3.0 PROJECT DESCRIPTION

3.1 Project Overview

3.1.1 Project Summary

The existing Pointe du Bois generating station (GS) has been in operation since 1911. The existing structure does not meet current Canadian Dam Association Dam Safety Guidelines for spillway capacity, shows signs of significant **concrete** deterioration, and requires manual methods for operating the spillway gates that are challenging to perform safely and in the time required. For these reasons Manitoba Hydro has initiated the replacement of the Pointe du Bois spillway. The powerhouse will continue to operate with ongoing maintenance. The ongoing operation and maintenance of the powerhouse is not included in the scope of the Pointe du Bois Spillway Replacement Project.

The Pointe du Bois Spillway Replacement Project (the Project) involves the replacement of the existing concrete and earthfill water retention and spillway structures with new structures (Figure 3.1). In general, the new structures are comprised of a new primary spillway and associated approach and discharge channels at the east shore of the Winnipeg River, a new secondary spillway located west of the primary spillway about mid-stream of the river, and new earthfill dams constructed immediately downstream of the existing spillways and sluiceway. The earthfill dams and associated transition structures will connect the new spillway structures to provide a continuous dam structure from the east shore to the existing powerhouse. The existing west gravity dam will be maintained and enhanced for dam safety and the existing east gravity dam will be replaced with a new permanent earthfill dam and tied into the powerhouse with a new concrete gravity wall.

The general arrangement of the Project was selected considering dam safety, lake sturgeon habitat, constructability, stakeholder effects, flexibility for the incorporation of a potential future powerhouse, and cost effectiveness. The new spillways have been sized to be consistent with the dam safety guidelines and Manitoba Hydro policy.

As noted, a key consideration on the placement of the project components is the interaction of the Project with requirements for the life cycle of lake sturgeon. A joint biology and engineering team was created to consider this interaction.

Through the process of determining the location of the general arrangement, the following criteria were maintained:

- Avoid in-water work in known lake sturgeon spawning areas;
- Maintain flow over the known spawning areas;
- Preserve turbulent flow on the east side;
- Maximize opportunities for adaptive management; and

- Consider the biological benefits of having the spillway on the upper portion of shelf.

Construction is scheduled to begin upon receiving environmental and other required approvals (earliest will be fall 2011). The construction of the Project is anticipated to take approximately five years with completion scheduled for the fall of 2016.

Through the upcoming process of detailed design there may be opportunities for improvements to the design and constructability of the Project to reduce schedule and improve cost effectiveness, without changing potential environmental impacts.

3.1.2 Project Location

The Pointe du Bois GS is located at Pointe du Bois, Manitoba on the Winnipeg River. Pointe du Bois is located about 170 km by road northeast of Winnipeg and 43 km east of Lac du Bonnet. The site is located within the Whiteshell Provincial Park. The Project will be undertaken at the existing site shown on Figure 3.2.

3.1.3 Existing Structures

The existing Pointe du Bois powerhouse and associated water control structures (Pointe du Bois GS) were constructed between 1909 and 1926. The Pointe du Bois GS was acquired by Manitoba Hydro from Winnipeg Hydro in 2002. The Pointe du Bois GS has suffered considerable deterioration throughout its operation, mainly related to durability and performance of concrete mixes used at the time of construction.

The existing structures consist of the west gravity dam, powerhouse, east gravity dam, a number of spillways (Bays 1 to 35, 36 to 44, 45 to 65, 101 to 114 and 121 to 133), a five bay sluiceway, a rockfill dam, a pedestrian bridge, and a vehicle access bridge. The maximum safe flood capacity of the Pointe du Bois GS is considered to be approximately 2,850 cms, or about a 1:90 year flood. These structures are outlined on Figure 3.3 and are shown in Photo 3.1.

The maximum discharge for the existing powerhouse is approximately 712 cms which is the maximum outflow that can be used to produce power through the **turbine**s. The plant capacity is 78 MW and produces an average of 580 **gigawatt** hours (GWh) of energy per year. The existing powerhouse will continue to operate with ongoing maintenance.

Source: Manitoba Hydro Power Planning Department

Photo 3.1: Existing Pointe du Bois Facilities

3.2 Project Components

The components of the Project can be categorized as those related to the supporting construction infrastructure, those related to the principal structures, and those structures to be decommissioned. A general description of each of these project categories is provided below and a more detailed account of construction activities associated with them is outlined in Sections 3.4, 3.5, and 3.6.

3.2.1 Construction Infrastructure

Figure 3.4 provides approximate locations for the supporting construction infrastructure. The layout of the supporting infrastructure has been determined based on general accepted construction methods; however, variations of this layout are expected and are dependent on efficiencies that the contractor will determine during construction. The activities associated with construction infrastructure are detailed in Section 3.4.

The construction infrastructure for the Project includes the following:

- **Work Areas** – A number of potential work areas have been identified for laydown and storage areas, material sources, temporary buildings, rock crushing and concrete batch plants;
- **Barge Landings** – The primary method of transporting construction material to the east side is via barge. The barge landings are anticipated to be approximately 10m x 40m in dimension and will be utilized to load and unload construction materials. Alternate means of transporting construction material may be utilized by the contractor. These include winter roads or temporary road / bridge across the spillway shelf;
- **Material Source Areas** – Rock, granular, and **clay** sources are required for the construction of the principal and supporting structures. These sources are located in the areas identified on the east side of the river at the site, along PR 313, along the Manitoba Hydro Slave Falls access road, and at existing quarries in the Milner Ridge and Seddons Corner areas;
- **Construction Power** – Construction power will be provided to the east side work area from the Pointe du Bois townsite. The power cable will be attached to overhead towers through the townsite, pass underneath the Winnipeg River utilizing **directional drilling** and then connect to overhead towers on the east side. This power source will remain in place following construction and be utilized as permanent power for the new spillway;
- **Excavated Material Placement Area** – Excess material excavated as part of the construction activities will be placed at this location;
- **Cofferdams** – A number of cofferdams are required to provide dewatered conditions for construction activities;
- **Townsite Access Roadway** – A new permanent roadway will be constructed as shown to separate construction and public traffic; and
- **Construction Roadways** – Initial construction will include a variety of temporary roadways that link with barge landing and other key work areas.

3.2.2 Principal Structures

The new principal structures for the Project include the following and are shown on Figure 3.5.

- Primary spillway
- Secondary spillway
- Transition structures and wing walls

- Earthfill dams
- Primary spillway approach and discharge channels
- Existing gravity dam stabilization.

The construction activities associated with the principal structures are outlined in Section 3.5.

3.2.2.1 Primary Spillway

The primary spillway is located on the east side of the Winnipeg River. It consists of concrete piers, **rollway**s, and bridge structures and dedicated steel **water control gates** and towers. The new primary spillway will be a five-bay (**ogee** type) overflow structure approximately 86 m long with 3 m wide piers separating the bays. Each bay will be controlled remotely using vertical lift gates with dedicated wire rope hoists. Upstream **stoplogs** will be provided for gate maintenance. This spillway is intended as the primary means for flood control and to manage the **forebay** elevation. It can be controlled through "push button" operation either locally and or remotely by Manitoba Hydro staff. The capacity of the primary spillway at **full supply level** (FSL) elevation of 299.1 m is 3670 cms. See Section 3.10 for details related to the operation of the new spillways.

A bridge deck will be supported on the spillway piers for permanent roadway access across the new primary (and secondary) spillways to facilitate operation and maintenance to the spillways and water retaining structures by Manitoba Hydro staff and contractors. There will be no public access to the bridge deck and other principal structures.

3.2.2.2 Secondary Spillway

The new secondary spillway will be a seven-bay (ogee type) overflow structure approximately 84 m long with 2 m wide piers separating the bays. The bays will be manually controlled by vertical lift roller gates operated with a travelling **gantry** crane. Upstream stoplogs will be provided for gate maintenance.

The secondary spillway is located centrally on the Winnipeg River. This structure is intended to be utilized to manage large floods. The capacity of the secondary spillway at FSL elevation 299.1 m is 1130 cms. See Section 3.10 for operation of the new spillways.

3.2.2.3 Transition Structures and Wing Walls

Transition structures and wing walls are required to transition from concrete structures to earthfill structures including the primary spillway, the secondary spillway and cofferdams, and to connect the new earthfill dam to the existing powerhouse.

3.2.2.4 Earthfill Dams

The earthfill dams connect the primary and secondary spillway to form a continuous structure to retain the Pointe du Bois forebay at its design elevations. The four earthfill dams identified as part of the Project are the east abutment dam, the east main dam, the west main dam, and the south dam.

3.2.2.5 Primary Spillway Discharge and Approach Channels

The discharge and approach channels are excavated channels downstream and upstream of the primary spillway, that are necessary to achieve the **hydraulic** capacity of the spillway. These will serve to direct water flow into and out of the new primary spillway. Each channel will be approximately 80 m in width and 180 to 200 m in length. The approach channel will be excavated to elevation 287.5 m and the discharge channel to elevation 286.0 m.

3.2.3 Structures to be Decommissioned

The existing spillway and water retaining structures (not including the powerhouse and west gravity dam) will not be required for the continued operation of the Pointe du Bois GS. Therefore, the existing spillways, sluiceways and other water retaining structures will be decommissioned.

