EXHIBIT JRS-4

Spill Response and Contingency Requirements for the Cross Cascade Pipeline

Prepared For: Prefiled Testimony of Jon R. Stack, ST Engineering, Inc.
Regarding the proposed Cross Cascade Pipeline by Olympic Pipeline

Sponsor: Cross Valley Water District

Date: February 12, 1999

Issue: Spill Response and Contingency Requirements – Goals for Preventing Contamination, Mitigating a Spill, Monitoring of the Groundwater Supply

Document: Spill Response and Contingency Requirements for the Cross Cascade Pipeline, prepared by Golder Associates, dated February 11, 1999.

February 11, 1999 Our ref: 983-1277

Cross-Valley Water District
P.O. Box 131
8710 180th Street SE
Snohomish, Washington 98291

ATTENTION: Mr. Gary Hajek, General Manager

RE: SPILL RESPONSE AND CONTINGENCY REQUIREMENTS FOR THE CROSS-CASCADE PIPELINE

Dear Mr. Hajek:

This letter outlines recommended elements of spill response and contingency planning related to potential groundwater contamination from the Cross-Cascade Pipeline.

Cross Valley Water District (CVWD) should develop mitigation and contingency plans, either independently or in conjunction with plans developed by Olympic Pipeline Company (OPC) that reflect the site specific and operational aspects of the CVWD service area. Given the lack of detail provided by OPC on these issues in its permit application and subsequently in the Draft Environmental Impact Statement, CVWD should request that OPC develop a spill prevention, mitigation and monitoring plan specifically for the Cross Valley Aquifer. The plan should clearly identify actions and contingencies, as well as how and when they will be implemented. OPC should work closely with CVWD on this plan, and should provide additional site-specific data in order to support the selection of specific actions. Preparation of the plan and concurrence by CVWD should be a part of any stipulated agreement with OPC.

CVWD could incur significant cost, regardless of what strategy is developed or how information is collected. In addition to its participation in developing a spill response plan, CVWD should initiate additional monitoring of its own wells, and possibly install additional monitoring wells to ensure that water quality standards are achieved and that a continuous water supply is assured for its customers. Based on the information provided by OPC in its application, it is our opinion that OPC should obtain guidance and oversight from CVWD in the design and implementation of a mitigation and monitoring strategy for a regionally significant sole-source aquifer. The City of Renton is developing, at OPC’s expense, a protection plan for its aquifer areas that are traversed by an OPC pipeline. This approach may be applicable to CVWD.

Further details of our recommendations, which could become elements of a stipulated agreement with OPC, are provided below.

Introduction

We have defined three "goals" to consider in identifying a strategy that is applicable to protection of a sensitive groundwater supply: prevention, mitigation, and monitoring.

1. Prevention is defined as the actions that would prevent any contamination from entering the ground surface. Short of re-location of the pipeline alignment, preventative measures would typically be engineered designs applied to the pipeline itself or the trench in which it is placed. If the primary goal is prevention, a high level of reliability, accuracy, and redundancy is required in the pipeline itself. Highly reliable prevention can minimize the need for mitigation and monitoring.
2. Mitigation is defined as the actions that would mitigate, alleviate or minimize contamination that is released. Mitigation measures would typically be response actions and clean-up protocols that would be used in the event of a spill, and design elements that would complement the actions necessary in the event of a spill. If the primary goal is mitigation, a high level of reliability, accuracy, and redundancy is required in the systems surrounding the pipeline and the actions taken if a spill occurs.
3. Monitoring is defined as the on-going system by which the performance of the prevention and mitigation goals is documented.

Based on the spill volumes presented in the DEIS, prevention, mitigation and monitoring should be considered for two levels of spill:

- An "undetectable" release that could persist for a period of days or weeks. This type of spill could release volumes on the order of 10,000 to 80,000 gallons. The release of product from OPC's Renton–area pipeline apparently went undetected for nearly one year. The Renton spill was on the order of 80,000 gallons.
- A detectable release that could persist for a period of hours. This type of spill could release larger volumes, potentially in the 100,000 to 300,000 gallon range.

