3.0 CONSTRUCTION – COMPONENT-SPECIFIC INFORMATION

This section describes the pipeline construction activities that will be required for the new mainline segments, laterals, and connections, as well as for the minor route realignments and pipeline installations that will be associated with the conversion portion of the Project. The section also includes information on the construction of:

- pump stations
- meter stations
- tank terminals
- marine terminal

3.1 NEW PIPELINE CONSTRUCTION

3.1.1 Construction Execution

A pipeline construction execution strategy is being developed. At this stage in Project planning, approximately five prime pipeline contractors are expected to be required for pipeline construction.

The prime pipeline contractors will be responsible for constructing approximately 20 construction spreads but may sub-contract some activities, such as for pipe stringing, hydrostatic testing, drain tile repair, reclamation, sheet piling, de-watering and HDD activities.

Energy East will award separate service contracts for third-party NDE.

The Alberta and Ontario East segments will each have two construction spreads. These will be constructed successively by a single contractor in each province. These contractors will also be used to construct the New Brunswick segment. Summer construction was selected because of primarily dry terrain and scheduling requirements for New Brunswick.

In Québec, three contractors will work to complete the construction of 14 spreads. The contractors will begin north of the St. Lawrence River and work their way eastward toward the river. One of the three contractors will focus construction of urban areas in and around Montréal and Lévis.

The New Brunswick segment will have four construction spreads that will be constructed by the two contractors working on the Alberta and Ontario East segments. Construction in New Brunswick is scheduled to take place in both summer and winter based on contractor and personnel availability, with wet areas primarily targeted for winter work.

3.1.2 Construction Activities

Energy East will employ conventional construction methods and industry best practices for pipeline construction. Construction activities will include:

- mobilizing to site
- clearing and mulching
- stripping and conserving top soil
- trenching and blasting
- drilling trenchless crossings
- grading, pipe hauling, stringing and bending
- welding
- coating
- installing cathodic protection systems
- adding buoyancy and settlement controls
- lowering-in and backfilling
- performing and inspecting NDE
- hydrostatic testing and doing tie-ins
- grading and fencing
- doing a pre-start up safety review (PSSR)
- commissioning and starting up the pipeline
- doing final clean-up and reclaiming temporary infrastructure
- demobilizing

Construction will be done in accordance with the applicable TransCanada specifications, standards and operating practices and with the EPPs for this Project.

3.1.3 Right-of-Way Preparation

The pipeline ROW will be cleared in accordance with the EPP for the Project. Grading requirements along the ROW will vary from no grading in flat or wetland areas, to grade cuts in some localized areas.

Grading will depend on factors such as slope angles, soil types and ice content during winter backfilling activities. Grading of the ROW will be performed to the extent necessary to accommodate field pipe bending limits and ensure the safe movement of pipe, equipment and personnel along the ROW.

In agricultural lands and unfrozen conditions, topsoil conservation will be performed to ensure that topsoil is stripped, stockpiled, and replaced in a manner which prevents the loss of topsoil, mixing with subsoil, or degradation of soil quality.

See Appendix 7-5 for typical drawings that show ROW use during construction, including the minimum surface disturbance technique and both cultivated and non-cultivated lands under frozen and unfrozen conditions.

3.1.4 Stringing, Welding, NDE and Coating

Pipe will be trucked from local stockpile sites and strung along the ROW.

In order for the pipeline to conform to the profile of the centerline or directional changes, forged fittings or a bending machine will be used to bend the pipe along the ROW. The individual pipe joints will then be lined-up, clamped in place and welded by either mechanical or manual welding methods. Welding procedures will be determined during detailed design. The joining program and NDE of welds will comply with the requirements of the OPR and CSA Z662-15.

Welds will undergo NDE and once validated, will be coated. See Section 2.9, Engineering Design, for additional information on the primary specifications and standards to be used for joining and coating.

3.1.5 Trenching, Blasting, Installation and Backfill

Once the centerline of the pipeline has been staked, a single trench using conventional open trench pipeline construction methods will be created. Hydraulic excavators and/or trenching machines will be used to excavate the trench to the specified dimensions as determined during detailed design. In frozen ground and rock conditions, the ditchline may be ripped before trenching or blasting as required. The excavated materials from blasting may be crushed, stockpiled and where suitable, used as a base for laydown and facilities. If materials are not suitable then they will be removed from their location and disposed of in a pre-approved disposal site.

Open trench installation will take place in accordance with the procedures described in the EPP for the Project. The minimum width of the trench and depth of cover to the pipe may be found in Appendix 4-1,Typical Drawings.

