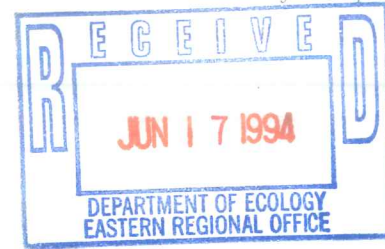


SEACOR

*Science & Engineering
Analysis Corporation*



**FINAL
WORK PLAN FOR
INDEPENDENT REMEDIAL ACTION
WHITTY'S MINIMART
485 SOUTH MAIN STREET
COLVILLE, WASHINGTON
SEACOR Job No. 00004-026-01**

**Submitted by
SEACOR**

**For
Whitten Oil Inc.
370 West Fifth Avenue
Colville, WA 99114**

June 16, 1994

Prepared by:

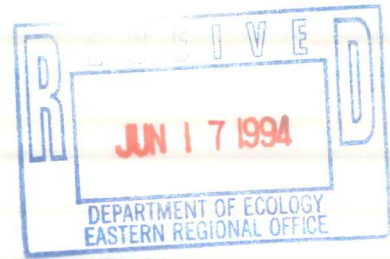
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LETTER OF TRANSMITTAL

Date: June 16, 1994

Attn: Mr. Michael Boatsman, Project Coordinator

Company: Department of Ecology

Address: N 4601 Monroe, Suite 202

Spokane, Washington 99205-1295

Project: Whitten Oil Job No: 00004-026-01

RE: Order DE-91TC-E702 Independent Remedial Action Plan

Enclosed:

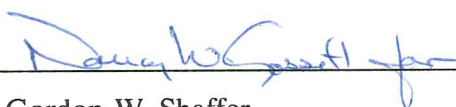
- ☐ Proposal
- ☐ Contract
- ☒ Report
- ☐ Letter
- ☐ Other: _____

For:

- ☒ As Requested
- ☐ Review
- ☐ Your Information
- ☐ Approval
- ☐ Signature
- ☐ Return
- ☐ Other: _____

Comments: Mike,

Please find enclosed the final draft of the Independent Remedial Action Work Plan. Please contact
either Nancy Gossett or Gordon Shaffer with any questions.

Signature: 

pc: _____

Name: Gordon W. Shaffer

Title: Project Manager

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1.0 INTRODUCTION

1.1 PURPOSE

On behalf of Whitten Oil, Inc. (Whitten) and Federated Service Insurance Company, this Work Plan has been prepared for remediation of petroleum releases to soil and groundwater at the former Whitty's Minimart facility (Minimart), located at 485 South Main Street in Colville, Stevens County, Washington (Figure 1). The remedial work plan addresses remediation of soils and groundwater contaminated with various petroleum hydrocarbons (TPH) identified in soil and groundwater at the Minimart site. This Work Plan has been developed in response to Enforcement Order Numbers DE91TC-E702 (amended November 15, 1993) and DE91-E701 issued by the Washington State Department of Ecology (Ecology), and in accordance with the Washington State *Model Toxics Control Act Cleanup Regulation* (MTCA), WAC 173-340. This Work Plan provides sufficient information for the implementation of cleanup of TPH-impacted soil and groundwater which underlie the site.

1.2 REPORT ORGANIZATION

Included within this Work Plan, either directly or by reference, are four documents which have been developed for proceeding with cleanup action at the facility: (1) Engineering Design Report [WAC 173-340-400(4)(a)]; (2) Compliance Monitoring Plan (WAC 173-340-410); (3) Construction Drawings and Specifications [WAC 173-340-400(4)(b)]; and (4) Safety and Health Plan [WAC 173-340-810]. These documents have been combined into one comprehensive Work Plan to avoid unnecessary duplication of effort, and to expedite progress of the cleanup action. This Work Plan also provides an overview of the site and existing conditions, an outline of the project objectives, and a detailed description of the selected remedial alternative. Section 2.0 provides the site conditions; Section 3.0 discusses the remedial objectives, permitting, and technical and regulatory considerations; Section 4.0 describes the components and construction of the remedial design (Engineering Design Report); and, Section 5.0 presents the Sampling, Analytical and Compliance Monitoring Plan. Construction Drawings and Specifications, the SEPA checklist, and the Determination of Nonsignificance are included in the appendices. A site safety and health plan which includes excavation and safety monitoring components was submitted to Ecology with the remedial investigation work plan for the Minimart site. This plan is incorporated in this remedial action plan by reference.

