Appendix 3 – Design of Compression Facilities
3.1 Introduction

The CS-A1 (Gordondale) Compressor Station Project consists of the addition of one new Solar Taurus 70 compressor unit and the upgrading of the existing Solar Centaur 50 Model 5702 compressor unit.

3.2 Design

The new Solar Taurus 70 compressor unit will be a multi-stage centrifugal compressor driven by a gas generator and power turbine. The design specifications of the new unit are as follows:

- Solar Taurus 70 gas turbine is a twin shaft, simple cycle package equipped with SoLoNOx (dry low NOx) combustor and rated at 7.7 MW (ISO);
- Solar C406 multi-stage centrifugal compressor with 416mm (NPS16) nozzles.

The existing unit will be upgraded to a twin shaft, simple cycle, Solar Centaur 50 Model 6102S gas turbine equipped with SoLoNOx combustor and rated at 4.6 MW (ISO). The existing centrifugal compressor will be retrofitted with a new impeller assembly.

3.2.1 Principal Components of Project

The following are the principal components of the proposed Project:

(a) One new rigid frame compressor building, approximately 290 square metres x 14 metres high, will be constructed to house the new Taurus 70 unit.

(b) One new rigid frame auxiliary building, approximately 68 square metres x 5.2 metres high, will be constructed to house two new generator sets and switchgear.

The Plot Plan (Drawing SK-CS-A1-102) included in Appendix 5 of this application shows the new building layout.

(c) 300 metres of new 508 mm (NPS 20) and 610 mm (NPS 24) main gas piping will connect the new unit to the existing station piping. This will include a new
(d) A new fuel gas system will be installed to supply sweet natural gas to the new Taurus 70 compressor unit. This will include an inlet fuel gas scrubber, fuel gas heater, fuel gas regulators, fuel gas meter system, isolation valves, blowdown valves and associated piping and fittings, instrumentation, and electrical and control equipment.

(e) The existing heating system will be expanded to supply heating medium to the new buildings and the new fuel gas heater. The system will include adding unit heaters, system isolation valves and associated piping and fittings, instrumentation, and electrical and control equipment.

(f) The existing compressed air system will be expanded to supply instrument air, utility air, buffer air and pulse air for the new equipment. Instrument air is required for station pneumatic control, utility air for station maintenance, buffer air for the compressor dry gas seals and pulse air for the gas turbine inlet air filters. This system will include adding two new rotary screw air compressors, heatless air dryers, one dry air receiver system, isolation valves and associated piping and fittings, instrumentation, and electrical and control equipment.

(g) Two new 500 kW natural gas powered generator sets and a switch gear will provide the required prime and standby power for the compressor station load. The two existing 230 kW generator sets will be removed.

(h) A new 480 VAC Motor Control Centre will be installed to control all motors and package equipment for the new unit and station upgrade.

(i) A new compressor unit control panel will be installed to monitor and control the new compressor unit. The unit control panel will interface to a Station Control Panel (SCP). The new equipment will consist of the Unit Control Panel (UCP), Operator Console; Supervisory Control and Data Acquisition (SCADA) equipment and Remote Terminal Unit (RTU) equipment.
A lube oil system will be installed to provide lube oil to the new gas turbine compressor unit. This system will consist of an oil storage vessel (contained within the compressor building), oil transfer pump, oil cooler, oil vent demister system, isolator valves, and associated piping and fittings, instrumentation, and electrical and control equipment.

The potable water system will be extended to the new compressor building through an above-ground, insulated and heat-traced galvanized line.

The existing unit will be refurbished with an upgraded Solar Centaur 50-6102S gas turbine and a new impeller assembly on the existing C334 centrifugal compressor. The upgrade also involves converting the combustor to a SoLoNOx system complete with associated fuel system and controls, and upgrading the gas turbine power rating from 4.1 MW (ISO) to 4.6 MW (ISO). Discharge gas cooler will be added if required.