Measures such as the installation of rock shielding or wood lagging may be used, as required, to ensure that the pipe and pipe coatings are not damaged during lowering-in and backfill operations.

After the joined pipeline is lowered into the trench, the pipe will be covered with suitable native backfill material. In frozen conditions, the settlement of backfill materials will depend on, among other things, the ice content of the soil placed in the trench. Ditch settlement in areas with high ice content soils may be offset with varying amounts of suitable material obtained along or adjacent to the ROW or by imported fill.

At any given time during pipeline construction activities, the length of open trench and pipe stringing gaps will be reduced, to the extent practical, to minimize environmental, socio-economic and safety concerns.

3.1.6 Cleaning and Pressure Testing

The pipeline will be cleaned with a in-line cleaning tool to remove construction debris when construction is complete. This debris will be collected and disposed of in accordance with applicable regulations and the hydrostatic test plans for the pipeline portion of the Project. These plans will be completed during detailed design and will include line pipe and related components.

Pre-fabricated components, such as aboveground risers, valve assemblies and forged fittings with associated piping, will be tested in accordance with the pressure testing requirements in Clause 8 of CSA Z662-15, prior to arrival on site.

Hydrostatic test plans will require, among other things:

- water sources, dewatering sites and where required, temporary access
- proper lighting and shelters for personnel during testing
- appropriate documentation to facilitate leave-to-open

Water for hydrostatic testing will be drawn from approved sources and after use, the test water will be disposed of in accordance with the applicable regulatory requirements. The test water will be transferred from one test section to another, when and where practical.

3.1.7 Buoyancy and Settlement Controls

The pipeline backfill must be suitable material and have a sufficient depth of cover to counteract the buoyancy forces of the pipe. When a pipeline is placed in an area with light soil backfill or a water table near grade, the pipeline will require buoyancy control.

There are several buoyancy control options. Each option has advantages and disadvantages based on location, soil type, and construction access. The final buoyancy control design might use a combination of options to optimize the design and costs.

3.1.8 Pipeline Watercourse Crossings

Energy East's process for selecting watercourse crossing locations and techniques was developed using industry accepted design and installation practices, upgraded to reflect site-specific assessments and the Fisheries and Oceans Canada (DFO) *Measures to Avoid Causing Harm to Fish and Fish Habitat* (which have replaced DFO Operational Statements).

For a more detailed description of the watercourse crossing method selection criteria for the Project, refer to Volume 4, Section 2.6, Watercourse Crossings.

See Figure 3-1 for a decision tree illustrating the selection process. An overview of watercourse crossing construction follows.

Energy East will consider the following criteria in selecting a pipeline crossing method:

- watercourse parameters
- fisheries information
- integrated construction/mitigation strategies

3.1.8.1 Trenchless Crossings

Trenchless crossings, including HDDs, are generally used for watercourses with flows, water depths and channel widths that cannot be effectively isolated.

HDD crossings require two work areas, one on each side of the watercourse (i.e., the entry and exit sides), with access for vehicles and equipment between the two work areas. The access may be across the watercourse or will use existing infrastructure where available, on or near the pipeline ROW. Work pads will be established on both the entry and exit sides. The entry side will accommodate the drill site equipment, including the drilling rig, drill pipe, and mud tank. The exit side will be prepared like a typical ROW and will be used to string and weld the pipe. After the borehole reaches its design size through successive reaming, the pipe will be pulled through the drill path. Drilling mud is circulated under pressure through the entire operation, which goes round-the-clock and is monitored continuously.

Once the HDD is completed, the drilling mud and cuttings will be disposed of at an approved disposal site.

HDD piping will be hydrostatically tested twice – once before the pipe is pulled through the drill path and again after installation and connection to the tie-in piping.

3.1.8.2 Trenched Crossings

Trenched crossings include open cut and isolated crossing methods. These techniques will be accompanied by an integrated suite of construction activity-related and physical works mitigation measures to reduce potential adverse effects on fish and fish habitat. For details on these measures, see the EPPs for the Project (ESA Volume 21, Sections 5 and 6).