3.3 Construction Phases

Construction of the Project is scheduled to begin following the receipt of environmental and other required approvals (earliest fall 2011). In general, the schedule assumes two ten-hour shifts per day, six days per week with reduced activities in the winter months. However, to manage schedule risk, construction activities will likely require periods of activities occurring 24 hours per day and seven days per week. With this schedule, the Project is anticipated to take approximately five years to complete. It is noted that the activities associated with the schedule are seasonal in nature and delays in the start of the schedule could result in a full year delay in the completion of the Project.

The Project will be constructed in two stages with a total of six phases. Stage 1 includes the construction activities performed while maintaining the operation of the existing spillway (Phases 1 to 4). Stage 2 includes the construction activities performed while replacing the operation of the existing spillway with the new primary spillway (Phases 5 to 6).

A summary schedule of the six phases is outlined on Figure 3.6 and the general activities associated with each phase are described below. These phases identify the anticipated but approximate **duration**s associated with the various construction activities. Manitoba Hydro and the contractor may identify opportunities to reduce this schedule during detailed design and construction.

The duration of activities assumes the timing restrictions for environmental protection, such as no in-water work from April 1 to June 30, and no clearing and grubbing during critical bird nesting periods, generally from May 1 to August 1.

3.3.1 Phase 1–Infrastructure Preparations

The construction activities for the Project will require the development of infrastructure to support the Project within and adjacent to the construction area, shown on Figure 3.7A. The constructed infrastructure work is initiated in this phase and will include the development of material sources, security at the site, re-**alignment** of local roadways, development of work areas and office facilities, installation of power supply and communications, as well as clearing, grubbing and preparation of the contractor work areas.

3.3.2 Phase 2–Construction–Downstream Cofferdam and Discharge Channel Excavation

During Phase 2, shown on Figure 3.7B, a barging operation will be established to provide construction access to the east side of the river. The downstream **cofferdam** to isolate the primary spillway work area from the river will be constructed with earthfill materials (typically blast rock and clay). The earthfill materials will be sourced from the east side of the river within the work area. This work will include the development of a quarry, a rock crushing operation and a clay material site. Controlled blasting will be used for the quarry development. **Dewatering** and some ongoing pumping of seepage from within the area protected by the cofferdam will be required. A sediment management program will be in place for the dewatering and seepage.

The primary spillway discharge channel will be constructed with controlled blasting techniques and excavation of **bedrock** to a geometry which achieves the hydraulic flow requirements.

The portion of the channel completed within the protection of the downstream cofferdam will include measures put into place to stabilize the new rock walls. Rock generated from the excavation of the channels will typically be used within the project for rockfill or crushed rock products.

3.3.3 Phase 3–Construction–Primary Spillway Concrete and Channel Excavation

The primary spillway will consist of a concrete reinforced structure set on bedrock. The formwork and reinforcement will be prepared at site, with the concrete cast-in-place. This work will include detailed forming and finishing of the concrete to tolerances which allow the installation of the spillway gates and associated mechanical equipment.

The approach channel excavation located in the existing forebay upstream of the existing rockfill dam can be completed using a rock mattress to facilitate the blasting and excavation operation (Figure 3.7C). Alternate methods for channel excavation may be an upstream cofferdam or in-water blasting. Rock generated from the excavation of the channel will typically be used within the project for rockfill or crushed rock products.

3.3.4 Phase 4–Construction–Complete Primary Spillway and prepare East Main Dam

Earthfill dams designated as the east main dam and the east abutment dam will be constructed and tied into the primary spillway during Phase 4 (Figure 3.7D). The earthfill dams will use local earth materials including rock, **gravel**, **sand**, and clay that have been prepared and placed to meet construction specifications. The east abutment dam will extend east from the primary spillway and tie in to the existing bedrock high ground. The east main dam will extend west from the primary spillway to the secondary spillway to ultimately retain the forebay between the two structures. Construction of this structure will be initiated in Phase 4 but not completed until a portion of the secondary spillway has been constructed in Phase 5.

The completion of the primary spillway will include the installation of the spillway gates, hoists to lift the gates and other electrical/mechanical installations including fire protection. Prior to operating the primary spillway, the structure and gates will be commissioned, which includes a series of tests and initial controlled releases of water.

3.3.5 Phase 5–Construction–Secondary Spillway, Main Dam and South Dam

During Phase 5 (Figure 3.7E), the connection between the west and east banks of the river will be completed, allowing vehicle traffic to access the full site and eliminate the need for barging services.

The construction of the secondary spillway will include a small amount of controlled blasting and rock excavation for the spillway foundation, before concrete can be placed. The spillway will consist of a concrete reinforced structure with formwork and reinforcement prepared at site and cast-in-place concrete. The installation of spillway gates and associated mechanical equipment will be completed at this structure as well during this phase.

The earthfill dams designated as the west main dam and south dam will be constructed of local and imported earth materials including rock, gravel, sand and clay that have been prepared and placed to meet construction specifications. The earthfill dams will extend westward from the secondary spillway and then southward to the existing powerhouse. At the southern most portion of the south dam, the concrete powerhouse east abutment transition structures will be built to connect the powerhouse to the south dam.

3.3.6 Phase 6–Decommissioning–Existing Structure Removal and Rehabilitation of Disturbed Areas

A number of existing facilities and structures at the Pointe du Bois GS will no longer be required following completion of the Project. The existing structures and facilities to be decommissioned during Phase 6 of the Project will include the following: spillways and sluiceway, rockfill dam, east gravity dam and curved spillway, pedestrian bridge, and other support components associated with these facilities (Figure 3.7F).

During Phase 6, when construction is complete, the temporary facilities set up to support the construction activities will be removed. These facilities include temporary offices and service buildings, work areas, and temporary roadways. Rehabilitation of all disturbed areas will be initiated during Phase 6.

3.4 Construction Infrastructure Activities

3.4.1 Site Preparation

Site preparation consists of clearing, grubbing, stripping, and the control of surface or near surface water. Clearing and stripping involves removal of brush through mechanical means, typically using scrapers, bulldozers, motor graders and front-end loaders.

Grubbing involves the removal of stumps, logs, roots, and other organic matter as required. Organic soil will be stockpiled on the site for later use during the rehabilitation of the disturbed areas, after construction is completed.

Merchantable timber will be salvaged for utilization, if required. Scrub and brush will be stockpiled and disposed of by burning in a manner approved by Manitoba Conservation.

Clearing and grubbing activities will be scheduled to avoid critical migratory bird nesting periods. These are currently assumed to occur between May 1 and August 1 of any year.

3.4.2 Townsite Access Roadway

During construction of the Project, there will be construction activities in the immediate vicinity of the Pointe du Bois townsite. To address safety concerns of public interaction with construction traffic/activities in the area, a new permanent two lane gravel road from PR 313 to Glassco Avenue will be constructed for use by non-construction traffic during construction of the Project. The road will turn south off PR 313, approximately 380 m west of Glassco Avenue, and follow the old tramway line east, to reconnect to Glassco Avenue north of the existing townsite and south of the north peninsula construction area (Figure 3.8). Project-related construction and worker traffic will continue east along PR 313 into the northern peninsula contractor's work area. Construction and worker traffic will share PR 313 with public traffic up to the turn-off to the new townsite access roadway. Security gates will be installed to prevent public traffic from travelling into the construction areas. An asphalt surface will be placed on the new roadway in Phase 6 of the Project.

There will be no public access to the existing boathouses or boat launch along the north peninsula north of the west work area during construction.

3.4.3 Work Areas

Work areas for Manitoba Hydro and the contractor will be located on the west and east sides of the Winnipeg River and on the center island as indicated on Figure 3.4. The areas are expected to be prepared in Phase 1 of the Project. The existing Manitoba Hydro work area on the west side of the river will be designated as the contractor work area and expanded as shown on the Figure. The contractor work area on the west shore covers an area with existing storage sheds and warehouses. These buildings may be used during the construction work, or if not required, may be maintained or removed to accommodate existing operations of the generating station.

A contractor's work area will also be designated on the east side of the river in close proximity to the principal structures. The area immediately downstream of the existing curved spillway (referred to as the center island) will also be made available to the contractor as a work area.

These work areas were identified based on suitable terrain and topography, and access to roads and marine transportation between the east and west sides. The work areas will serve various functions to support construction activities including temporary buildings, laydown and **staging area**s, material storage areas, aggregate processing (rock crusher) and concrete batch plants. Specific layout and management of the site will be determined by the contractor; however, guidelines will be developed to ensure the contractor's operational plans are submitted to Manitoba Hydro, who will review them to ensure they conform to **regulatory** requirements.

Site runoff control on both the east and west sides will be designed to incorporate work area grading and perimeter ditches to collect and control local runoff, and discharging to existing natural drainage features in the surrounding area. Best management practices will be implemented by the Contractor(s) to manage **erosion** and **sedimentation** potential. Ditch and culvert capacities will be sized to manage flow volumes and velocities at rates low enough to minimize erosion and scouring potential of the drainage area. Where necessary, **riprap** energy dissipaters will be installed in areas where velocities are deemed to produce significant potential for erosion.

3.4.4 Buildings

Buildings required for the Project include offices (with lunchroom and washrooms), safety and supply trailers, material testing laboratories, general workshops, and maintenance facilities. The buildings will be portable and/or modular in accordance with the latest edition of the *National Building Code of Canada* and the latest edition of the *Manitoba Building Code* applicable for the area.

Foundations for all buildings will be designed in accordance with the latest edition of the Canadian Foundation Engineering Manual. The buildings will be temporary and therefore, the foundations will be designed in such a manner that the foundations can be removed with minimal impact.