2.0 BACKGROUND

2.1 SITE OVERVIEW

2.1.1 Site Description

Whitty's Minimart was formerly a retail gasoline station located at 485 South Main Street on approximately 0.75 acres in a residential and commercial neighborhood in Colville, Stevens County, Washington (Figure 1). The site is presently owned by Mr. Carroll Whitten and his wife. The property was operated by Whitten Oil between March 1977 and August 1992. Records indicate that the facility was previously operated prior to 1977 as Larry's Exxon.

The Minimart property is bordered to the north by residential housing (Figure 2). An alley borders the east side of the site. Bowe's Office Equipment and vacant residential lots bound the east side of the alley. Dominion Avenue borders the south side of the site. Colville Auto Repair is located on the south side of Dominion Avenue opposite the Minimart. U.S. Route 395 (Main Street) borders the west side of the site. A parking lot and restaurant are located west of Main Street opposite the Minimart. The layout and nearby properties are shown on Figure 2.

The site is approximately 1,600 feet above mean sea level (MSL). The Colville River is located approximately one mile west of the Minimart. Two stormwater conveyance pipelines are located adjacent to the Minimart facility. One pipe is located under the east side of Main Street, and flows to the south. The other pipe incorporates a small unnamed creek that has been routed through pipe below grade, and generally flows west beneath Dominion Avenue. The two stormwater pipelines are believed to converge at the west side of Main Street, and flow to an outfall southwest of the Minimart. The routing of the stormwater conveyance system is shown on Figure 2. Stormwater eventually discharges into the Colville River in the vicinity of Colville's wastewater ponds (Figure 1). Stormwater from the Minimart sheets off of the facility, and enters the stormwater conveyance system through several drains.

The former service and retail sales building and service canopy remain at the site. Approximately 40 percent of the Minimart facility is currently paved, including the area beneath and surrounding the canopy. The Minimart previously used four underground storage tanks (USTs) for storage of gasoline and diesel fuel products. These USTs have been removed:

- **Tank T-1** - A 2,000-gallon diesel fuel UST.
- **Tank T-2** - A 10,000-gallon regular unleaded gasoline (unleaded) UST;
- **Tank T-3** - A 6,000-gallon super unleaded gasoline (super) UST;
- **Tank T-4** - A 6,000-gallon leaded gasoline (regular) UST; and,

The former locations of the USTs are shown on Figure 2.

2.1.2 Site Geology

Based on information collected by SEACOR and others, the subsurface soil consists of a mixed zone of silts, sands and gravels to a depth of 7 to 8 feet below ground surface. This mixed zone is underlain by a clay layer. The clay layer appears to be underlain by a silts and sands to a minimum depth of approximately 20 to 22 feet below ground surface.

2.1.3 Groundwater

Groundwater is first encountered at a depth of approximately 4 to 6 feet below grade surface (BGS) within shallow silt and sand deposits. These deposits overlie an apparently laterally continuous clay layer which appears to act as an aquitard and confines deeper water bearing layers. The depth at which the clay layer was first encountered was generally 7 to 8 feet below ground surface. Therefore, the saturated thickness of the first water bearing layer was generally limited to approximately 1 to 3 feet. Based on two deeper boring drilled during the Remedial Investigation (RI), the clay aquitard has an apparent thickness of nine to 16 feet. Groundwater appears to generally flow toward the south to southwest. Estimated hydraulic conductivity at the site is on the order of 2×10^{-6} to 2×10^{-4} feet per minute. A hydraulic gradient of 0.02 ft/ft has been estimated.