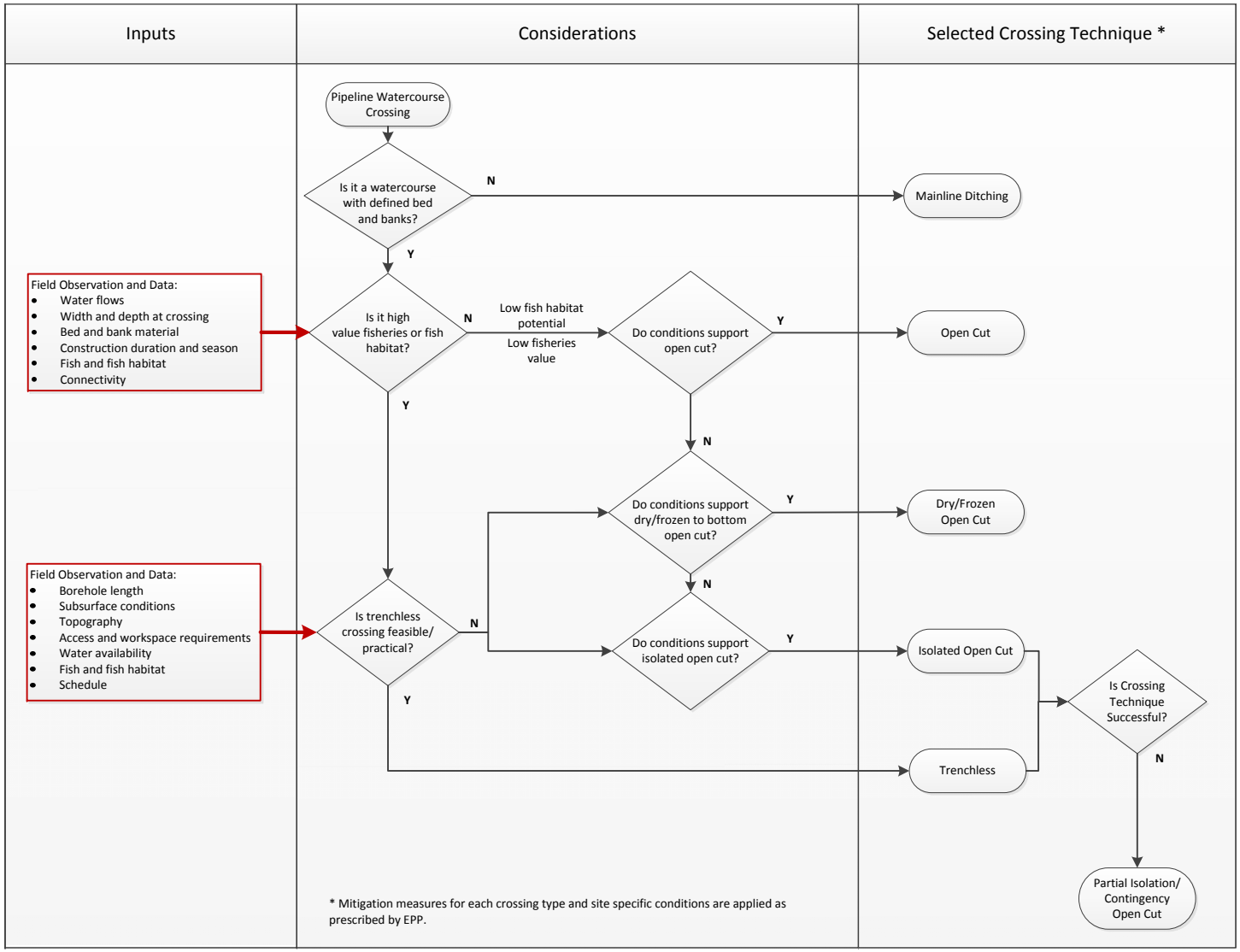

Figure 3-1: Watercourse Crossing Selection Process (CA Rev. 0)

Isolated crossing methods will be used for watercourses with open water or under-ice flow that can be handled by isolation equipment. Isolated methods, using dams and pumps or flumes, divert flow around or across a construction zone to allow trench excavation, pipe installation and backfilling to occur away from flowing water. Both require vehicle access and work areas. Silted water is typically left in the trench during these activities and then pumped onto a nearby vegetated or snow-filled area, rather than back into the watercourse. If the flow or watercourse conditions at the time of construction do not enable the implementation of practical flow isolation, an open cut method will be used as a contingency to complete the crossing.

In addition to the TWS associated with the construction ROW, open cut crossings require additional TWS for spoil, material and equipment stockpiles, pipe preparation and access to both sides of the watercourse. However, open cuts typically have a smaller footprints compared to other crossing methods and their use is not limited by water flow volumes or watercourse widths. They can generally be completed more quickly than the other methods.