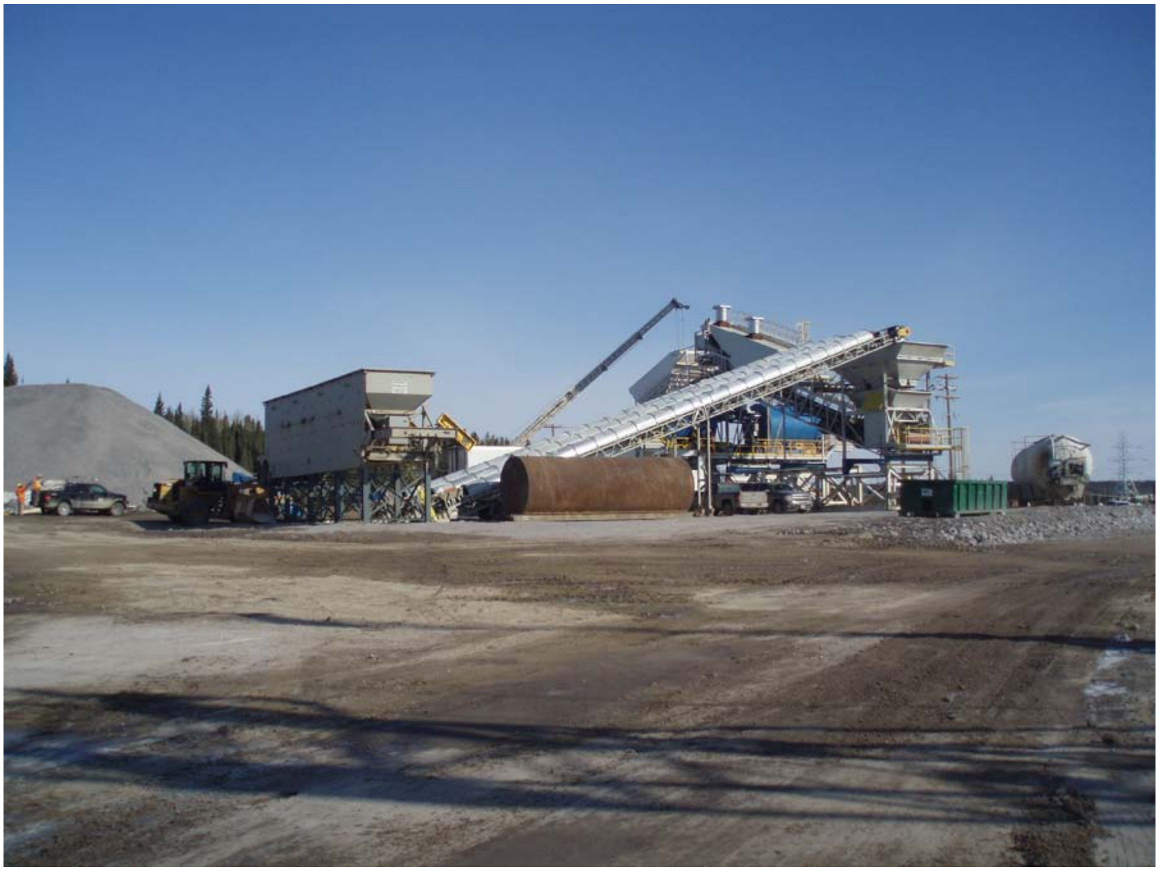
3.4.5 Laydown and Staging Areas

The work areas will have adequate space provided to include laydown and staging areas, stockpiled granular materials, fuel storage and handling, parking lots and other temporary infrastructure required to support construction activities.

3.4.6 Concrete Batch Plants and Crushing Operations

A concrete batch plant(s) will be located on either the east or west side of the river, or one on both sides, depending upon the contractor's construction methods.

The contractor will be responsible for determining the location, layout and installation of the concrete production facilities within the contractor work area. A typical batch plant, shown in Photo 3.2, mixes water, cement, aggregates, and additives to produce concrete. When operating, water for the plant(s) will be drawn from the river at a maximum flow rate of 120 L/s, and water intakes will be screened in accordance with the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (Fisheries and Oceans Canada 1995). The **cement** will be delivered to site by truck throughout the duration of the Project and may be stored in silos located adjacent to the batch plant.



Source: Manitoba Hydro Wuskwatim Construction Department

Photo 3.2: Typical Batch Plant

Aggregates for the concrete will be produced by crushing, screening, washing and stockpiling bedrock obtained from the Project's excavations, as well as granular material obtained from one or more of the off-site granular deposits. Typical crushing and stockpiling operations utilize a number of crushers and conveyor belt systems.

The control of concrete temperatures during summer months may require nitrogen or ice to facilitate appropriate temperatures for the placing of the concrete. Concrete operation, if required during winter, will require heating systems to maintain aggregate and water at suitable temperatures. Heated water will not be discharged directly into the river. Concrete wash water will be directed into **settling pond**s or tanks for treatment until it is suitable to discharge into the river in accordance with *Manitoba Surface Water Quality Objectives and Guidelines* (Williamson 2002), see Section 3.4.11.6 for details.

3.4.7 Construction Access

Access will be required for transportation of personnel, large equipment and materials to the construction site and contractor work area on the east side. Personnel will likely be transported by motor boat or ferry or by foot access over the existing structures. A temporary walkway will be constructed across the existing facilities to allow safe foot access of personnel to the east side.

The primary mode of access for construction equipment and materials will be by floating barge during the open water season (typically May through November). Alternate access modes that may be implemented by the contractor include temporary winter roads and a temporary road/bridge access across the lower spillway shelf. The construction access options are outlined on Figure 3.9.

3.4.7.1 Barge Access

Barges during the open water season will be the primary mode of access to the east side. A wharf with a barge landing will be provided on the west side of the river in the contractor work area with road access and docking, loading and offloading space provided. A similar wharf and barge landing will be provided on the east side of the river near the contractor's work area.

The barge landings will be constructed using a steel structure consisting of either sheet pile or bin walls or alternatively a timber crib structure filled with granular material (Figure 3.10). Equipment to be used includes cranes, rotary drills, backhoes, and bulldozers.

It is estimated that one to four barges will be used depending on the specific activities during construction. The barges will typically range in size up to 60m x 20m that may require up to 2m of draft. The barges will travel in an arc upstream of the islands in the outer forebay with a single one-way trip from one side to the other taking approximately 15 minutes. If only a single barge is operating it is estimated that it will cross the forebay twice an hour whereas if four barges are operating it is estimated that there will be up to six barge crossings per hour.

In cold conditions such as during early spring and late fall, ice formation could impede barge travel. The contractor may utilize methods such as bubblers and continuous tugboat traffic, and heavy equipment such as excavators and trenchers to maintain an open barge path.

3.4.7.2 Winter Ice Road Access

The development of a winter ice road to access the site may permit delivery of equipment, materials and workforce via truck traffic during the winter period. Preliminary ice road routes have been identified and are shown on Figure 3.9.

3.4.7.3 Lower Spillway Shelf Road Access

If river flows are low enough in the first year of construction, the contractor may construct piers, abutments and causeway sections to allow the installation of a temporary bridge across the spillway rapids downstream of the existing spillways. This access would connect the central island area to the east bank (Figure 3.11) and would provide unconstrained year round access to the east side. The unconstrained access provides opportunities for schedule optimization.

Rockfill would be used for the causeways with no in water work permitted during the period April 1 to June 30. It is anticipated that the placement of the causeway rockfill between bridge spans would have a relatively small effect on the water levels upstream of the bridge as well as the velocities through the bridge openings.

The bridge system would be designed to be stable for the flows in excess of the construction design flood and would be operational for the construction period. The bridge and causeway would be designed so that overtopping of the structure would not occur for all flows that could be conveyed through the spillway/sluiceway structure at the upstream edge of the rapids. Risk of failure of the bridge or causeway would be consistent with the risk of failure to the existing **water control structure**s.

After the Project is completed and permanent access is established to the east side of the river the temporary bridge would be removed and salvaged. The causeways, abutments and piers would be removed. This could be done by controlling the flow through the new spillway structure(s) to provide “dry access” to these areas. The removal work would be done outside of the fish spawning window with control of sediment consistent with other construction activity procedures.

3.4.8 Stabilization of the East Gravity Dam

The east gravity dam (EGD) will be stabilized in Phase 1 of the Project to protect the structure during the controlled blasting activities required for Project construction. The stabilization will include a rock buttress installed against the downstream face of the EGD. The rock buttress would be placed using backhoes and dozers. A cross section of this stabilization work is shown on Figure 3.12. Rock utilized for the stabilization of the EGD will be removed from the EGD and re-used for the construction of the south earthfill dam.

3.4.9 Construction/Permanent Power

Electrical power for construction will be required on both the east and west side of the river. The existing townsite distribution system has insufficient capacity to service the needs of the construction activity or the long-term needs of the Project. Accordingly, a new transformer substation will be built consisting of two substation transformers within the Townsite (Figure 3.13), to provide electrical power for construction support services and works. The distribution substation will also provide future permanent power for operation of the new spillways. Power to the west side construction area will be provided from the substation via a wood pole distribution line. Power to the east side construction area will be provided from the substation through a directional drilled cable underneath the river and then a wood pole distribution line.