Prevention Strategies

The most obvious prevention strategy for protecting the CVWD aquifer would be an alternate alignment for the pipeline. There is some degree of prevention provided in the design, construction, and testing of the pipeline. Additional pipe wall thickness, localized cathodic protection, more detailed inspection and additional block valves would increase the reliability of the preventative elements of the pipeline, but may not completely prevent a release. Remote monitoring of pipeline flows (through the SCADA system) is not preventative, since detection of a release does not prevent it from occurring.

The volumes of product present in the pipeline at any given time are large enough that it is probably impossible to have a completely preventative design of the pipeline that protects the CVWD service area from large "detectable" releases. For "undetectable" releases, the closest thing to prevention would involve trench or vault designs that could accommodate an "undetectable" release without overflow or seepage into the ground. This type of design might include different trench geometry and/or bulkheads, placed based on topography and drainage patterns along the alignment or vaults for pipeline valves.

Conventional Mitigation Strategies

Mitigation strategies should be clearly specified in a spill response plan such that CVWD can accurately assess the reliability of the proposed response and clean-up. Mitigation is initially a function of response time to a detected release. Once a release is detected and a response is initiated, the methods used to characterize, clean-up, and monitor the site dictate the effectiveness of mitigation. OPC should identify characterization and clean-up approaches within the CVWD service area, taking into account site specific geotechnical conditions and a range of release scenarios. At a minimum, CVWD should ensure that it can review, comment and amend all spill response, site characterization and clean-up plans, and further review, comment, and amend based on new information as it becomes available.

Conventional Mitigation strategies and response action alternatives are completed in the following four steps:

- Identification of clean up criteria;
- Screening of potential remedial technologies based on applicability to gasoline and diesel contamination and the ability of the technologies to meet the identified cleanup criteria;
- Evaluation of the suitable remedial technologies identified during the screening process; and,
- Ranking of the alternatives.

Clean-up criteria are provided in Washington State Model Toxics Act (MTCA). However, clean-up levels for groundwater are typically higher than drinking water standards. CVWD should specify drinking water standards as clean-up levels.

The following technologies are possible remedial alternatives that would be implemented at a release site:

- Soil Vapor Extraction (SVE)
- Air Sparging
- In-Situ Bioremediation
- Ex-Situ Bioremediation
- Groundwater Extraction and Treatment ("Pump-and-Treat")

CVWD should request that OPC conduct a screening level feasibility study of which technologies would be appropriate for different locations or spill scenarios within the CVWD service area. This may require some reconnaissance level of field investigation, such as test-pits or monitoring wells, and could be conducted during construction of the pipeline.

<u>Alternate Mitigation Strategies</u>

Three alternate approaches to mitigation are discussed below.

1.) <u>Improved Leak Detection.</u> For "detectable" releases, OPC appears to have adequate response capabilities. However, the fact that an "undetectable" release can occur, would suggest that one approach to mitigation would be to improve the ability to detect small releases. Improved detection could be accomplished by:

- *Vapor sensors:* Because vapors travel much faster than liquids in the subsurface, vapor sensors may detect leaks before major environmental damage occurs. Vapor systems are available to provide complete coverage of a pipeline and area able to be calibrated for specific subsurface conditions.
- *Other sensors:* Newer detection technology uses flexible, liquid absorbing cables to detect water, conductive liquids, and liquid hydrocarbon fuels and solvents in unwanted areas. When moisture is absorbed into the cable, the circuit shorts and current flow increases generating a spill alert. The instrumentation switches to a "locating" mode and provides the distance from the instrumentation to the spill location.
- *Pigging:* The most commonly used pipeline inspection tools ("pigs") utilize the Magnetic Flux Leakage (MFL) technique in order to detect internal or external corrosion. The MFL inspection pig uses a circumferential array of MFL detectors embodying strong permanent magnets to magnetize the. Abnormalities in the pipe wall, such as corrosion pits, result in magnetic flux leakage near the pipe's surface. These leakage fluxes are detected by probes or induction coils moving with the MFL detector. Newer inspection tools ("smart pigs") are shifting from the mere detection, location and classification of pipeline defects, to the accurate measurements of defect size and geometry. Modern, high-resolution MFL inspection tools are capable of giving very detailed signals, but requires considerable expertise, as well as a detailed understanding of the effects of inspection conditions and the magnetic behavior of the type of pipeline steel used.