3.1.8.3 Equipment Crossings at Watercourses

Where the need for a temporary equipment crossing structure is identified, one or more of the following techniques will be used:

- snow/ice crossings for winter construction
- clear span or portable bridges for summer and winter construction
- temporary culverts

Confirmation of the actual crossing method will include an assessment of site conditions at the time of installation, and will reflect the judgment of experienced personnel at the site. The assessment will take into account:

- terrain
- soil conditions
- the intended use and duration of the crossing
- water flow properties at the site

During detailed design, typical drawings for the proposed crossing types will be prepared. Crossing-specific drawings will only be developed where required.

3.2 CONVERSION PIPELINE CONSTRUCTION

3.2.1 Construction Execution

A pipeline construction execution strategy is being developed for the conversion portion of the Project. At this stage in Project planning, approximately five prime

pipeline contractors are expected to be required to complete construction of the conversion portion of the Project.

The conversion portion of the Project will be constructed by approximately 20 spreads with up to 250 workers per spread.

The work schedule will alternate between winter and summer construction periods, based on regional conditions and timing restrictions associated with planned outages on the TransCanada Mainline.

Construction will take place in multiple locations simultaneously across the conversion segments.

3.2.2 Work on In-Service Operating Systems

On the conversion segments, Energy East will be working in both existing TransCanada facility sites and in disturbed or undisturbed areas without existing TransCanada facilities.

Where activities are undertaken at existing facility sites, construction may require work around or on operating in-service gas pipelines. Daily approval will be obtained from TransCanada field operations staff to ensure that the work area has been confirmed as having no gas present and work is safe to resume. In addition, for work required on gas pipelines where the pipe will be cut or welded, the OCC will ensure that the lines are safely isolated and have been confirmed as having no gas flow and/or residual gas in the pipe. The OCC will use approved gas monitoring devices to ensure there is no gas present while the activities are taking place. This is standard practice that ensures safe access for construction activities. The OCC will also ensure there is no interruption to existing gas capacity contracts and service remains seamless during the conversion transition period.

During detailed design, additional safety protocols will be incorporated into the SSSPs for sites and facilities where work is required around in-service lines. These protocols will include procedures for working around in-service lines, including those that specify minimum setbacks and parameters that govern hydrovac operations, hand excavation and mechanical excavation.

3.2.3 Construction Activities

Energy East will employ conventional construction methods and industry best practices for construction associated with the conversion segments. Construction-related activities for this portion of the Project include:

- pipeline repairs, removals and replacements arising from an integrity assessment of the pipelines to be converted

- modifications, isolations, reconnections and removals or replacements of pipeline and associated facilities (e.g., block valves)
- three new 1067mm (NPS 42) river crossings to replace the existing 914 mm (NPS 36) gas line crossings
- route realignments to avoid congested areas and for constructability reasons
- installing mainline block valves along the converted segments

Construction of the conversion portion of the Project will involve activities such as:

- mobilizing to site
- clearing and mulching
- stripping and conserving top soil
- trenching/blasting
- installing trenchless crossings
- grading, pipe hauling, stringing and bending
- welding and coating
- installing cathodic protection
- adding buoyancy control/settlement controls
- lowering-in and backfilling
- conducting non-destructive examination
- hydrostatically testing and tying into pipelines
- final grading and fencing
- commissioning and starting up
- cleaning-up and reclaiming temporary construction facilities
- demobilizing

During activities in the vicinity of existing TransCanada facilities, work will involve excavation around operating systems and the implementation of the applicable TransCanada specification. This governs how work is performed around the operating facilities, assures safe working conditions for personnel, and protects TransCanada assets from accidental damage during the construction process.

3.2.4 Outage Schedule

In conjunction with the TransCanada commercial operations team, Energy East will develop a detailed outage schedule for each conversion construction spread. The outage schedule will be confirmed in collaboration with the TransCanada Gas Control group, engineering team and regional operations offices.

During conversion construction, TransCanada regional operations offices will be responsible for gas outages and gas handling (e.g., de-pressuring existing gas lines, safely evacuating gas from pipe to be worked on).

Construction activities identified under Section 3.2.3 will require regional operations office overview.

3.2.5 Watercourse Crossings

The conversion portion of the Project will require construction of at least three new river crossings; three that are currently proposed with the potential for others to be identified as a result of integrity inspections.

The three proposed crossings are:

- Assiniboine River in MB
- Madawaska River in ON
- Rideau River in ON

The Assiniboine river crossing will be trenched because an HDD crossing has a high risk of not being completed successfully. The construction will be designed according to DFO and Transport Canada requirements and will be constructed outside the restricted activity periods for the river. The existing crossing will be deactivated according to section 44 of the OPR and CSA Z662-15, Clause 10.15.1, Deactivation of Piping).