The proposed river crossing consists of an electrical cable installed in a high density polyethylene (HDPE) conduit, cored directly through the bedrock below the river bed. The quality of the rock at the site is such that loss of fluid to the formation in any one location is not expected. Control of potential losses throughout the drill path will be required through the use of loss control materials (LCMs) such as bentonite pellets or saw dust with the possibility of requiring cementing operations in the event that specific fractures or joints in the bedrock cannot be sealed by conventional LCM.

Drilling is anticipated to proceed from west to east. Local grading will be required at the drill rig and exit locations. Cleared work spaces of 60 x 50 m for the drill rig and 30 x 20 m for the exit location work area are likely required although the size and shape can be modified to suit ground conditions. If ground conditions are not suitably stable to place the rig, gravel may need to be compacted and covered with rig or swamp mats to provide stability.

Depending on the exit location relative to the slope, the anticipated drill path length is approximately 660 m horizontal length.

Permanent power for the spillway will be distributed on two separate routes, physically separated, providing 100% redundancy of power supply. The first line will be the cable routed underneath the river (initially installed for construction power) and a wood pole distribution line on a 12 m right-of-way to the ancillary building on the east side. The second line will run from the powerhouse within the new permanent earthfill dam, across the primary and secondary spillways, to the ancillary building. A stand-alone diesel generator will provide an additional level of redundancy for emergency power to operate the spillway gates in the event of a substation failure.

3.4.10 Communications

To facilitate construction communications, existing infrastructure at the site will be utilized.

Permanent communications infrastructure for the new spillways will be provided by extensions from the communication infrastructure in place at the Pointe du Bois GS and will consist of a fibre optic link cable extended by way of overhead line poles to the west side and in conduit over the vehicle access bridge and new spillways to the east side.

3.4.11 Water, Wastewater and Waste Management

3.4.11.1 Potable Water

Potable water for the work areas and buildings will be provided by a local water service provider delivering water on a regular basis (water will be stored in above ground tanks). On the west side the office structure may tie into the existing Pointe du Bois water system. River water may be utilized for use in washrooms.

3.4.11.2 Fire Water Services

Fire protection services will be provided by Manitoba Hydro's current operation. The contractor will also provide fire protection, drawing water from the Winnipeg River.

3.4.11.3 Water Intakes

There will be two water intakes for domestic, fire protection and construction use. The water will be drawn from the river, one on the west side and one on the east side (Figure 3.14). The maximum pumping rate for each intake will be less than 120 L/s. The water intake will be designed to comply with the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (Fisheries and Oceans Canada 1995).

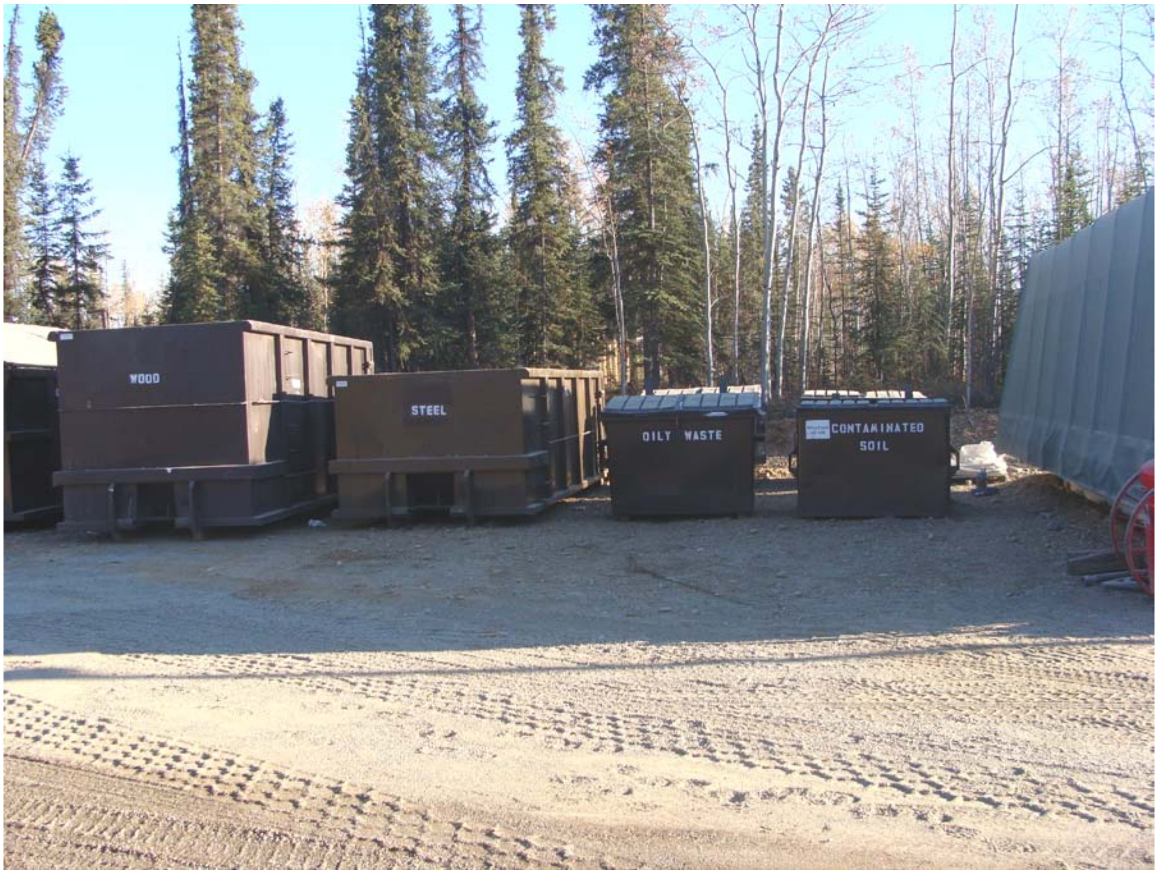
3.4.11.4 Wastewater

Sewage from Project related facilities will be stored in approved above ground tanks and disposed via haulage to an approved off-site existing sewage treatment facility. Tanks will be emptied regularly and will have the capacity to handle three days of storage as a contingency.

As an alternative, Manitoba Hydro may discharge the Project generated domestic sewage into the existing Pointe du Bois wastewater collection system on the west side. The system is currently operating at approximately 30% of its licensed capacity of 110 m^3/day. The domestic sewage production from the Project is expected to be approximately 5 m^3/day on average with a peak production of 10 m^3/day. Based on preliminary findings, it appears that the Pointe du Bois wastewater treatment plant has the capacity to handle all of the Project's generated domestic sewage.

3.4.11.5 Waste Management

Solid waste from the Project will generally be managed via the use of container storage and haulage of the waste off-site to an existing permitted waste disposal facility. Typical containers used for storage are shown in Photo 3.3. A contract will be issued to a licensed hauler for the pick-up, transport and disposal of any hazardous waste materials at a licensed hazardous waste facility. Recyclable waste materials such as rebar and steel will be recycled to the extent practical.



Source: Kiewit

Photo 3.3: Typical Waste Container Storage Bins

3.4.11.6 Settling Ponds or Tanks

Settling ponds or tanks will be required on both the west and east sides for wash water from concrete batching and dewatering the cofferdam. Wash water from concrete batching and transport will be directed to a sufficiently sized settling pond or mobile concrete wash water treatment units. Concrete wash water will be treated for alkalinity and **turbidity** before it can be released into a natural water course.

Manitoba Hydro together with the contractor will be responsible to design and locate the ponds/tanks. Uncontrolled discharge from dewatering operations or wash water from concrete operations will not be permitted. All discharge from the settling ponds will comply with the Manitoba Surface Water Quality Objectives and Guidelines.

3.4.12 Stormwater Management Ponds

Stormwater management ponds may be located on both the west and east side. The ponds would collect runoff water from the work areas during storm events to ensure that potentially contaminated runoff water does not freely discharge into the river.

Manitoba Hydro together with the contractor will be responsible for location and design of these facilities.

3.4.13 Material Source Areas and Rock Disposal Areas

The borrow materials required for the Project include clay, granular fill/crushed rock, rockfill, riprap and concrete aggregates. Estimated borrow material quantities are summarized in Table 3.1.

Table 3.1: Estimated Borrow Material Quantities

Material	Quantity (cubic metres)
Clay	100,000
Granular Fill/Crushed rock	35,000
Rockfill	275,000
Riprap	20,000
Concrete aggregates	40,000

Site investigations have identified a number of sources for clay, rock and granular (sand and gravel) materials that can be used for construction of the Project.

The primary material source areas for rock and clay are located on the east side of the Winnipeg River (BR-6 and CL-1) and along Highway 313 (BR-2 and CL-3) as shown on Figure 3.15. Rock material from the new primary spillway approach and discharge channels excavations will also be used. The use of the east side material sources and excavated rock will not require heavy truck traffic on local roadways.

Alternative borrow sources for rock and clay are located adjacent to the Slave Falls Road at Moose Creek (BR-3 and CL-8 on Figure 3.15). If these locations are utilized, transport of materials to the Project site will be on the Slave Falls Road and Glassco Avenue.

The rock material sources have been evaluated for potential acid rock drainage (ARD). The results indicate that there is negligible potential for the generation of ARD from the rock materials to be used for the Project.

Granular materials for the Project will be sourced from existing aggregate quarries located in the vicinity of Seddons Corner and Milner Ridge. Transport of aggregate materials to the Project site from SG-9 to SG-13 (Figure 3.16) will be on PTH 44, PTH 11, PR 211, PR 520 and PR 313. Granular materials may also be supplied by commercial suppliers operating in other areas such as Birds Hill or Gull Lake.