2.) <u>Redundant Water Supply:</u> A second approach to mitigation would be to develop a redundant water supply system that is not susceptible to contamination from the pipeline and can meet the needs of the CVWD. This is more of a contingency than a mitigation. A hydrogeologic or engineering study would be necessary to identify possible alternate water supply (i.e. wells or interties) and the ability of those sources to meet CVWD needs. The system may need to be in-place prior to the occurrence of contamination in order to assure uninterrupted service.

3.) Treatment. A third approach to mitigation would be to provide water treatment for compounds found in gasoline, such as benzene and MTBE. A treatability and engineering design study is necessary to identify methods of treatment for the design flow rates and contaminant concentrations. The system may need to be in-place prior to the occurrence of contamination in order to assure uninterrupted service.

Monitoring Strategies

Additional monitoring should be initiated to ensure that groundwater quality standards are achieved and that a continuous water supply is assured for CVWD customers. The elements of the monitoring strategy should include:

Establishing compliance points. This basically defines the locations at which monitoring should occur (the monitoring network). Some combination of the CVWD production wells themselves, and off-site sentinel wells should serve as compliance points. The number and optimal placement of wells must be determined based on actual site characteristics and groundwater modeling. The design of the network should ensure reliable detection of relatively small contaminant plumes. This may require many wells.

Establishing action levels. This basically defines the contaminant level at which some action is taken for one or more monitoring locations. Typically, levels less that the MCL for a given contaminant are used as action levels in aquifers used as a drinking water supply. An action level essentially represents the community's "tolerance" for contamination.

Installing a monitoring system. For groundwater, we recommend both shallow and deep monitoring well completions. This would ensure that the vertical extent of possible contamination is identified.

Establishing background water quality levels. This can be accomplished using methodologies outlined in Ecology publication # 96-02, *Implementation Guidance for the Ground Water Quality Standards.*

Monitoring and reporting. Quarterly sampling is typical for environmental monitoring, and ensures that undetected, cumulative, or persistent contamination is identified.

Site Characterization

Adequate prevention, mitigation and monitoring strategies are dependent on accurate and defensible characterization of site conditions. We recommend that a comprehensive hydrogeological assessment of the pipeline alignment be carried out, utilizing guidance provided by Washington Department of Ecology. The site investigation should develop sufficient data to determine:

1. Geologic and hydrogeologic characteristics.
2. Ground water depth and flow direction, including seasonal variations.
3. Ground water velocity, transmissivity, storage coefficient, hydraulic conductivity, porosity, and dispersivity.
4. Thickness, permeability, and aerobic/anaerobic condition of the unsaturated zone.
5. Topography and drainage patterns.
6. Soil type, horizontal and vertical extent, infiltration rate, organic carbon content, and mineral content.
7. Location, construction, and use of existing wells within 1/4 mile of the alignment.
8. Background water quality, determined using methodologies outlined in Ecology publication # 96-02, *Implementation Guidance for the Ground Water Quality Standards.*

This information should then be used to conduct groundwater flow and transport modeling. The area impacted should take into account advection, dispersion, and diffusion of contaminants in ground water. The size of the area will depend upon the effluent quality, the aquifer characteristics, and the rate of assimilation. This modeling would be used to determine the optimal placement of monitoring devices, compliance points, and action levels to be used in a spill response and contingency plan.

Cost

Costs are difficult to assign for a number of reasons. We have assumed that CVWD would request that OPC bear most, if not all, of the cost associated with the development and implementation of a comprehensive spill response plan. Although we have not conducted an analysis of potential costs, it is our opinion, that the likely combined cost to CVWD and OPC for developing an adequate spill response plan (including the necessary site characterization, modeling, monitoring network design and implementation), followed by a conventional mitigation response to one large spill and the eventual installation of a treatment system at one or more CVWD wellheads, is at least at about 3 million dollars.

Please do not hesitate to call if you have any questions.

Sincerely,

GOLDER ASSOCIATES INC.

Robert H. Anderson
Associate and Senior Hydrogeologist

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