The Madawaska and Rideau rivers will be crossed using HDD. The existing NPS 36 pipeline crossings will remain in gas service during the new crossing construction. They will be reconnected to the TransCanada Mainline Line 1200-1 and modified accordingly to remain operational as part of the North Bay Shortcut gas system.

3.2.6 Pipeline Cleaning and Pressure Testing

Hydrostatic test plans will be developed during detailed design for areas along the conversion segments that will be modified by construction, including:

- route realignments
- pipe replacements resulting from integrity digs
- the three river crossings

These areas will be cleaned with an in-line cleaning tool to remove construction debris. This debris will be collected and disposed of in accordance with applicable regulations and the hydrostatic plans.

Pre-fabricated components, such as aboveground risers, valve assemblies and elbow fittings with associated piping, will be tested in accordance with the pressure testing requirements in Clause 8 of CSA Z662-15, prior to arrival on site.

Pipeline girth welds, including tie-in welds and repairs, will be non-destructively examined. No hydrotests are planned for these tie-in welds.

Water for hydrostatic testing will be drawn from approved sources and, after use, will be disposed of along the pipeline ROW in accordance with the applicable regulatory requirements.

3.3 PUMP STATION CONSTRUCTION

This section describes construction of pump stations and the associated electrical sub-stations. Seventy-one pump stations will be constructed for the Project, 70 mainline and one lateral.

3.3.1 Construction Execution

A construction execution strategy is being developed for the pump stations. It will be modified and updated through the design and construction phases. Prefabrication and modularization will be completed offsite to the greatest extent possible. Considerations will also be made to award portions of the work to local contractors where the appropriate expertise and resources are available.

At this stage in preliminary design, the strategy contemplates construction occurring from fourth quarter 2018 to fourth quarter 2021 (see Figure 2-1). Construction will take place throughout the year, with certain activities deferred to summer to reduce potential environmental effects.

3.3.2 Construction Activities

Energy East will employ conventional construction methods and industry best practices in constructing the pump stations. Construction activities for this portion of the Project will include:

- mobilizing to site
- clearing, stripping and topsoil storage
- excavating and blasting, if required
- site grading to rough grade
- installing stormwater pond
- installing access roads where and when required
- placing a cold storage modular building
- installing ILI launchers/receivers
- installing equipment such as pumps and motors
- piling and installing pile caps and steel structures
- installing piping, valves and sumps
- installing electrical equipment, wiring, and buildings
- installing instrumentation, control, and safety systems
- completing and inspecting equipment and piping, including NDE
- conducting NDE of tie-ins to the pipelines
- piping hydrostatic testing

- final grading and fencing
- commissioning and starting up
- cleaning-up and reclaiming temporary construction facilities
- demobilizing

Construction will be done in accordance with the applicable TransCanada specifications, standards and operating practices and with the EPPs for this Project.

3.3.3 Construction Sequencing

Pump station construction will start with clearing and grubbing with excavation/blasting to rough grade, then installation of piles and underground services. This will be followed by installation of pile caps for all pump foundations and ancillary equipment.

Structural steel pre-assemblies and structural steel supports will be installed on pile caps to accommodate piping, electrical, and instrumentation to and from the pumps, in-line receivers and launchers, and ancillary equipment. Pumps will be placed on a prepared foundation, piping will be connected, and alignments completed. Modularized electrical equipment shelters will be installed on foundations and cable trays will be installed to and from the equipment. Electrical and instrumentation cables will be pulled out to equipment and terminated.

Most pump stations will have power supplied from the existing utility power grid to the electrical sub-stations. The sub-stations will be prepared with all civil works completed, including piling and foundations, before any high-voltage electrical work begins in the yard. Steel structures will be installed and transformers mounted on the foundations. Cabling will be run to a low voltage area within electrical building area of the pump stations and grounding systems placed in the high-voltage yards. When all large components are installed, the high-voltage substation area will be fenced and covered with stone (i.e., de-ionized rock). Tie-in from the grid will be scheduled with local utility providers when system completion is reached. Temporary on-site diesel generators will be required for construction until the electrical substation is operational.

Eight pump stations in northern Ontario will require their own gas turbines to operate pumps and provide stand-by power. This equipment will be installed on piled foundations during pump station construction. High-voltage transformers will also be installed on piled foundations with cabling pulled from the substation area to the electrical building area. The high-voltage yard will be fenced and covered with stone. Low voltage cabling will then be pulled and terminated at the pump station electrical equipment shelters.