3.4.13.1 Development of Material Source Areas

Material source areas will be cleared, grubbed and prepared, as required. Organic material and overburden will be removed to expose the desired materials and stockpiled for use in site rehabilitation at the end of the Project.

3.4.13.2 Rockfill/Aggregates

Once the site is prepared, temporary access roads constructed of crushed rock material will be established (initial material will be imported to the site until the source has been sufficiently developed to initiate material production). Holes for placing explosive charges will be drilled using rock drills. Controlled blasting techniques will be used to control fly rock and vibrations. Broken material will be removed following the detonation using backhoes, bulldozers and trucks. The material will be sorted and stockpiled according to material classification and gradations. Sorted and stockpiled materials will then be further crushed, screened and blended to produce finish materials meeting project requirements.

3.4.13.3 Clay

Once the site is prepared, the clay will be excavated using backhoes, laid out in thin windrows, then disced and graded until the clay moisture content nears optimum levels for placement/compaction. The clay will then be loaded into trucks and hauled to the placement area or stockpiled for future use on the project. Stockpile areas will be either in the **borrow area**s or on work areas adjacent to the spillway.

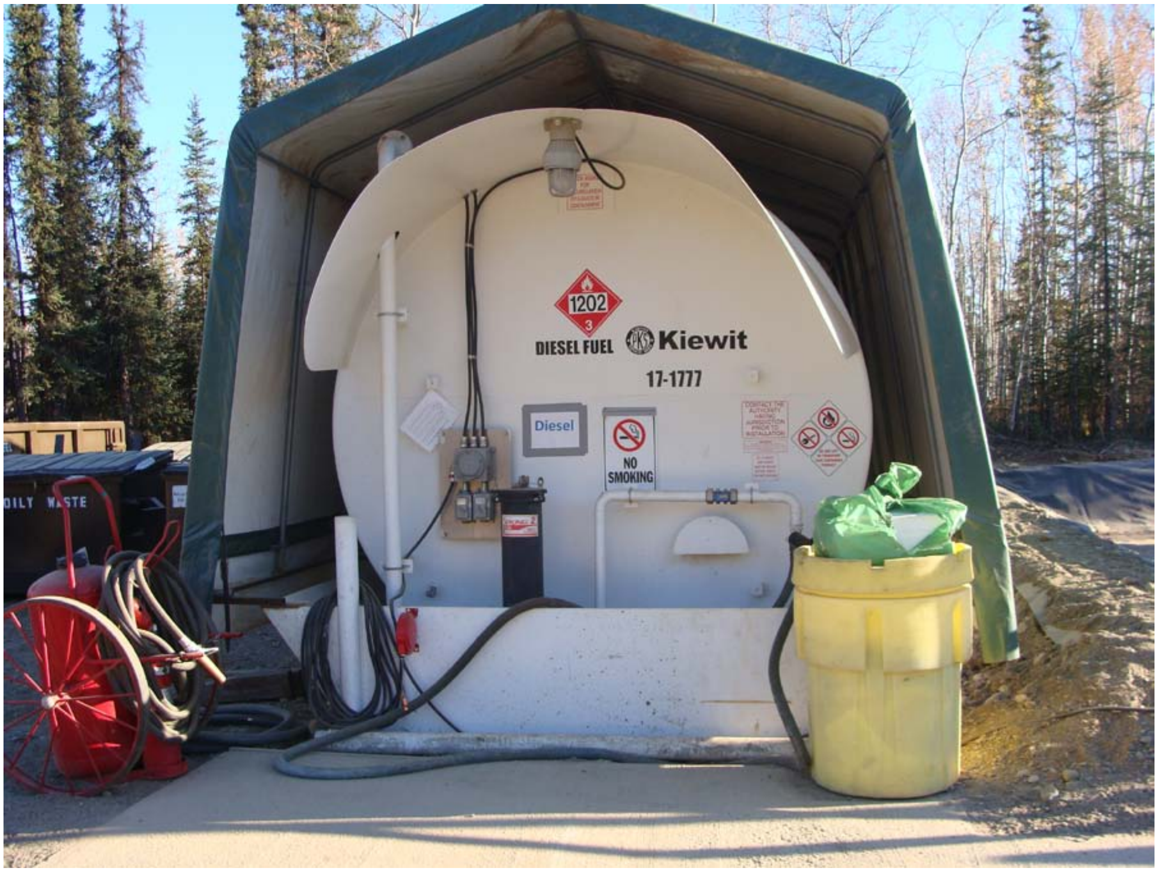
3.4.14 Explosives Storage

Explosives utilized for rock excavation shall be managed and stored as required by the applicable federal and provincial regulations. Items to be considered when determining storage locations are distances to water courses, roadways, occupied buildings and important structures. Types and quantities of explosives are also considered when determining locations.

Use of explosives for excavations in or near water will be in accordance with the Guidelines for the Use of Explosives in or Near Canadian Fisheries Water.

3.4.15 Fuel Storage and Transportation

Fuel handling and storage will comply with Manitoba regulatory requirements respecting storage and handling of petroleum products and allied products. A typical layout of fuel storage and containment is shown in Photo 3.4. The transportation of fuel to the east side may occur through various methods including barging, the use of helicopter, or piping.



Source: Kiewit

Photo 3.4: Typical Fuel Storage

3.5 Construction of Principal Structures

3.5.1 Primary Spillway

Details of the primary spillway are outlined in Figure 3.17A and Figure 3.17B. Construction of the primary spillway will be initiated with the installation of the downstream cofferdam. The cofferdam will be constructed around the work area to enable work on the primary spillway to take place in the dry. The existing rockfill dam will serve as the upstream end of the downstream cofferdam. During construction of the primary spillway the bulk of the seepage through the cofferdam is expected to result from existing seepage through the rockfill dam which is considered to be clean. This seepage water will be kept separate from the work areas through the use of collection sumps and diversion berms and will be discharged directly back to the river. Any seepage which becomes contaminated with sediment beyond that as stipulated in the regulatory requirements will be collected and pumped out to a settling pond/tank located in the east side work area for treatment prior to being discharged back to the natural environment.

During construction of the primary spillway, seepage through the cofferdam will be collected and pumped to a settling pond/tank located in the east side work area.

Once the cofferdam is in place, the foundation area for the primary spillway will be excavated. The excavation will be a drill/blast/excavate operation using explosives to fracture the rock and backhoes/dozers/rock trucks to remove the material. Following completion of the excavation, concrete placement for the primary spillway will be completed. Typical equipment for concrete operations will be used, including cranes, concrete mixers and pumps, transit trucks, welders and hand tools. The primary spillway gates and hoists will be installed following concrete placement. Equipment used for gate installation includes cranes and scaffolding. The primary spillway will be completed and put into service in the fall of 2014.

3.5.2 Secondary Spillway

Details of the secondary spillway are outlined in Figure 3.18A and Figure 3.18B. Construction of the secondary spillway will commence with excavation and foundation preparation. The existing spillway will serve as the upstream cofferdam to enable work to take place in the dry. Seepage will be handled by methods as described for the primary spillway. Concrete placement will be completed followed by gate installation. Equipment used will be similar to that used in the construction of the primary spillway.

3.5.3 Approach and Discharge Channels

Discharge and approach channels will be excavated to direct water flow out of and into the new primary spillway (Figure 3.19). Each channel will be approximately 80 m in width and 200 m in length. The discharge channel will be excavated to elevation 286.0 m and the approach channel to elevation 287.5 m.

The elevation of the discharge channel was chosen to be above the normal **tailwater level** to imitate the manner in which the current spillway discharge plunges off the shelf and across the current fish spawning habitat and to eliminate the need for a cofferdam in identified sturgeon habitat.

The discharge channel will be constructed in the dry inside the downstream cofferdam. Given that the elevation of the discharge channel is above the tailwater level, a cofferdam is not required below the spillway shelf. Holes will be drilled for explosive charges using rock drills.

Controlled blasting techniques will be utilized to control fly rock. Following detonation, materials will be removed using backhoes, bulldozers and trucks. Excess waste material will be hauled to east side material placement areas utilizing temporary haul roads in the work area. The appropriate federal and provincial regulations concerning use of explosives and blasting criteria will be adhered to.

The approach channel may be excavated utilizing a number of potential methods as outlined in Section 3.5.5.

There are no discharge or approach channels required for the new secondary spillway.

3.5.4 Construction Design Flood

The construction design flood magnitude adopted for the temporary construction works for the Project is 2610 cms, corresponding to a 1:50 year flood. The existing spillway will continue to be used to pass flows in excess of powerhouse capacity, until the primary spillway is completed. Once completed, the primary spillway will be used as the primary flood passage structure, and the existing spillway structures will no longer be used. Construction of the Project will not affect the operation of the Pointe du Bois GS, the station's discharge capacity, **frequency** of spill, or the forebay full supply level.

3.5.5 Cofferdams

Three cofferdams are potentially required for the Project, one downstream to allow construction of the primary spillway discharge channel (Figure 3.20), one upstream to allow construction of the primary spillway approach channel (Figure 3.21), and one required for the construction of the powerhouse east abutment transition (Figure 3.22).