### 3.2.2 Detailed Design

The proposed compressor station upgrade at CS-A1 will be designed, constructed and tested in accordance with the provisions of the *National Energy Board Act*, the *Onshore Pipeline Regulations, 1999* ("OPR-99"), Westcoast’s specifications and the following standards:

1. CSA Z662-07, Oil and Gas Pipeline Systems
2. ASME B31.3-2006, Processing Piping
3. CSA Z245.1-07, Steel Line Pipe
4. CSA Z245.11-05, Steel Fittings
5. CSA Z245.12-05, Steel Flanges
6. CSA Z245.15-05, Steel Valves
7. CSA B51-03, Boiler, Pressure Vessel, and Pressure Piping Code
9. CSA C22.2 No. 0-M91 (R2006), General Requirements – Canadian Electrical Code, Part II
10. CAN/CSA C22.3 No. 6-M91 (R2003), Principles and Practices of Electrical Coordination Between Pipelines and Electric Supply Lines
3.2.2.1 Station Main Gas Mechanical Design Parameters

The main gas piping within each compressor facility will be designed, constructed and tested in accordance with CSA Z662-07 and OPR-99. The maximum design stress levels to be utilized are those permitted by the applicable codes. The mechanical design parameters for the station are shown in Table 3-1 below.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Pressures – New Pipeline Piping</strong></td>
<td></td>
</tr>
<tr>
<td>• Maximum Operating Pressure (MOP):</td>
<td>8 446 kPag</td>
</tr>
<tr>
<td><strong>Design Pressures – Station Piping for New Unit</strong></td>
<td></td>
</tr>
<tr>
<td>(see Note 1 below):</td>
<td></td>
</tr>
<tr>
<td>• Maximum Operating Pressure (MOP):</td>
<td>8 446 kPag</td>
</tr>
<tr>
<td><strong>Design Pressures – Station Piping for Existing Unit</strong></td>
<td></td>
</tr>
<tr>
<td>(see Note 2 below):</td>
<td></td>
</tr>
<tr>
<td>• Maximum Operating Pressure (MOP):</td>
<td>8 446 kPag</td>
</tr>
<tr>
<td><strong>Design Pressures – New Pressure Vessels</strong></td>
<td></td>
</tr>
<tr>
<td>• Pressure Vessel Design Pressure:</td>
<td>9 290 kPag</td>
</tr>
<tr>
<td><strong>Design Temperatures</strong></td>
<td></td>
</tr>
<tr>
<td>• Pressure Vessel and Station Piping Design Temperature:</td>
<td></td>
</tr>
<tr>
<td>− Compressor Suction:</td>
<td>65°C</td>
</tr>
<tr>
<td>− Compressor Discharge:</td>
<td>120°C</td>
</tr>
<tr>
<td>• Minimum Design Metal Temperature:</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Value</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Below ground piping:</td>
<td>-20°C</td>
</tr>
<tr>
<td>Above ground piping:</td>
<td>-45°C</td>
</tr>
</tbody>
</table>

**CSA Z662-07 Factors for Station Piping**

- **F** = Design Factor: 0.8
- **L** = Location Factor: 0.625 (Stations)
- **J** = Joint Factor: 1.0 (Seamless)
- **T** = Temperature Derating Factor: 1.00 (Up to 120°C)

**Other**

- Maximum station ESD isolation & blowdown time: Three (3) minutes to 690 kPag
- Service:
  - Main Gas: Sweet
  - Fuel Gas: Sweet

**Notes:**

1. For the main gas piping associated with the new unit, the minimum wall thickness for each diameter pipe will be equal to or greater than that required by the standard for a maximum design pressure of 8 446 kPag, with the complete main gas system pressure tested to a minimum pressure of 11 830 kPag.

2. For the main gas piping associated with the existing unit, the minimum wall thickness for each diameter pipe will be equal to or greater than that required by the applicable standard for a maximum design pressure of 8 446 kPag with the main gas system pressure tested to a minimum pressure of 11 830 kPag.

