Exhibit “C”

BP Ferndale Pipeline Capacity Expansion Waiver Application

A Information Responsive To WAC 480-93-155 Requirements for Increasing Maximum Operating Pressure

Regulatory requirements for increasing the maximum operating pressure of the Ferndale pipeline system are specified in WAC 480-93-155 and 49-CFR-192 Subpart K. As per these regulations, a plan for uprating the pressure must be submitted to the WUTC at least thirty days prior to raising the pressure and must include a review of the following:

1. All affected gas facilities with their manufactured design and operating pressure and specifications;
2. Original design and construction standards;
3. All previous operating pressures and length of time at that pressure;
4. All leaks and the date and method of repair;
5. All upstream and downstream regulators and relief valves; and
6. All Cathodic Protection readings for the past three years (or three most recent inspections)

The plan must also include a detailed description of the proposed pipeline operating pressure increase procedure.

Each of these requirements is addressed below.

1. All affected gas facilities with their manufactured design and operating pressure and specifications

The pipeline facilities were designed to the requirements of DOT 49 C.F.R., Part 192, and the American Society of Mechanical Engineers (ASME) standard B31.8. The pipeline consists of the following components:

- Approximately 31.7 miles of NPS 16, 0.25” WT, API 5L-X65 steel line pipe;
- Five (5) mainline valves and blowdown assemblies, with line-break controls, (located at approximately 5-mile intervals along the pipeline);
- Metering, pressure regulation and pig launching facilities at Sumas, Wa., and
- Metering, pressure regulation and pig receiving facilities at the Cherry Point refinery, in Whatcom County, Wa.

The design and operating pressure specifications for these facilities are provided as follows:

Component	Specification	Design Operating Pressure
Steel Line Pipe	API 5L-X65	Class 3 – 1015 psig Class 4 – 812 psig
Pipe, flanges and fittings	ANSI 600	1440 psig
Valves, metering, and pressure control equipment	ANSI 600	1440 psig

Metallurgical test records for steel line pipe (mill certs) are included as Appendix 1 to this Exhibit "C". The steel line pipe was manufactured with a high-frequency ERW process.

The line pipe was mill coated with extruded polyethylene (EP) with shrink sleeves applied over field girth welds.

Gas metering equipment consists of Daniel ANSI gas turbine meters (w/ Daniel Series 2521 Flow computers).

The 16-inch line-break valve operators at mainline valve installations are Shafer 9x12 gas-over-hydraulic rotary vane operators.

All pipeline bends greater than 30 degrees are 6-D heat induction bends coated with thin film epoxy. Hot bends were fabricated by Associated Bending and Engineering Company.

2. Original design and construction standards

As stated above, the pipeline was designed and constructed in accordance with 49 C.F.R., Part 192, and ASME B31.8. Construction was completed in 1990.

During construction, 100% of field welds were x-rayed. Film records are maintained by, and available for review from BP.

An updated class location study was completed in April 2001 in compliance with 49-CFR- 192 Subpart K. Results of this study determined the following:

Class Location	Linear Distance (feet)	Percent of System
1	154,717	80.8
2	29,820	15.6
3	6,886	3.6
4	0	0

<u>Hydrostatic testing:</u> Following construction, the line was hydrostatically tested to 1828 psig (90% SMYS) and held for eight hours. Based on the licensed MOP of

550 psig, the pipeline presently operates with a design factor 0.27. At the proposed uprated MOP of 950 psig, the design factor would be 0.47.

Further, as part of commissioning the line in 1990, the pipeline was inspected using the Enduro Pipeline geometry tool to evaluate construction related dent anomalies. No anomalies (dents) were reported which exceeded a depth of 3%.

3. All previous operating pressures and length of time at that pressure

The Ferndale pipeline has operated in the range of 500-550 psig since it was commissioned in 1990.

4. All leaks and the date and method of repair

There have been no leaks or operational failures on the Ferndale Pipeline.