It is noted that alternative methods for excavation of the approach channel may be utilized rather than an upstream cofferdam. These are discussed in Section 3.5.6– Alternatives to Upstream Cofferdam

3.5.5.1 Downstream Cofferdam

A cofferdam downstream of the existing rockfill dam is required so excavation of the primary spillway discharge channel can occur in the dry. The cofferdam will be approximately 160 m long with a varying width, depending on the topography of the foundation. Figure 3.20 provides details of the downstream cofferdam. The cofferdam construction will be a double **groin** rockfill dam with the center core zone consisting of impervious clay.

The exterior sides of the cofferdam that are exposed to fast flowing water will be covered with riprap armouring to prevent erosion.

The cofferdam's inner and outer rockfill berms will be placed in the wet, followed by infilling of an **impervious core**. Clay material or alternative impervious geotechnical fabrics may be used as the impervious core. Equipment to be used in the cofferdam construction includes trucks, bulldozers, backhoes, and clamshell excavators.

The cofferdam will extend from a bedrock high-point in the south to the existing spillway structures in the north. To facilitate a water-tight tie-in to the existing structures, a transition will be required consisting of a new structural concrete tie-in wall that will extend from the existing sluiceway to the cofferdam. The structural wall is expected to be approximately 50 m length and a maximum of 10 m tall. The work area for the wall will be protected from river flows with rockfill, placed with the remainder of the cofferdam material.

Work areas within the cofferdam will be dewatered with pumps. Pumps will also be used to manage seepage in the dewatered area. Seepage through the rockfill dam is currently occurring and is considered to be clean. Any seepage through the rockfill dam that occurs during construction will also be considered clean, will be managed separately from other sources of seepage, and will be discharged to the river using pumps. Seepage within the cofferdam, from other sources and which is sediment laden (beyond that as stipulated by regulatory requirements) will be pumped to a settling pond/tank to remove suspended sediment before being discharged to the river.

The cofferdam will be removed prior to placing the primary spillway into service. Material will be removed using backhoes, clamshell excavators and possibly a dragline. Material removed will be re-used, to the extent possible, in the construction of the permanent earthfill dams. Surplus material will be placed in a material placement area in the east side work area. The inner groin and clay will be removed as much as possible using the outer groin for protection from the bulk of the flow from the existing sluiceways and spillway. The outer groin will be removed in flowing water as the potential velocities from the spillway discharge will not allow installation of a turbidity curtain.

A **remnant** of the cofferdam will be left in place. It will be incorporated into the east main dam.

3.5.5.2 Upstream Cofferdam

A cofferdam upstream of the existing rockfill dam (Figure 3.21) may be required so excavation of the primary spillway approach channel can occur in the dry.

The cofferdam could be a double groin rockfill dam with an impervious center core. The exterior sides of the cofferdam that are exposed to fast flowing water would be covered with riprap armouring to prevent erosion.

The cofferdam would be constructed in the wet, with placement of the inner and outer rockfill berms followed by an impervious core. Clay material or potentially impervious geotechnical fabrics may be used as the impervious core. Equipment to be used in the cofferdam construction includes trucks, bulldozers, backhoes, and clamshell excavators.

Work areas within the cofferdam will be dewatered with pumps. As well, pumps will be used to manage seepage in the dewatered area. Any seepage which becomes contaminated with sediment beyond what is stipulated in the regulatory requirements will be collected and pumped to a settling pond/tank located in the east side work area for treatment prior to being discharged back to the natural environment.

The cofferdam will be removed prior to placing the primary spillway into service. Material removed will be re-used, to the extent possible, in the construction of the permanent earthfill dams. Surplus material will be placed in a material placement area in the east side work area. A **silt curtain** will be used to minimize sediment release to the river. Material will be removed using backhoes, clamshell excavators and possibly a dragline. The inner groin and clay will be removed as much as possible using the outer groin for protection from the bulk of the flow from the river.

Alternative methods for the construction of the cofferdam will be considered by the contractor. The decision to use alternative means of constructing the upstream cofferdam will be determined by Manitoba Hydro working in partnership with the contractor to determine the most feasible option. The upstream cofferdam configuration as outlined above represents the option with the largest footprint and as such has been the footprint provided in the fish habitat compensation plan. Some potential alternatives to the rockfill and clay core cofferdam are outlined in Section 3.5.6.

3.5.5.3 Cofferdam for Powerhouse East Abutment Transition Structure

A cofferdam is required to construct the powerhouse east abutment transition structure (Figure 3.22). This concrete structure provides the impervious link from the south dam to the existing powerhouse. It is expected that this work will occur in Phase 5.

The small cofferdam will allow dewatering of the work area during construction and will extend from the powerhouse to the shore in a curved shape approximately 40 m long. The cofferdam may be constructed in water of approximately 3 meters depth and would be constructed with an outer rockfill groin and a clay core. A silt curtain will be installed for the duration of the cofferdam to contain the installation site.

The cofferdam will be constructed in the wet, with placement of the inner and outer rockfill berms followed by an impervious core. Clay material or potentially impervious geotechnical fabrics may be used as the impervious core. Equipment to be used in the cofferdam construction includes trucks, bulldozers, backhoes, and clamshell excavators.

Work areas within the cofferdam will be dewatered with pumps. As well, pumps will be used to manage seepage in the dewatered area. Any seepage which becomes contaminated with sediment beyond that as stipulated in the regulatory requirements will be collected and pumped to a settling pond/tank for treatment prior to being discharged back to the natural environment.

3.5.6 Alternatives to Upstream Cofferdam

3.5.6.1 Rockfill Blast Mattress

An alternative to the upstream cofferdam for the construction of the new primary spillway approach channel will be the construction of a temporary rockfill **blast mattress** to facilitate the drilling and blasting of the approach channel (Figure 3.23). The area to be blasted would be filled with rock obtained from the discharge channel excavation. Drilling through the rockfill mattress would be undertaken to place explosives to fracture the rock underneath the mattress.

The rock would then be removed from the formed approach channel using equipment such as backhoes and clamshell excavators. The removed rock would be re-used, to the extent possible, in the construction of the permanent earthfill dams. Surplus material would be placed in a material disposal area on the east side.

3.5.6.2 In-Water Blasting/Excavation

In-water blasting may be utilized to construct the primary spillway approach channel. The in-water blasting would be undertaken in accordance *Department of Fisheries and Oceans Guidelines for the use of Explosives in or near Canadian Fisheries Waters* (Wright and Hopky 1998).

Drilling operations will be carried out from barge decks utilizing the following procedures:

- Placement of silt curtain around work area to be effected;
- Placement of stabilizers to fix barge in position;
- Utilization of hydraulic and/or pneumatic drills working from the barge to drill cased holes to depth;
- Placement of bubble curtains around the area to be blasted to exclude fish from the area and decrease risk of damaging overpressures. Curtains would be installed in such a way as to remove fish from the area;
- Loading of drill holes from a barge and blasting of rock following DFO guidelines for working within/near waterways, which stipulates the usage of low nitrate explosives; and
- Removal of blast rock will be done with equipment such as clam shell equipped cranes and/or excavators to barges for hauling to a material placement area on site.

3.5.7 Earthfill Dams

Earthfill dams will be constructed immediately downstream of the existing spillways, sluiceway and rockfill dam to connect the spillways and tie into the existing facilities and river banks (Figure 3.24). There are four sections of earthfill dams as follows:

- East abutment dam–ties into the east shore of the Winnipeg River and connects to the new primary spillway;
- East main dam–connects the new primary and secondary spillways and ties into the remnants of the existing rockfill dam and cofferdam;
- West main dam–connects the new secondary spillway and ties into the higher bedrock outcrop east of the intake channel north of the east gravity dam. The west main dam will also transition into the south dam; and

- South dam–constructed adjacent to the existing east gravity dam on the downstream side, tied into the powerhouse by a new concrete gravity wall and transitioned into the west main dam.

The earthfill dams will be zoned earthfill embankments consisting of an impervious core with granular and crushed rock filters and outer rockfill shells. The earthfill dams will generally be founded on bedrock and foundation **grouting** will be used to minimize seepage under the dams.

The east abutment and east main dams will be constructed while the primary spillway is being constructed (Phase 4). Material will be hauled from clay and rock sources on the east side using trucks. Temporary roads made of crushed rock material will be located within the work area connecting the borrow sources to the construction site. Material for the earthfilled dams will likely be installed using trucks, dozers and backhoes for placement and shaping and roller type equipment for compaction. Earth scrapers may also be used for hauling and placement of clay materials.

The west main dam and south dam will be constructed while the secondary spillway is being constructed (Phase 5), using the same type of equipment as used for the east abutment and east main dam construction. Materials for these earthfill structures will likely be obtained from sources on the west side of the river; however, sources on the east side may be utilized. Material originating from the east side will likely be hauled using temporary access roads in the work areas and also the bridge of the newly constructed primary spillway. Material originating from the west side will be hauled across the vehicle access bridge and temporary roads from the center island across the rock shelf immediately downstream of the existing spillway which serves as the cofferdam.

The earthfill dams will be built in the dry, either behind newly constructed cofferdams or existing structures which serve as cofferdams.

3.5.8 Transition Structures and Wing Walls

Transition structures are concrete **gravity structure**s constructed as a transition between the **earth structure**s and the concrete structures. Transition structures will be required on the west and east sides of the new primary and secondary spillways and on the east side of the existing powerhouse. Wing walls will be used to contain the earth dams where the dams connect to the concrete structures. Construction methods used for these concrete structures are similar to that undertaken for the primary and secondary spillway structures.