### 3.2.2.2 Station Utilities Design Conditions

The utility piping within the new compressor facilities will be designed, constructed and tested in accordance with the requirements of ASME B31.3-2006 and OPR-99 except as noted in Section 3.4.2, Non-destructive Examination. The maximum design stress levels to be utilized are those permitted by the codes.

Based on the anticipated loads, the utility system for the compressor station upgrade will be designed to the operating parameters defined in Table 3-2 below.

**Table 3-2 Utilities Design Conditions**
## 3.2.2.3 Corrosion Prevention

### General

All buried piping and steel structures will be protected from external corrosion by using an external coating system supplemented with impressed current cathodic protection. Above-ground steel materials will be protected from external corrosion by applying a coating system.

### Coating


<table>
<thead>
<tr>
<th>Description</th>
<th>Mechanical Design Condition</th>
<th>Maximum Operating Condition</th>
<th>Minimum Operating Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Press (kPag)</td>
<td>Temp (°C)</td>
<td>Press (kPag)</td>
</tr>
<tr>
<td>Low Pressure Vent Piping</td>
<td>1 034</td>
<td>48</td>
<td>1 034</td>
</tr>
<tr>
<td>Fuel Gas – High Pressure</td>
<td>8 450</td>
<td>48</td>
<td>8 450</td>
</tr>
<tr>
<td>Fuel Gas – Compressor</td>
<td>4 140</td>
<td>48</td>
<td>2 760</td>
</tr>
<tr>
<td>Fuel Gas – Auxiliary</td>
<td>414</td>
<td>48</td>
<td>414</td>
</tr>
<tr>
<td>Buffer Air</td>
<td>1 034</td>
<td>65</td>
<td>689</td>
</tr>
<tr>
<td>Instrument Air</td>
<td>1 034</td>
<td>65</td>
<td>689</td>
</tr>
<tr>
<td>Utility Air</td>
<td>1 034</td>
<td>65</td>
<td>689</td>
</tr>
<tr>
<td>Heating Medium</td>
<td>690</td>
<td>93</td>
<td>414</td>
</tr>
<tr>
<td>Lube Oil Piping</td>
<td>1 034</td>
<td>65</td>
<td>689</td>
</tr>
<tr>
<td>Potable and Cooling Water Piping</td>
<td>414</td>
<td>120</td>
<td>414</td>
</tr>
<tr>
<td>Hydrocarbon Drains</td>
<td>1 034</td>
<td>48</td>
<td>414</td>
</tr>
</tbody>
</table>
Painting

Above-ground piping will be prepared, primed and painted in accordance with Spectra Energy Specification AP-PC1.3, December 16, 2008, Painting Plant Facilities.

Cathodic Protection

The compressor station upgrade will be designed to have minimal underground piping. New below-ground piping will be protected by the existing impressed current cathodic protection system. The existing cathodic protection system will be augmented, if required, once the new facilities are installed and the necessary testing has been completed.

3.2.2.4 Flow Diagram

Residue gas will be delivered to the new unit from the 660 mm (NPS 26) Alberta Mainline pipeline via connections to the existing 406 mm, and new 508 mm and 610 mm station piping. Gas will flow through the existing and new inlet scrubbers prior to entering the two compressor units for compression. The gas will then flow through to the discharge gas coolers, and delivered to TransCanada Pipelines and Alliance Pipeline via the existing 406 mm and new 508 mm and 610 mm station piping. A simplified flow schematic diagram for CS-A1 (Drawing SK-CS-A1-801) is included in Appendix 4 of this application. The peak-day flow diagram for the proposed compressor station upgrade is set out in CS-A1-PEAKDAY/01 which is included in Appendix 4.

3.2.2.5 Flow Simulations

The calculations of gas flows, pressure drops and compression requirements for the mainline transmission system were carried out using a computer model to simulate the operation of the system.