In March 2000, the pipeline was in-line inspected using a PII Canada Ltd. MagneScan HR magnetic flux leakage tool for integrity verification of the pipeline. Results of this inspection (final report received March 2000) identified the presence of external corrosion beneath disbonded shrink sleeves. Metal loss anomalies were assessed in accordance with the modified version of ASME B31G-1991 criteria and calculation methodology. Results of this analysis identified one metal loss feature that required repair. Repair method consisted of installation of four clock springs to re-enforce the metal loss area. Two additional metal loss features consistent with manufacturing grind markings along the longitudinal seam weld were also investigated.

The only repairs performed to the pipeline system were the single corrosion anomaly referenced above, and the two manufacturing grind investigations subsequent to the 2000 in-line inspection. Repair of these features was achieved using clock spring technology.

Gas odorization, at concentrations specified in 49 C.F.R., Part 192, is introduced at the Sumas meter station.

All mainline block valves are currently equipped with automatic low-pressure, line-break controls. In order to enhance its ability to monitor the operation of the Ferndale Pipeline system, BP is currently in the process of installing telemetry to all 5 mainline block valves via a SCADA system. Each of the block valves will be monitored from BP's central gas control facility in Tulsa, Oklahoma. The gas control center will have the ability to monitor line pressure at each block valve, as well as the ability to remotely open or close each valve.

5. All upstream and downstream regulators and relief valves

Upstream pressure-regulation facilities are located at the Sumas meter station, at the interconnection with the Duke Gas Transmission (Westcoast Energy Inc.) pipeline system.

Six-inch and eight-inch pressure control valves at the Sumas meter station (S-PVC-1 and 2) are Fisher Type 8510 edisk valves with Type 1052 actuators and 4150 controllers and set for fail closed.

Downstream pressure regulation facilities are located at the Cherry Point Meter station. The four-inch pressure control valves at Cherry Point station (CP-PVC—1 and 2) are V-100 vee-ball valves with Type 1051 actuators and 4160 reset controllers, set for fail closed.

6. All Cathodic Protection readings for the past three years (or three most recent inspections)

Review of the past three years Cathodic Protection records from the Ferndale Pipeline show that the pipeline has received complete cathodic protection. Rectifier records indicate proper and continuous operation; casing surveys indicate electrical isolation from the product pipe and all insulators are providing electrical isolation.

Appendix 2 to this Exhibit "C" contains the Cathodic Protection Readings for the past three years for the Ferndale Pipeline.

B Engineering Critical Assessment and Proposed Pipeline Maintenance Activities for Increasing Maximum Operating Pressure

This section of Exhibit "C" provides additional technical analysis and proposed maintenance activities to support increasing the operating pressure of the Ferndale Pipeline.

An Engineering Critical Assessment (ECA) of hazards known to affect pipeline integrity will be used to demonstrate that the Ferndale Gas Pipeline can safely operate at an increased MOP of 950 psig, and through a proactive maintenance program, with a safety factor equivalent to that of a newly constructed pipeline system (Class 3 area - 0.5 design factor). Hazards to be discussed include:

- manufacturing/construction related defects;
- external corrosion;
- stress corrosion cracking;
- geotechnical, and
- third party mechanical damage.

In general, these hazards can be divided into two categories: non-time-dependent hazards whose characteristics do not change with time, and time-dependent hazards whose characteristics change over time in service. Construction or manufacturing related pipeline defects are non-time dependent hazards in that they are present from day one and do not degrade or worsen over time (e.g. weld imperfections, mill defects). Corrosion, SCC, geotechnical and third party mechanical damage are time dependent pipeline hazards.

Manufacturing/Construction related defects

At the time of construction, the Ferndale Pipeline was hydrostatically tested to 1828 psig for eight hours (90% SMYS) pressure test. Passing a hydrostatic test demonstrates that no critical defects were present on the pipeline. Subsequent to the test, only time dependent failure mechanisms can become a concern to the continued safe reliable operation of the pipeline system.