3.5.9 Inner Forebay Improvement to Existing Structures

To accommodate the potential of forebay **surcharge** in large flood conditions or in the case of a sudden powerhouse shut down, new parapet walls and curbing will be constructed. These features will be constructed of concrete and/or steel.

The installation of anchors and other concrete rehabilitation works to address potential forebay surcharge will be completed on the west gravity dam and in the powerhouse.

3.6 Decommissioning

The scope of decommissioning works includes demolition or removal of the existing spillway facilities and the decommissioning and rehabilitation of construction related infrastructure.

3.6.1 Existing Structure Removal

Decommissioning of existing structures will involve the following actions:

- The existing spillways and sluiceway will be decommissioned, with the stoplogs and hoists removed following completion of the new secondary spillway and water retaining structures;
- The existing spillways and sluiceway railings and decks will be removed;
- The piers for any spillway bays and the sluiceway upstream of the new secondary spillway will be removed to the elevation of the existing rollway (which will stay in place) in order to limit headloss; based on construction methodology, blasting, hoe ramming, wire saw, and/or underwater excavation may be required.
- The piers for the other spillways, sluiceway, curved spillway, and east gravity dam will remain in place as is (extending above the water level); and
- Any portions of the existing rockfill dam that remain after the new primary spillway approach channel excavation is complete will be incorporated into the new earthfill dam, allowing water to flow unimpeded to the new primary spillway.

3.6.2 Rehabilitation of Disturbed Areas

Material source areas, storage areas, **quarry site**s, work areas, temporary access roads, barge landing sites, winter road access, downstream road/bridge access, settling ponds, and on-land disposal sites will be rehabilitated in accordance with best management practices and regulatory requirements.

In preparation for the rehabilitation, all work areas will be cleared of construction related buildings, equipment, debris, and other construction waste. Organic materials that are stripped and stockpiled during initial work area site preparations will be tested and amended with soil improvements as necessary, and will be redistributed to areas designated for re-vegetation. The re-vegetation strategy will take into account wildlife habitat preservation and enhancement, buffer strips for visual screening, and overall drainage and water quality management objectives for areas disturbed during construction. Re-vegetation will be undertaken in target areas, in accordance with best management practices, using a combination of native plants and complementary non-invasive introduced species. A **monitoring** and follow up program will be implemented post-restoration to aid in success of the re-vegetation program.

3.7 Workforce

The on-site contractor workforce is estimated to consist of about 3300 person months with a peak workforce of about 200 people. In addition, the Manitoba Hydro on-site workforce is estimated to be about 1000 person months with a peak workforce of about 25 people. There will also be about 15 service contract people on-site during construction.

An on-site construction **camp** will not be required. Accommodations for the workers could include local workers homes, local and nearby community facilities, renting of existing commercial facilities, renting of local houses / cottages and/or the contractor developing a work camp outside Whiteshell Provincial Park. Workforce estimates are shown on Figure 3.25.

3.8 Traffic

The Project is expected to generate additional traffic volumes, with associated noise and inconvenience, for the delivery of materials and equipment and the transportation of personnel during Project construction. A shuttle bus service will be used from a marshalling area outside Whiteshell Provincial Park to transport workers to and from the construction site to reduce the amount of traffic on PR 313. An estimate of forecasted traffic on PR 313 is shown on Figure 3.26

Heavy truck traffic on PR 313 for hauling clay, rock and granular materials to the site could vary depending upon which of the potential borrow sources that have been identified are approved and used.

Truck traffic will primarily be associated with hauling granular borrow material from Seddons Corner as well as from the existing rock quarry (BR-2) and clay source CL-3, adjacent to PR 313.

During the peak construction periods, such as in 2013, construction related traffic may increase average daily traffic from approximately 380 vehicles per day to approximately 650 vehicles per day. This traffic increase estimate is based on an assumption that 75% of contractor labour-personnel using commuter buses and 25% of contractor labour-personnel and supervisory-personnel using personal vehicles. During non-peak construction periods, traffic increases are expected to be about 15% to 20% of existing traffic volumes and predominately associated with personnel transportation.

The exact volume of daily traffic is dependent on the location of borrow sources used and the varying demand for material. Manitoba Hydro and the contractor may endeavour to reduce peak material hauling requirements through stockpiling. This provides the opportunity to reduce the construction related peak daily traffic volumes.

There are also material sources located adjacent to the Slave Falls Tramway. If this material is utilized, the earthfill related traffic currently noted to travel along PR 313 would occur along the Slave Falls access road and on Glassco Avenue. This traffic would be managed appropriately and could include the use of barriers, signage, and flag personnel.

3.9 Navigable Water Protection Measures

Assessment of public risk and the selection of appropriate control measures for the Project have been considered under the guidance of *Transport Canada Guidance Document for Water Control Structures*, the *Ontario Power Generation Guidelines for Waterways Public Safety* and *Manitoba Hydro's Public Waterway Safety Management Guidelines*.

To accommodate waterway navigation during the construction of the new spillway, the use of physical barriers such as booms and buoys, along with the posting of public warning signage will assist in mitigating public exposure to potential hazards. The Project requires access to the east bank of the Winnipeg River for construction which will entail the use of barges and motor boats for transportation of personnel, equipment and materials. A preliminary proposal on the placement of booms and buoys is shown on Figure 3.27. The design was created in accordance with the requirements identified under the *Navigable Waters Protection Act*, *Canadian Private Buoy Regulations* and *Canadian Coast Guard Regulations*. Warning, danger and extreme danger signage will be used at various locations upstream and downstream of the Pointe du Bois GS to educate the public on the potential hazards. Barge and motor boat operations will be in accordance with *Transport Canada's Marine Safety Guidelines*.

The Winnipeg River is identified as a navigable waterway both upstream and downstream of the Pointe du Bois GS. Pre-established portage routes and boat launches exist on the west side of the river, currently accommodating motorized and non-motorized vessel activity. As the existing boat launch located on the northern peninsula is located within the construction zone of the Project, it will be closed to public during construction with boaters being re-directed northwest to a boat launch site at Sawmill Bay. Alternate portage routes will also be required during construction as the upstream access point was the boat launch that will be closed during construction.

The re-direction to the Sawmill Bay site can accommodate the portage as there exists a network of roadways and standard signage to provide direction. The portage site downstream of the Pointe du Bois GS at Eight Foot Falls will continue to be accessible during all phases of the Project.

It is noted that, a number of leased boat houses are located upstream of the west work area and these boat house owners will not have vehicle access to their facilities during construction.

Recognizing the ongoing risk associated with navigable waters following construction, safety booms, buoys and signage will continue to be used to assist in the prevention of inadvertent access to exclusion zones.

Safety booms and buoys will be designed for installation on an annual basis in accordance with the boating season for the region. Appropriate signage informing the public to the various levels of danger and potential hazards will be posted in locations visible from land and water. Manitoba Hydro is exploring various options regarding boat launch and portage facilities during and following construction to meet the needs of the local stakeholders. Manitoba Hydro is also conducting a safety and risk audit on the site under Manitoba Hydro's new Public Waterway Safety Management Guidelines which may result in further considerations on all safety measures.

As the Project continues to advance forward, ongoing review and considerations will be given to the waterway management plans as details are finalized.

3.10 Operation

3.10.1 Existing Operations

The current Pointe du Bois GS is operated in a **run of river** mode (there is no storage of water). Flows in excess of powerhouse capacity are passed through the existing spillway, such that the outer forebay is controlled at or near the target Full Supply Level (FSL) elevation of 299.1 m. The historical forebay operating levels are shown in Figure 3.28.

The maximum safe flood capacity of the Pointe du Bois GS is considered to be approximately 2,850 cms, or about a 1:90 year flood. This capacity includes all the spillways, the sluiceway and powerhouse capacity that can be relied upon in emergency conditions. The capacity of the existing spillways at FSL is approximately 2,625 cms, or about a 1:50 year flood. With all the powerhouse units, spillway bays and sluiceway operating at maximum discharge, the total capacity of the station would be as high as approximately 3,300 cms, or a 1:200 year flood.

The inflows at Pointe du Bois are mainly regulated by several upstream **reservoir**s operated within the Winnipeg River basin to satisfy a diverse set of interests including flood control, hydroelectric generation, recreation, fisheries, and cottagers. The Winnipeg River and its main tributary, the English River, drain a basin that covers an area of approximately 150,000 km^2. About two-thirds of the basin lies within

Northwestern Ontario. The Lake of the Woods Control Board (LWCB) was formed in 1919 and is responsible for managing the outflows from Lake of the Woods and Lac Seul into the Winnipeg River. Its purpose is to control and regulate certain major waterways in the basin according to the various interests.

3.10.2 New Spillways Design Criteria

The inflow design flood (IDF) of 5,040 cms for the project is based on a "High" incremental consequence classification according to the current dam safety guidelines. The primary and secondary spillways in combination will be capable of passing the IDF without surcharging the forebay above the IDF level of 299.7 m, to ensure that sufficient **freeboard** remains on the dams to contain wind generated waves. The Canadian Dam Association Guidelines classify projects based on the potential incremental consequences of failure. Projects are classified as to the relative severity of consequences of dam failure, incremental to the impacts which would occur under the same natural conditions (flood, earthquake or other event), but without failure of the dam.

Additionally, the spillways are designed to pass at least the 1:1000 year flood of 4,280 cms, exclusive of powerhouse discharge, without surcharging the forebay above the FSL of 299.1 m.