(a) Basic Assumptions

The basic assumptions for design purposes used in the calculations are as follows:
1. Pressure and temperature base drop: 14.73 psia (60°F) = 101.325 kPa (15°C)

2. Specific gravity of gas compared to air: 0.575

3. Initial gas temperature: 95°F (35°C)

4. Heat content: 1023 BTU ft\(^3\) = 38.09 GJ/10\(^3\) m\(^3\)

5. Compressor station piping pressure losses:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Suction psi</th>
<th>Discharge psi</th>
<th>Suction kPa</th>
<th>Discharge kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taurus 70</td>
<td>5</td>
<td>10</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>Centaur 50</td>
<td>25</td>
<td>11</td>
<td>180</td>
<td>80</td>
</tr>
</tbody>
</table>

6. Compressor fuel gas requirements:
   (a) Taurus 70 Gas Turbine Unit: 7 310 BTU/BHP-Hr = 10.34 MJ/KW-Hr
   (b) Centaur 50 Gas Turbine Unit: 8 500 BTU/BHP-Hr = 12.02 MJ/KW-Hr

(b) Flow Formula

The flow formula used for calculating pressure drops is the Rational Flow Equation adjusted for differences in elevation and temperature. The basic Rational Flow Equation is:

\[ KQ^2Lf = Y(P_1^2 - P_2^2) \]

Where:
- \( P_1 \) = Initial pressure in psia
- \( P_2 \) = Final pressure in psia
- \( Y \) = Deviation from Boyle’s Law
- \( Q \) = Volume in millions of cubic feet per day
- \( L \) = Distance in miles
- \( f \) = Friction factor
- \( T \) = Absolute temperature of gas, degrees Rankine
- \( S \) = Specific gravity of gas (air – 1.00)
- \( D \) = Inside diameter of pipeline in inches
- \( K \) = \( ST \times (10)^{12} \)
To compensate for changes in elevation, the following equation is used to determine static hydraulic pressure head:

\[
P_E = \frac{W_a S \Delta h Y}{P_{avg}}
\]

Where:

- \(P_E\) = Pressure head in psi due to change in elevation
- \(\Delta h\) = Change in elevation of pipeline gradient in feet. Positive for downhill flow and negative for uphill flow.
- \(P_{avg}\) = \(\frac{P_1 + P_2}{2}\)
- \(W_a\) = Weight of air @ 60°F and 14.73 psia
  - \(= 0.07656 \text{ lb/ft}^3\)

Let \(\Delta H = \frac{W_a S \Delta h}{14.73 (144)(2)}\), then \(P_E = Y \Delta H (P_1 + P_2)\)

The correction has been incorporated in the Rational Flow equation shown above. The expanded equation thus becomes:

\[
KQ^2L = Y (P_1^2 - P_2^2) + Y^2 (\Delta H) (P_1 + P_2)^2
\]

(c) **Temperature**
To compensate for the differences in gas temperature an equation derived by R.V. Dunkle\(^1\) has been used to determine the gas flowing temperature between individual profile points. The Dunkle equation is as follows:

\[
T_2 = [T_1 - T_G - J/A] e^{AX} + T_G + J/A,
\]

and hence,

\[
MFT = [T_1 - T_G - J/A] \left( \frac{e^{AX} - 1}{-AX} \right) + T_G + J/A
\]

Where:
- \(MFT\) = Mean flowing temperature between profile points
- \(T_1\) = Upstream gas temperature, °R
- \(T_2\) = Downstream gas temperature, °R
- \(T_G\) = Ground Temperature
- \(X\) = Pipe length, feet
- \(J\) = Joule-Thompson effect, °F/foot
- \(A = \frac{2\pi RU}{qCp}\)

Where:
- \(R\) = Pipe radius, feet
- \(U\) = Heat transfer coefficient BTU/(hour)(°F)(ft²)
- \(q\) = Gas flowing, Mcf/hour
- \(Cp\) = Specific heat of gas, BTU/(°F)(Mcf)
- \(E\) = Natural log base

(d) Transmission Factors

The transmission factor for various pipes is calculated using the equation for rough-turbulent flow region where it only depends on the absolute roughness