3.3.4 Cleaning and Pressure Testing

Hydrostatic test plans will be prepared during detailed design for the pump stations. These plans will be used to ensure that there are no material defects that could be detrimental to the safe operation of the pipeline and to prepare the new pump stations for commissioning prior to line filling activities.

The installed pump stations will be constructed using best industry practices for ensuring the cleanliness of installed components and piping. The components and piping will be filled with water and then hydrotested according to the hydrostatic test plans and any applicable specifications and codes.

In-line cleaning tools cannot be used in pump stations. As an alternative, as the hydrotest water is drained from the system, samples of the water will be taken to determine cleanliness. Where debris is present, flushing of the systems will continue until the water is debris-free. Water for the hydrotests will either be obtained from local municipalities or trucked to site, or will be sourced from various suitable water sources and trucked or pumped to site through a temporary water line.

During testing, water may be stored temporarily in piping systems within the facility and, after use, will be disposed of in accordance with the applicable regulatory requirements.

3.4 METER BANKS AND STATION CONSTRUCTION

Delivery meter stations will be installed at the termini of the Montréal and Lévis laterals. Receipt meter banks will be required at the Hardisty D tank terminal and the Cromer pump station. Custody transfer metering will also be required at the Hardisty D and Saint John tank terminals.

Construction of meter banks located with other facilities is described in the tank terminal and pump station sections.

3.4.1 Construction Execution

A construction execution strategy is being developed for the meter stations. It will be modified and updated through design and construction.

Prefabrication and modularization will be completed offsite to the extent possible.

3.4.2 Construction Activities

Energy East will employ conventional construction methods and industry best practices in constructing the meter stations.

Construction activities for this portion of the Project will include:

- mobilizing to site
- surveying
- clearing, grading, and topsoil storage
- excavating and blasting if required
- site grading to rough grade
- piling and installing pile caps
- installing meter run skid and instrumentation buildings
- installing pipe and steel coating
- installing electrical, control, and safety systems
- performing and inspecting NDE of tie-in welds
- hydrostatic testing
- final grading and fencing
- commissioning and starting up
- final clean-up and reclaiming temporary construction facilities
- demobilizing

Construction will be done in accordance with the applicable TransCanada specifications, standards and operating practices and with the EPPs for this Project.

3.4.3 Construction Sequencing

Meter station construction will start with civil works, beginning with clearing, grubbing, blasting (if required) and levelling to rough grade. This will be followed by installing piles and underground services and then by the installation of pile caps for foundations and ancillary equipment. Structural steel pre-assemblies and structural steel supports will be installed on pile caps to accommodate piping, electrical, and instrumentation.

Next, the meter run skid, instrumentation building and ancillary equipment will be installed, followed by piping and hydrotesting.

Modularized electrical shelters will be installed on foundations and cable trays will be installed to and from the equipment. Electrical and instrumentation cables will be pulled out to equipment and terminated. Testing of electrical and instrumentation will take place and systems will then be readied for handover to commissioning.

3.4.4 Cleaning and Pressure Testing

Hydrostatic test plans will be prepared during detailed design for the delivery meter stations.

In-line cleaning tools cannot be used in the meter stations or meter banks. As an alternative, as the hydrotest water is drained from the system, samples of the water will be taken to determine cleanliness. Where debris is present, flushing of the

systems will continue until the water is debris-free. Water for the hydrotests will either be obtained from local municipalities or adjacent facilities.

After use, the test water will be disposed of through adjacent facilities with wastewater handling capability or along the pipeline ROW in accordance with the applicable regulatory requirements.

3.5 TANK TERMINAL CONSTRUCTION

This section describes construction of the three tank terminals required for the Project.

3.5.1 Construction Execution

A construction execution strategy is being developed for the tank terminals. It will be modified and updated through design and construction.

Prefabrication and modularization will be completed offsite to the extent possible. Considerations will also be made to award portions of the work to local contractors where the appropriate expertise and resources are available.

Energy East will work with specialized contractors, such as tank erection contractors, for the completion of the work required for the Project to secure the required resources.

3.5.2 Construction Activities

Construction of the tank terminals will be completed in a sequenced manner to allow for safe execution, based on the construction execution strategy for these facilities. Construction is expected to proceed year-round through completion. Certain activities, such as clearing and site preparation, may be scheduled for summer to reduce potential environmental effects.

