work hours and are called out to respond to emergencies related to outages and damage to the electrical system. Electrical Apparatus Maintenance staff are on standby to respond to emergencies related to stations or associated electrical equipment failure. The standby staff are contacted by the customer contact centre or System Control department to respond to emergencies outside regular office hours.

Transmission lines and substations will be restored first. Priority is then given to restoring service to essential facilities, including hospitals, police, fire and rescue, communication facilities, and water pumping stations. The next priority is to restore power to the largest number of customers' with the highest return on effort. The focus is on neighborhoods, businesses, industrial, and agricultural facilities. Service will then be restored to small groups of customers and single residences.

9.2.8.1 Assessment Conclusion

Depending on the nature and timing of the outage, service to individual customers could be interrupted for a period of time. Outages occurring due to severe weather events (e.g., winter storms, floods, extreme wind events) could have more pronounced effects on customers.

Residual effects would depend on the nature and the timing of the event. For example, a tower failure during the growing season could result in the need for construction equipment to remove or repair a damaged tower on agricultural fields, which could lead to crop damage and soil degradation (e.g., compaction). A collapsed tower could result in a power outage and the effects discussed in section 21.1 could occur on infrastructure and services, agriculture, and community health and well-being. The

potential exists for human and wildlife injury or mortality, damage to vegetation or soils, or fires resulting from downed lines. Line maintenance crews would address damage to personal property, vegetation or soils. Soil contamination issues would be addressed following the Manitoba Hydro Spill Response Plan. If the collapsed tower destroyed wildlife habitat or land used for hunting, trapping or plant harvesting sites by First Nations or Metis or by other land and resource users, a residual effect would occur; however, the extent of duration of the effect would be limited.

In certain situations, such as during major storms, some areas may be inaccessible to repair crews due to ice, floods, fallen trees, or other safety issues. This would mean some customers have to wait longer for power to be restored while these areas are cleared.

The implementation of Manitoba Hydro's mitigation measures and response plans for power outages is expected to result in the restoration of power in a short time in all but the most extreme cases, and the effects of events such as a tower collapse would be localized and short term.

The viability of wildlife populations or the capacity of critical habitat for wildlife SOCC would not be jeopardized. The long-term persistence of vegetation communities in the RAA and viability of vegetation SAR will not be contrary to federal or provincial management objectives. Disruption to infrastructure and services and agriculture is expected to be short term and minimal. Given the localized extent of the effects on wildlife habitat used for traditional purposes of Indigenous communities and organizations and for other resource users, effects on land use activities is not expected to extend beyond the actual collapsed structures. The likelihood of injury or death to humans or wildlife is low, given the limited area affected by a tower collapse and the rarity of such an occurrence. The effect of tower collapse on the affected VCs is assessed as not significant.

While the magnitude of effects of a power outage on Infrastructure and Services, Employment and Economy, Agriculture and on Health during a power outage could be moderate to high, the likelihood is low, given the natural frequency of occurrence and robust monitoring and mitigation measures. As a result, residual effects are assessed as being not significant.

9.3 Overall assessment conclusion

The Project is being designed, and will be constructed and operated with the utmost regard for health, safety, and environmental protection to minimize its potential environmental effects that could result during the normal course of construction and

operation and maintenance as well as those that could result from accidents, malfunctions, and unplanned events.

The careful planning of the Project and the implementation of proven and effective mitigation will minimize the potential for accidents, malfunctions, and unplanned events to occur. The effects of an individual accident or unplanned event could have significant effects on a localized extent. For example, a fire could negatively affect nesting birds or a spill could affect surface or groundwater quality. However, the potential for these events to occur, given the measures that will be undertaken to prevent their occurrence, is low. In the very unlikely and improbable event that an accidents, malfunctions, and unplanned events of any considerable magnitude were to occur, it would be of a short duration, low frequency, or limited geographic extent such that major residual adverse environmental effects would be unlikely to occur.

Manitoba Hydro has been successfully constructing and operating transmission lines in the province for more than 50 years. The experience, skills and insights gained through dealing with past accidents and malfunctions are reflected in an environmental protection program that includes specific mechanisms for monitoring and managing environmental issues. The program includes plans to reduce the likelihood of environmental effects from the Project and mechanisms to prevent accidents and malfunctions and deal with the consequences of occurrence.

Overall, given the nature of the Project and credible accidents, malfunctions, and unplanned events considered, events on all biophysical and socioeconomic components during all phases of the Project, are assessed as minor and not significant, with the following exceptions:

- Any event that results in a human fatality;
- A power outage that extends for a period that affects the provision of health care services; and
- Spills that destroy critical habitat, or affect agriculture land so that current operations cannot continue, or land use and traditional land use and resource use cannot continue as presently carried out, or the visual quality of the landscape changes from undisturbed to disturbed in areas where this is an important planning objective.

In light of the nature of the Project and proposed protection, mitigation and response plans in place, the likelihood of significant residual environmental effects of all Project-related accidents, malfunctions, and unplanned events occurring is low.

Available in accessible formats upon request