\(^1\) Dunkle, R.V., “Predicting Temperature Distribution Along Gas Transmission Pipelines”. 1942
and internal radius of the pipe. The calculation is made using the following formula:

\[
T = \sqrt{\frac{1}{f}} = 4 \log \left( \frac{7.4R}{k} \right)
\]

Where:
- \( R \) = Internal radius of pipe, inches
- \( k \) = Absolute roughness, inches
- \( f \) = Friction factor

(e) **Compressor Horsepower Determination**

Compressor horsepower determination has been done by the use of the following general horsepower equation:

\[
hp = \frac{3.0325 Q_0 P_0 T_1 Z_1}{T_0 e} \left[ \frac{k}{K - 1} \right] \left[ \frac{k - 1}{K} \right]^{r - 1}
\]

Where:
- \( Q_0 \) = Flow rate in MMCFD
- \( P_0 \) = Standard pressure = 14.74 psia
- \( T_0 \) = Standard temperature = 520°F
- \( e \) = Efficiency
- \( T_1 \) = Inlet temperature °R
- \( Z_1 \) = Compressibility at inlet
- \( k \) = Ratio of specific heats 1.28
- \( r \) = \( P_2/P_1 \) = compression ratio
- \( P_2 \) = Discharge Pressure psia
- \( P_1 \) = Suction Pressure psia

Gas temperature after compression has been calculated using the following formula:
\[ \Delta T = T_1 \left( \frac{k - 1}{r} \right) - \frac{k}{e} \]

Where:

\[ \Delta T = \text{Temperature rise, } ^\circ R \]

### 3.2.2.6 Control System

The control system for the new compressor station upgrade facilities will be a microprocessor-based system with input/output modules. Monitoring and control inputs will be from PC based operator consoles in the control room and from Westcoast’s Gas Control Centre in Vancouver. The control system will perform both facility control and safety shutdowns. The facility control will include controls for unit speed, pressure and surge. The pressure controller will control unit speed to bring the measured pressure to control set points and also to prevent overpressure. The surge control system will monitor the surge controller and pressure controller and activate surge control valve to protect the unit. Emergency shut down pushbuttons will permit a total facility shutdown regardless of the state of the control system.

Fire and combustible gas detectors in the compressor buildings will be continuously monitored by the control system. Upon detection of a shutdown level by any one of these detectors, horns will sound in the appropriate area and beacon lights will be activated to alert personnel to any danger. The control system will activate appropriate block and blow-down functions. Ventilation equipment will be activated for gas but shutdown for fire. Continuous monitoring of the detectors will be accessed from the control room operator stations.

Fire detection at the compressor station includes smoke detection via ionization or photoelectric detection, flame detection via UV-IR detection and heat detection via RTD elements located in critical areas. Combustible gas detection will be done using electro-catalytic detection. Devices will be connected to the main station control system to provide alarms and shutdowns according to the Compressor Station Shutdown Key drawing.
3.2.2.7 Risk Management Plan

A hazard and operability study (HAZOP) was conducted during the detailed design phase of the Project. A site safety assessment will be performed prior to commencement of construction.

3.3 Materials

3.3.1 Material Specifications

All valves, fittings and flanges will comply with the requirements of CSA-Z245.15-05, CSA Z245.11-05 and CSA Z245.12-05, respectively, for Class 3 service.

All auxiliary piping will be ASTM A333 Grade 6 or ASTM A106 Grade B seamless material having a minimum yield of 241 MPa. The main gas pipe to be used on this Project will conform to Westcoast Specification SP-51-33, Rev. 5, November 29, 2006, Piping Materials for CSA Z662 Compressor Stations & Meter Stations Sweet Natural Gas Service, CSA Z245.1-07 or ASTM Specifications.

3.4 Joining

3.4.1 Joining Program

All joining for the new facilities at CS-A1 will be conducted in accordance with the requirements of CSA Z662-07, ASME B31.3-2006, 2004 ASME VIII Division 1 and OPR-99. Westcoast commits to completing, and filing with the Board, the field-joining program applicable to this Project prior to the start of field joining.