Energy East will employ conventional construction methods and industry best practices in constructing the tank terminals. Construction activities will include:

- mobilizing to site
- clearing, stripping, and topsoil storage
- excavation, blasting and slope stabilization if required
- site grading to rough grade
- installing water, wastewater and storm water management system
- installing piping and sumps
- construction of tank foundations and secondary containment with impermeable liner

- erecting tanks on foundations
- piling, installing pile caps, erecting steel structures and pipe racks
- installing aboveground piping and valves including tank manifolds
- erecting prefabricated buildings
- installing booster pumps complete with motors
- installing electrical, instrumentation, control, and safety systems
- installing fire protection system including piping, pumps, foam skid and foam nozzles
- performing and inspecting NDE
- hydrostatic testing
- final grading and fencing
- commissioning and starting up
- cleaning-up and reclaiming temporary construction facilities
- demobilizing

Construction will be done in accordance with the applicable TransCanada specifications, standards and operating practices and with the EPPs for this Project.

3.5.3 Construction Sequencing

Tank terminal civil works will begin with clearing, grubbing, stripping, excavating and levelling to rough grade. The surface materials, including topsoil, will be stockpiled in designated areas on-site for potential use in final site preparation.

Construction of the tank terminal access roads, tank foundations, pump foundations, underground piping and electrical cabling, storm and fire water ponds, and foundations will require excavation. If blasting is required, controlled blasting techniques will be employed, conforming to the applicable federal and provincial regulations, permits, and safety requirements. The excavated materials from blasting may be crushed, stockpiled and where suitable, used as a base for laydown and facilities. If materials are not suitable then they will be removed from their location and disposed of in a pre-approved disposal site.

Following tank terminal civil works, piles, underground services, and foundations for tanks, piping, and buildings will be installed. Tanks will be erected on granular foundation and pumps will be installed on prepared foundations. Structural steel supports will be installed on pile caps or foundations to accommodate piping, electrical, and instrumentation. The fire protection system including fire pumps, foam skid, piping and foam nozzles will be installed.

Modularized electrical equipment shelters will be installed on foundations and cables will be installed to and from the electrical equipment. Electrical and instrumentation cables will be pulled out to equipment and terminated. Other modular buildings, equipped with heating, ventilating and mechanical systems, will also be installed on foundations and connected electrically.

3.5.4 Cleaning and Pressure Testing

Hydrostatic test plans will be prepared during detailed design for the tank terminals. These plans will be used to ensure that there are no material defects that could be detrimental to the safe operation of the piping, tanks and installed components, and to prepare the tank terminal for commissioning prior to line filling activities.

The tank terminals will be constructed using best industry practices for ensuring the cleanliness of installed components and piping. The components, piping and tanks will be filled with water and then hydrotested according to the hydrostatic test plans and any applicable specifications and codes.

In-line cleaning tools cannot be used in the tank terminals. As an alternative, as the hydrotest water is drained from the system, samples of the water will be taken to determine cleanliness. Where debris is present, flushing of the systems will continue until the water is debris-free. Water for the hydrotests will either be obtained from local municipalities, adjacent facilities, or suitable nearby water sources. The water will be pumped to site through a temporary water line and recycled for re-use for further testing, where practical.

After use, hydrotest water will be tested and returned to the source of origin, released through the facility storm water management system, or disposed of at an adjacent facility with waste water handling capability in accordance with the applicable regulatory requirements.

3.6 MARINE TERMINAL CONSTRUCTION

This section describes the construction of the Canaport Energy East marine terminal.

3.6.1 Construction Execution

A construction execution strategy is being developed for the marine terminal and will be modified and updated through design and construction.

In general, the strategy will be to complete each work front in sequence. For example, the foreshore works and dredging works will be performed first. When the base marine structures are complete, the topside equipment and systems can be installed. In general, the onshore work is expected to proceed independently from the marine structures.

Pre-fabrication and modularization will be completed offsite to the extent practical. Consideration will also be made to award portions of the work to local contractors where the appropriate expertise and resources are available.

The majority of marine logistics will likely be from a water-borne plant. The upland civil improvements will be from land. Larger terminal elements such as piles, loading arms, fenders, reinforcing steel, pre-fabricated steel or concrete, will be transported either to staging areas via ship, rail, or truck and then loaded onto material barges for transportation to the point of installation, or will be delivered directly to the point of installation via barge.

3.6.2 Construction Activities

Construction of the marine terminal will be completed sequentially. Construction will be year-round until completion, although certain activities will be affected by seasonal restrictions due to marine life and other environmental constraints.