Table 3.2 outlines some of the key design parameters and design criteria for the new spillways.

Table 3.2: Summary of Key Parameters and Design Criteria for the Project	
Parameter	**Value**
Full Supply Level (FSL)[1]	299.1 m
Inflow Design Flood (IDF) Level[2]	299.7 m
Minimum Spillway Capacity @ FSL	4,280 cms
Minimum Inflow Design Flood Capacity (IDF)[2]	5,040 cms
Spillway Discharge Capacity at FSL Primary spillway Secondary spillway	4,800 cms total 3,670 cms 1,130 cms
Spillway Discharge Capacity at IDF Level Primary spillway Secondary spillway	5,430 cms total 4,030 cms 1,400 cms

[1]Full Supply Level (FSL)–the normal controlled level of the outer forebay

[2]Inflow Design Flood (IDF) and IDF Level – the capacity required for the passage of floods, selected in accordance with current CDA guidelines. The IDF Level is the maximum elevation that the reservoir would rise to during passage of the IDF.

3.10.3 Operations during Construction

Construction of the Project will not affect the operation of the Pointe du Bois GS, the station's discharge capacity, frequency of spill, or the forebay full supply level. The existing spillway will continue to be used to pass flows in excess of powerhouse capacity, until the primary spillway is completed. However, under normal operating conditions, opportunities to pass flood flows in a manner to minimize risk to construction activities, without affecting forebay levels, such as using spillway bays farther from the construction areas, may be considered. Once completed, the primary spillway, will be used as the primary flood passage structure, and the existing spillway structures will no longer be used.

3.10.4 New Spillway Operation

After construction of the new primary and secondary spillways, flows in excess of powerhouse capacity will be passed through new spillways, and the outer forebay will continue to be controlled at or near the existing target full supply level (FSL) elevation of 299.1 m. The operation of the Pointe du Bois GS and frequency of spill will not change as a result of the construction of the new spillway.

The spillways and associated approach and discharge channels will provide the means to convey water from the outer forebay when flows exceed powerhouse capacity. Additionally, the spillways will assist in controlling the outflows and reservoir levels at the site, as well as protecting the dams and principal structures in the event of unexpected loss of powerhouse capacity. The discharge channel will convey the primary spillway discharge to the **tailrace**.

The primary spillway will be equipped with automated gates and dedicated hoists for each of the five gates, which will be operated sequentially to adjust for varying river discharge conditions.

The secondary spillway will be required to provide supplemental spillway capacity above approximately 3,420 cms. Under larger floods, additional spillway bays will be opened as required to protect the station and maintain control of the reservoir. If spillway discharges above 4,800 cms are required, the forebay will begin to surcharge above the full supply level as flows increase through the fully open spillway bays of both structures. Under such very infrequent, higher flow conditions, the Project is designed to allow for a modest amount of surcharge while ensuring that sufficient freeboard remains on the dams to contain wind generated waves. The Project is designed to safely pass floods under a maximum surcharge of about 0.6 m at which time the forebay would reach the IDF Level of 299.7 m and the combined discharge capacity of the primary and secondary spillways will be equivalent to the inflow design flood (IDF) of 5,040 cms. A nominal temporary surcharge of 0.1 m above FSL (299.1 m) will be assumed to account for difficulties in precisely balancing hourly variations in inflow and outflow.

The spillways will also be tested periodically to verify proper operational capability.

3.10.5 Forebay Level

The existing forebay will continue to operate within the historical operating range, shown in Figure 3.28, and the forebay area will not change as a result of the Project. Preliminary existing and post-project spillway discharge capacity **rating curve**s are shown in Figure 3.29. No minimum operating level is specified in the *Water Power Act* License, as the Pointe du Bois generating station is considered a run-of-river plant, and **drawdown** of the forebay to release stored water is not normally required.

3.10.6 Operations under Abnormal Conditions and Emergency Operations

The Pointe du Bois GS may operate differently under abnormal conditions. Abnormal operating conditions, such as major overhauls, scheduled outages for maintenance or load rejection (generating units tripping off), could result in flows and levels fluctuating higher or lower than would normally occur. This could result in forebay level increases or drawdown greater than normal conditions. These effects would be similar or more pronounced for the existing spillway arrangement in comparison to the post construction condition, where push button operation of the primary spillway could mitigate the forebay variation.

During potential emergencies, such as a risk of imminent failure of one of the dams, or a halt in flow through the generating station due to a downstream accident, rapid forebay drawdown or surcharging may occur. In extenuating circumstances such as these, the forebay level could rise above the FSL. At the same time, the required emergency flow increases or decreases, including flow reductions to zero if necessary, would result in greater changes in the tailwater levels than would be experienced during normal operations. The likelihood of this occurrence is small.

3.11 Maintenance Procedures and Regulatory Compliance

Manitoba Hydro will operate the Project in accordance with the terms and conditions of the *Water Power Act* License, *the Environment Act* License and any other regulatory requirements and licenses that may apply.

Manitoba Hydro is committed to the practice of environmental stewardship and will ensure that employees operating the station will continue to integrate environmental practices and enhancement measures into their daily operations in accordance with its environmental management system (EMS).

Manitoba Hydro makes safety a top priority in every aspect of our operations. Corporate safe work procedures that have been developed will be applicable to the Project.

3.11.1 Vegetation Management/Landscaping

For the safe and efficient operation of the spillway and associated facilities, vegetation management will be undertaken for right-of ways, fire breaks (fire guards), station yards and earth-fill dams. Landscaping, erosion controls, pest control and drainage management will all be components of a vegetation management program.

Activities would include the removal of new growth, cutting grass and spraying for disease and insect control. Equipment used would include spot sprayers, water trucks, tractors and mowers. Mechanical means of vegetation control would be the preferred method and chemicals would only be used if mechanical methods were unsuccessful.

3.11.2 Water Management

Operation the Pointe du Bois GS requires monitoring of water availability and other relevant components such as water levels and ice thickness information. This activity is performed to ensure that water is available for downstream users as well as for power generation and to ensure that impacts from ice processes and extreme flow conditions (high or low) can be managed.

3.11.3 Plant Equipment Rehabilitation

Spillway equipment will need to be overhauled or replaced at the end of its useful life.

Equipment is monitored and maintained to operate in compliance with manufacturer and corporation standards. Leaks, mechanical failures and reduced performance are recorded and remedial actions taken as needed.

Exterior structures exposed to the elements will be maintained and replaced as required.

Where work is being undertaken adjacent or near to water, appropriate precautions will be taken to ensure that harmful substances do not enter the aquatic environment.

3.11.4 Hazardous Materials/Petroleum Handling and Storage

A spill response plan for all operating and maintenance activities will be kept in the control room, engineering office, and with the emergency response crews.

3.11.5 Access Roads Maintenance

The new re-alignment of PR 313 will be part of provincial road network

During the operation of the spillway, Manitoba Hydro access roads and trails will require regular maintenance year round to ensure access to the spillway and associated sites. Activities will include road inspection, repair, erosion control, dust control, snow removal, and maintenance of ditches and culverts.

3.11.6 Work Yards – Post-Construction

Contractors may be required for maintenance of the structure in the future. Construction equipment, machinery and parts, and any other equipment required for major maintenance programs will be marshalled and stored at designated sites. These sites will comply with all regulatory requirements. The sites will be kept tidy, organized and a current inventory and materials management program will be maintained.

Maintenance of the spillway and infrastructure will require gravel, sand, rockfill, road repair, and road surface material stockpiles. Stockpiles will be located within Manitoba Hydro's work area.

3.11.7 Spillway Structures

Concrete structures will infrequently need maintenance to ensure safety and effective operations. Examples of this maintenance could include: piezometer replacements, grouting and exterior concrete repair work.

Activities associated with these repairs could include drilling, changes in forebay water levels, and working in the water. All activities will be conducted as required by regulatory requirements at the time the work is conducted.

3.11.8 Earth Dams

Maintenance of earthfill structures will include vegetation management (so that the impervious core is not damaged by the roots of trees and shrubs). Also general repairs will occasionally need to be done to earthfill dam **crest**s due to settlement or to the protective riprap due to erosion.

3.11.9 Distribution Lines

During operations of the spillway, distribution lines will be needed for onsite storage buildings. Maintenance of these distribution lines could include changeover of poles, insulators, pole mounted transformer and other hardware. Only PCB-free oil will be used in distribution line infrastructure.

3.11.10 Waste Management

During operation of the spillway, wastes will be generated from domestic sources, wood, scrap metal, surplus equipment, packaging materials, light bulbs and solvents and other cleaners. Station recycling programs provide opportunities to reduce, reuse and recycle the wastes whenever possible. Wastes will be stored in protected areas and disposed of regularly to reduce potential for unsafe conditions and negative aesthetic impacts.

Non-hazardous waste would be diverted from landfills when possible for reuse and recycling. Where landfill disposal is used disposal methods must comply with local and provincial regulatory requirements.

Hazardous wastes will be stored in approved bins, and handled, transported and disposed of in compliance with regulatory requirements.

3.11.11 Emergencies, Accidents and Malfunctions

An emergency preparedness plan will be prepared for the Spillway Project to deal with potential major emergency scenarios, which may occur during the life of the plant. Manitoba Hydro will also prepare response plans to deal with emergencies such as oil spills. Manitoba Hydro will ensure that staff is trained in the implementation of the procedures.

The systems and equipment necessary to protect the integrity and safety of the facilities in these emergency situations are incorporated in the final design.