3.4.2 Non-destructive Examination

The main gas piping within the compressor facilities will be designed, constructed and tested in accordance with the requirements of CSA Z662-07 and OPR-99. The maximum design stress levels and the types and minimum extent of non-destructive examination to be utilized are those permitted by the codes.

Utility piping will be designed and constructed in accordance with the requirements of ASME B31.3-2006 and OPR-99. The maximum design stress levels and the types
and minimum extent of non-destructive examination to be utilized are those permitted by the codes except for the requested exemption in the following paragraph:

Westcoast is requesting an exemption from Order MO-08-2000 with respect to the non-destructive examination of all welds for the auxiliary piping systems which are designed and constructed in accordance with ASME B31.3-2006 and have a design pressure of 1 034 kPa or less. Westcoast is requesting the Board’s approval that the non-destructive testing for these welds be carried out in accordance with ASME B31.3-2006, Article 341.4.1(b)(1). Westcoast submits that compliance with ASME B31.3-2006 will not compromise the safety of Westcoast’s employees or the public.

Section 344 of ASME B31.3-2006 allows the following as acceptable non-destructive examination methodologies:

- visual examination
- magnetic particle examination (MP)
- liquid penetrant examination (LP)
- radiographic examination (R)
- ultrasonic examination (U)

The general requirements for the piping to be designed to ASME B31.3-2006 requirements are summarized in Table 3-3 below. The Project piping specifications allow the use of either ASTM A106 Gr. B or A333 Gr. 6 material for all of the above service classes. The maximum allowable stress level for these materials for normal operating temperatures is 138 MPa. Code allowed maximum stress levels would not be exceeded for any operating conditions.

**Table 3-3 Utility Piping Requested Non-destructive Examination Testing Requirements**

<table>
<thead>
<tr>
<th>Service</th>
<th>Design Pressures (kPag)</th>
<th>Design Temperatures (°C)</th>
<th>Joint Type</th>
<th>Minimum NDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Systems</td>
<td>1 034</td>
<td>65</td>
<td>Butt weld</td>
<td>10% R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Socket weld</td>
<td>10% MP Visual Inspection</td>
</tr>
<tr>
<td>System</td>
<td>Code</td>
<td>Inch</td>
<td>Weld Type</td>
<td>Welding %</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------</td>
<td>------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Butt weld 10% R</td>
<td>1034</td>
<td>48</td>
<td>Butt weld</td>
<td>10% R</td>
</tr>
<tr>
<td>Socket weld 10% MP</td>
<td></td>
<td></td>
<td>Socket</td>
<td>10% MP</td>
</tr>
<tr>
<td>Low Pressure Vents</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Gas Auxiliary</td>
<td>414</td>
<td>48</td>
<td>Butt weld</td>
<td>10% R</td>
</tr>
<tr>
<td>Socket weld 10% MP</td>
<td></td>
<td></td>
<td>Socket</td>
<td>10% MP</td>
</tr>
<tr>
<td>Heat Medium (Glycol/Water)</td>
<td>690</td>
<td>93</td>
<td>Butt weld</td>
<td>10% R</td>
</tr>
<tr>
<td>Socket weld 10% MP</td>
<td></td>
<td></td>
<td>Socket</td>
<td>10% MP</td>
</tr>
<tr>
<td>Lube Oil</td>
<td>1034</td>
<td>48</td>
<td>Butt weld</td>
<td>10% R</td>
</tr>
<tr>
<td>Socket weld 10% MP</td>
<td></td>
<td></td>
<td>Socket</td>
<td>10% MP</td>
</tr>
<tr>
<td>Potable &amp; Cooling Water</td>
<td>414</td>
<td>120</td>
<td>Butt weld</td>
<td>10% R</td>
</tr>
<tr>
<td>Socket weld 10% MP</td>
<td></td>
<td></td>
<td>Socket</td>
<td>10% MP</td>
</tr>
<tr>
<td>Hydrocarbon Drains</td>
<td>1034</td>
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<td>Butt weld</td>
<td>10% R</td>
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<tr>
<td>Socket weld 10% MP</td>
<td></td>
<td></td>
<td>Socket</td>
<td>10% MP</td>
</tr>
</tbody>
</table>

### 3.5 Construction

#### 3.5.1 Construction Safety Program and Security Plan

Construction will be performed in accordance with Westcoast’s Environmental Manual for Construction Projects (2006) which is on file with the NEB. Westcoast will approve the successful contractor’s Occupational Health and Safety programs to ensure they meet and or exceed Westcoast’s requirements, particularly those specific to CS-A1.