The proposed increased operating pressure of 950 psig would result in a design factor of 0.47. Based on the successful 1990 hydrotest, the safety factor for the pipeline would be 1.92.

External Corrosion

As already noted above, inspection of the pipeline in 2000 identified the presence of external corrosion beneath disbonded shrink sleeves. One feature required repair in accordance with ASME B31G. To eliminate future concern related to this hazard, the following maintenance activities are proposed:

PROPOSED MAINTENANCE ACTIVITY #1 – High Resolution In-Line Inspection:

Prior to proceeding with the proposed uprate, in-line inspect Ferndale Pipeline using a hi-resolution metal loss tool.

Since Integrity Management Rules have not yet been adopted by CFR Title 49 – Part 192 for gas pipelines, BP will utilize its existing procedure developed for liquid pipelines (P-195.422) for evaluating anomalies and repairing defects for the Ferndale Pipeline.

PROPOSED MAINTENANCE ACTIVITY #2 - **Selective Close Interval Survey:**

Following completion of the high-resolution in-line inspection, and prior to proceeding with the proposed uprate, undertake a selective Close Interval Survey. The selective CIS survey will be used to correlate results of the in-line inspection to cathodic protection survey results as well as validate the integrity of the EP coating system in specific areas.

The selective CIS survey would be conducted with the rectifiers interrupted, and target the following areas:

- Measurement of the pipe to soil voltage potential at all locations indicated by the inline inspection data as having external wall loss features.
- Measurement of the pipe to soil voltage potential at all mid-point locations or at the extremities of coverage between existing cathodic protection groundbed systems.
- Measurement of the pipe to soil voltage potential at all foreign structure crossing locations.

Results of this survey would be used to optimize the performance of the cathodic protection system, and, if necessary, undertake investigative digs.

As previously mentioned, the pipeline underwent a geometry tool inspection at time of construction and no dents exceeding 3% OD were identified. However, 13 years have elapsed since this inspection A third maintenance activity is proposed:

PROPOSED MAINTENANCE ACTIVITY #3 – In-Line Geometry Inspection
Prior to proceeding with the proposed uprate, inspect the Ferndale Pipeline with a geometry survey. All dent features identified in the geometry tool run will be evaluated and repaired in accordance with BP operating and maintenance procedure P-195.422 before implementing the pressure uprate.

<u>Stress Corrosion Cracking</u>
Failure by stress corrosion cracking (SCC) is not considered a threat to the Ferndale Pipeline system. According to historical performance reports, the pipeline coating type primarily defines susceptibility to failure by SCC. According to public documents, no SCC failures have occurred in the industry on pipelines, such as Ferndale Pipeline, that have been coated with extruded polyethylene. [1,2] At the proposed uprate pressure of 950 psig, the Ferndale Pipeline System would operate at 47% SMYS.

<u>Geotechnical</u>
Review of the pipeline right-of-way corridor has shown that no geotechnical concerns threaten the Ferndale Pipeline system. The pipeline right-of-way essentially traverses rural agricultural land or forested areas, and there are no major stream/river crossings or identified slope instability concerns.

<u>Third Party Mechanical Damage</u>
Standard design and operating practices are employed along the Ferndale Pipeline right-of-way to reduce the chance of third party damage due to unauthorized excavations or pipeline crossings. These measures include:

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[1] Report on the Inquiry: Stress Corrosion Cracking on Canadian Oil and Gas Pipelines, National Energy Board, December 1996.
[2] Stress Corrosion Cracking Recommended Practices, Canadian Energy Pipeline Association, 1997.

- Warning posts installed at all highway, road, railway and watercourse crossings;
- Aerial markers located at periodic intervals to aid in the aerial surveillance of the pipeline RoW; and
- Aerial marker balls on high power transmission lines where they cross the pipeline
- Aerial patrols are conducted on a bi-weekly frequency. These patrols are intended to observe and prevent activities carried out in close proximity to the pipeline that may pose a threat as well as to investigate activities, such as crossings, that may have already occurred.