The Project will employ offshore construction methods and industry best practices in constructing the marine terminal. Construction activities will include:

- mobilizing to site
- clearing, grading, cutting, filling and blasting (as required) for development of the auxiliary equipment area and the onshore area to rough grade
- developing access road and the pipe rack corridor
- completing foreshore temporary facilities and over-water staging areas.
- constructing onshore pipe support structures and underground utilities
- installing onshore piping
- dredging for berth pockets
- installing trestle abutment
- installing marine structure foundations (piling and caissons/coffer dams), including structure jackets and superstructures
- installing marine structure deck systems, catwalks, walkways, handrails and guardrails
- installing marine equipment (loading arms, fenders, quick-release hooks, etc.)
- erecting buildings
- installing pipe racks and cable trays
- installing offshore piping, vapour blowers, stripping pumps, etc.
- installing fire system, electrical and instrumentation systems, and other mechanical systems and equipment

- hydrostatic testing
- final grading and fencing onshore
- commissioning and starting up
- cleaning-up and reclaiming temporary construction facilities
- demobilizing

Construction will be done in accordance with the applicable TransCanada specifications, standards and operating practices and with the EPPs for this Project.

3.6.3 Construction Sequencing

Onshore civil works will begin with clearing and grubbing the site for the access road widening, pipe rack corridor, and staging at the foot of the marine access trestle. The construction of the onshore road and pipe rack foundations will require excavation of the indigenous ground material. The excavated materials will be stockpiled on the site for future use.

Offshore civil work consists of dredging at the berth pocket, installing pile jackets and jackets. The steel jackets, walkways, trestle beams, loading platforms, and access trestle will be prefabricated offsite to the extent possible. Each component will be cleaned and coated prior to loading for transport to the project site. Multiple jack-up barges will be used to install the above mentioned components. Each pile will be hoisted and set into its pile pocket by the jack-up rig's crane. The jacket will then be placed over a pre-installed pile. The super structure frame will be set and welded into place, supported by the jackets previously installed, ready to accept the precast concrete slabs.

The precast concrete spans will be placed by a jack-up rig onto the frame. The construction of the access trestle will proceed from the foreshore progressing seaward out to the loading platform followed by the interconnecting trestle.

With the completion of the trestles and all berth structures, the topside mechanical and electrical works, including the loading arms and hydraulic gangways works will be able to start. Concurrently, the mooring and breasting dolphins for both berths, as well as interconnecting cat walks, will be installed.

3.6.4 Cleaning and Pressure Testing

Hydrostatic test plans will be prepared during detailed design for the marine terminal. These plans will be used to ensure that there are no material defects that could be detrimental to the safe operation of the piping and to prepare the new marine terminal for pre-commissioning and commissioning.

The installed marine terminal will be constructed using best industry practices for ensuring the cleanliness of installed components and piping. The components and piping will be filled with water and then hydrotested according to the hydrostatic test plans and any applicable specifications and codes.

Energy East does not plan to use in-line cleaning tools used for the marine terminal. As an alternative, as the hydrotest water is drained from the system, samples of the water will be taken to determine cleanliness. Where debris is present, flushing of the systems will continue until the water is debris-free. Water for the hydrotests will either be obtained from local municipalities, adjacent facilities, or suitable nearby water sources. The water will be pumped to site through a temporary water line and recycled for re-use for further testing, where practical.

During testing, water may be stored temporarily in piping systems within the facility or temporary portable storage tanks on-site. After use, the test water will be filtered, tested and returned to its source or it will be disposed of at an adjacent facility with waste water treating capabilities in accordance with the applicable regulatory requirements.

3.6.5 Dredging

Dredging will be required at the Canaport Energy East berths to achieve under keel clearance requirements. The approach channel and turning circle for the tankers will be located in sufficiently deep water to ensure safe navigation. Dredging will consist of removal of relatively thin layers of silts, sands and potentially weathered rock.

Given the material quantity and type, dredging will be performed mechanically. A jack-up or floating barge equipped with either a crane/clamshell bucket or hydraulic long-reach excavator/bucket would be used to dredge.

The jack-up or floating barge would be assisted into position using tugs, before anchoring itself with spuds. The spuds are large diameter steel legs that can be lifted or lowered as required. Once the required dredge depth has been achieved within the reach of the equipment, the spuds are lifted and the tugs assist the barge in moving to a new position. This method uses independent dump scow or spoils barges attended and moved by tugs.

Energy East proposes to dispose of dredged material in an existing dredge disposal site located within the Saint John Harbour at Black Point, northwest of the proposal berths. The advantage of using a disposal site relatively close to the dredge area is that fewer spoil barges and support tugs are required to transport the removed material, increasing the efficiency of the dredge operation. Black Point is currently used by Saint John Port as a disposal site for the Port's annual maintenance dredge spoils.