The successful contractor will be responsible for the health and safety of all personnel employed by it or its subcontractors as well as any other person at the site connected with the contractor’s construction activities.

The successful contractor will supply Westcoast with a site specific construction security plan for their approval prior to the commencement of any site work. The site specific security plan will be reviewed to ensure it meets or exceeds the requirements.
of the Westcoast Operations Security Plan and the requirements of the NEB PRC 2006-01.

3.5.2 Environmental Protection

Construction will be performed in accordance with Westcoast’s Environmental Manual for Construction Projects (2006) which has been previously filed with the Board and will be supplemented with site specific procedures for CS-A1. Westcoast will conduct a pre-construction environmental orientation with key contractor supervisory personnel and inspection staff. They will be briefed on Westcoast’s commitments, the applicable environmental issues and mitigative measures.

Westcoast will provide periodic environmental inspection for key aspects of the compressor site preparation, as well as during construction of the Project. For more detailed information with respect to the Environmental Protection Program refer to the Environmental and Socio-Economic Assessment attached to this application as Appendix 7.

3.5.3 Right-of-way and Temporary Work Areas

All the compressor upgrade facilities for this Project will be installed within the boundaries of lands presently leased by Westcoast. No new right-of-way is required, although some temporary work areas are required on land adjacent to Westcoast property boundaries. All necessary consultation will be completed and all permits will be obtained before construction begins.

3.5.4 Crossing a Utility or Private Roadway

All compressor upgrade facilities will be installed within the boundaries of lands owned or leased by Westcoast and will not cross any third party utilities or private roadways.

3.5.5 Noise During Construction

To reduce the impact of construction noise, Westcoast will follow the mitigative measures recommended in the Environmental and Socio-Economic Assessment attached to this application as Appendix 7.
3.6 Pressure Testing

3.6.1 Pressure Testing

All piping will be tested in accordance with OPR-99 and all other applicable codes. A detailed Pressure Testing Plan will be developed during the detailed engineering phase of the Project. Westcoast commits to completing and filing the Pressure Testing Plan with the Board prior to the start of any shop or field pressure testing.

3.6.2 Permits for Use and Disposal of Water

Westcoast will obtain the necessary permits required in respect of the use and disposal of water for test purposes.

3.6.3 General Testing Requirements

Auxiliary piping will be pressure tested in accordance with Westcoast Specification SP-50-09, Rev. 1, December 18, 1997, Field Pressure Testing. Main gas piping will be pressure tested in accordance with Westcoast’s Specification SP-51-20 Rev. 0, January 11, 2002, Pipeline Construction – Pressure Testing.

3.7 Quality Assurance and Quality Control

A quality assurance program will be utilized for the engineering, procurement and construction of the Project. The quality assurance program will ensure that the products and services supplied conform to the specified requirements during design/development, production and installation. Detailed design completed to date follows the program for the Project. Completion of the engineering and procurement will follow the quality assurance program utilized by the engineering consulting firm. Construction will follow the quality assurance program utilized by the construction contractors. Westcoast representatives will periodically audit the programs of the engineering consulting firm and the construction contractors.

3.8 Operation, Maintenance and Emergency Response Manuals
Westcoast will develop specific operating and maintenance procedures for the new equipment at CS-A1 and integrate these new facilities into the following existing management systems and programs: Environment, Health and Safety Management Systems (July 2007); Emergency Management Manual and the Transmission Northern Region Field Emergency Response Plan, Rev. 6, January 2007; Operator Training Manual, January 2005; and the Pipeline Integrity Program.