In addition to the permanent and operating practices outlined above, BP proposes to augment its right-of-way patrol activities to include increased frequency of ground patrol and leak detection surveys as outlined in Maintenance activities #4 and #5:

PROPOSED MAINTENANCE ACTIVITY #4 – Ground Patrol
Upon uprating of the pipeline, incorporate into its operating procedures for the Ferndale Pipeline ground patrol of the entire right-of-way on a quarterly basis, with a maximum period between patrols of 4.5 months.

PROPOSED MAINTENANCE ACTIVITY #5 – Leak Detection Survey
Upon uprating of the pipeline, incorporate into its operating procedures for the Ferndale Pipeline a leak detection survey of the entire right-of-way on a quarterly basis, with a maximum period between patrols of 4.5 months.

Summary

The combination of existing design and construction specifications, operating practices, and proposed maintenance activities is a comprehensive approach to ensure the safety performance of the Ferndale Pipeline meets and in many areas exceeds minimum Federal and State requirements. A summary of key design, operating and maintenance activities relative to Federal and State requirements is provided below:

Design or Operating Condition	**Federal Requirement (Title 49 CFR Part 192)**	**State Requirement (WAC-480-93)**	**Ferndale Pipeline**
Design & Construction			
Hydrotest Pressure	1.1/1.25/1.5x proposed MAOP for Class 1/2/3 1045/1188/1425 psig for Class 1/2/3	1.1/1.25/1.5x proposed MAOP for Class 1/2/3 1045/1188/1425 psig for Class 1/2/3	1.9x proposed MAOP for all Class locations 1827 psig for all Class locations

Mainline Block Valves - Spacing - Operation	 20/15/8 miles for Class 1/2/3 local line-break control	 20/15/8 miles for Class 1/2/3 local line-break control	 5 miles for all Class locations - local line-break control; and - remote monitoring/ operation via SCADA to central control centre
Non-Destructive testing of Girth Welds	10/15/100% for Class 1/2/3	10/15/100% for Class 1/2/3	100% for all Class locations
Design Factor	0.72/0.60/0.50 for Class 1/2/3	0.72/0.60/0.50 for Class 1/2/3	0.47 for all Class locations
Operations and Maintenance			
RoW Patrol - Highway & Railroad Crossings - Balance of RoW	 2/2/4x per year for Class 1/2/3 1/1/2x per year for Class 1/2/3	 2/2/4x per year for Class 1/2/3 1/1/2x per year for Class 1/2/3	 24-26x per year aerial patrol and 4x per year ground patrol for entire RoW
Leak Detection Surveys	1/year (odorized)	- 1x per year for Business Areas and buildings of public assembly; - 1x per 5 years for Residential areas.	4x per year for entire RoW
Internal Inspection	Design to accommodate passage of internal inspection tools	Design to accommodate passage of internal inspection tools	- Permanent launch/receive facilities installed at original construction; - High resolution in-line

			inspection completed in 2000
Integrity Management – Pipeline Repairs	N/a	N/a	- Utilize existing BP procedures developed for liquid Integrity Management program

Conclusion

Operation of the Ferndale Pipeline system as a Class 3 location pipeline qualifies for an MAOP of 1015 psig. The proposed pressure uprate MOP is 950 psig, which is within the MAOP. The pipeline condition would exceed that of a new pipeline designed to operate in a Class 3 location with a 0.50 design factor. The design factor for the uprated pipeline would be 0.47.Therefore, based on this analysis, 950 psig is an acceptable MOP for the BP Ferndale Pipeline System.

C Procedure for Increasing the Maximum Operating Pressure of the Ferndale Pipeline

Safety

All pipeline operations, maintenance, and repair work will be conducted in accordance with BP Cherry Point Health and Safety Policies, OSHA regulations, and other applicable federal, state, local and industry safety standards.

During any pipeline operations, great care will be exercised to prevent the possibility of ignition of a potentially explosive mixture of natural gas and air near ground levels. No smoking, running engines, bare lights, spark producing devices, etc., will be allowed within 100 yards of pipeline operations and testing. Personnel should wear non-static clothing such as cotton, and avoid the use of footwear with exposed tacks or nails.

Natural gas vapor (an asphyxiant) can be breathed in small amounts without ill effects. Heavy concentrations, however, have a narcotic and intoxicating effect, which is soon followed by unconsciousness. Any individual experiencing dizziness or intoxication will be instructed to immediately signal for help and walk to any upwind location. Appropriate follow-up actions will be taken immediately.

Confined space entry permits are required for all work in trenches. Special care will be taken to protect personnel working in excavations or pipeline trenches. A safety watch will be maintained whenever personnel are inside a trench and the air will be monitored for natural gas accumulation.

The safety considerations mentioned are intended to be comprehensive. In addition, construction activities will comply with all BP and other applicable codes and standards.

Hazards Analysis

A hazard analysis review will be conducted to identify potential safety considerations resulting from activities to increase the pipeline operating pressure.

Notifications

The pipeline route does not pass through any municipalities. However, prior to testing the pipeline, all appropriate officials of all municipalities in the immediate vicinity of the section of pipeline where the tests are being made will be notified.

Procedures

The following are procedures for increasing the existing operating pipeline pressure of 550 psig to a new operating pressure of 950 psig. These procedures have been designed to increase the pipeline operating pressure in a controlled manner by stepping up the pressure in four incremental stages. Proceeding in a prudent and safe manner by increasing the operating pressure in stages will facilitate monitoring the pipeline and its components for possible leaks.
The increase in pipeline pressure will be staged in four 100 psig increments. Each incremental pressure increase will be approximately 25% of the total increase in operating pressure.

Current Operating Pressure	550 psig
1. 25% increment	650 psig
2. 25% increment	750 psig
3. 25% increment	850 psig
4. 25% increment	950 psig

Equipment Required

LEL Monitors
Compressor
2 Chart Recorders (at Sumas and Cherry Point Stations)

Personnel Requirements

Two Operators
Eight Field Inspectors
Instrument Technicians

Procedural Steps

1. Prior to increasing pipeline operating pressure:
    - Complete geometry tool and metal loss re-inspection runs and subsequent repair programs
    - Repair all known existing leaks in pipeline
    - Reset pressure control valves to new MAOP of 950 psig
2. Shut in pipeline at Cherry Point Meter Station and close valves to the Intalco pipeline.
3. Gradually increase the pipeline pressure at Sumas Meter Station allowing the operating pressure to slowly reach the next target 25% pressure increment.
4. Pressure shall be maintained by closure of isolation valves at Sumas and at the pipeline termination point at Cherry Point. Pressure at each test point should not vary more than +/- 2% over the test duration.
5. Maintain pressure for 1 hour or a period of time sufficient to carry out inspections.
6. Monitor line pressure at Sumas and Cherry Point Stations with chart recorder and pressure log. If a decrease in line pressure is observed indicating a leak, do not proceed with operating pressure increases until the leaks have been identified and repaired.
7. Personnel will walk the line monitoring for leaks.
8. Identify and repair all leaks before proceeding to increase operating pressure to next increment.
9. After the pipeline pressure has been held constant for one hour, repeat steps 3 through 8 for increasing operating pressure to next level.
10. After completing the intermediate stages of incremental pressure increases, maintain the final pipeline pressure of 950 psig for a period of 8 hours.
11. Walk entire length of pipeline to monitor for indications of leaks.
12. After maintaining pipeline pressure at 950 psig for an 8 hour period, slowly open downstream valves at Cherry Point to enable pipeline pressure to equalize.
13. Return system to normal operations at increased operating pressure of 950 psig at Sumas Meter Station.