2.2 PREVIOUS ENVIRONMENTAL STUDIES AND CURRENT STATUS

2.2.1 Previous Site Investigations

Petroleum hydrocarbon-like sheen and odors have been periodically observed in the stormwater conveyance system downgradient of the property. Petroleum hydrocarbons have been identified in soil and groundwater beneath the Minimart facility, as well as at the Colville Auto Repair located across Dominion Street south of the site.

In July 1984, Petroleum Equipment Maintenance Co. of Spokane, Washington conducted tightness tests of the four UST systems at the Minimart. According to the tests, the regular gasoline dispensing line and the diesel fuel UST failed the test. A portion of the regular gasoline dispensing line, and the diesel fuel tank and distribution line were replaced.

A site investigation was conducted in 1984 by Soil Exploration Company of St. Paul, Minnesota. Potential sources of gasoline entering the stormwater conveyance system were identified. During this investigation, a cut-off trench and sump were installed along a section of the west side of the Minimart property to intercept and prevent migration of gasoline in the subsurface from entering the stormwater conveyance system. The trench reportedly recovered the majority of free product observed in the stormwater pipe running beneath Main street. This work was documented in *Gasoline Spill Investigation and Remedial Measures Implementation Report* (Soil Exploration Company, August 1984). In July 1990, gasoline was again observed in the stormwater conveyance system. Ecology initiated emergency response activities that included removing floating gasoline and water from the cut-off trench sump. Two additional trenches were installed along the southern and western boundaries of the site to determine specifically where gasoline was entering the stormwater conveyance system. The trenches were also used as part of a vapor extraction system (*Results of Remedial Action and Whitten Oil in Colville, Washington*, Olympus Environmental, Inc, 1990).

A Remedial Investigation (RI) was conducted by Ecology in 1991 to further investigate the sources of TPH in the area. As part of the investigation, several borings and monitoring wells were completed at the Minimart facility and Colville Auto Repair. The investigation recommended that additional work be performed to further define the source(s) of TPH at the site (*Whitten Exxon Oil, Remedial Investigation, Colville, Washington*, Science Applications International Corporation, June 1991).

Ecology issued Enforcement Order No. DE 91-E701 mandating Whitten Oil to conduct UST system tightness tests, and subsequent excavation to expose product distribution lines at the Minimart. Testing conducted in August of 1991 revealed pin-hole leaks in the unleaded gasoline dispensing line. The unleaded dispensing pipeline was removed and replaced. Soil samples were collected along the product dispensing lines, and in the vicinity of the pin-holes during the tank testing and pipe line replacement.

SEACOR performed a supplemental site characterization study (*90-day Site Characterization Report for Whitten Oil, Inc, Whitty's Minimart*, SEACOR, November 1991). The scope of work included the following:

- Drill and sample six shallow soil borings around the location of the dispensing line pin-holes;
- Drill and sample a groundwater monitoring well near the northwest corner of the Minimart facility; and,
- Complete and sample a hand auger boring at Colville Auto Repair and near the 6,000 gallon leaded gasoline UST at the Minimart.

Three soil samples collected and analyzed during the site characterization exceeded the MTCA Method A cleanup level for TPH as diesel, and three samples exceeded MTCA Method A cleanup levels for one or more gasoline constituents. A groundwater monitoring well (MW-1) was installed in the city easement near the northwest corner of the Minimart facility to help assess groundwater flow direction, and investigate for the presence of potential upgradient hydrocarbon sources. Groundwater was not encountered during well completion. A soil sample collected from the boring was analyzed and did not contain detectable concentrations of TPH constituents. Laboratory analysis of a soil sample collected from the hand auger boring at Colville Auto Repair also revealed no detectable levels of petroleum constituents.

2.2.2 Remedial Investigation and Findings

SEACOR initiated a Remedial Investigation (RI) in July 1992. Thirteen additional soil borings were completed at and around the Minimart facility. Soil samples from the boring were analyzed for various petroleum constituents. Results are summarized below and presented in detail in *Revised Draft Remedial Investigation, Whitten Oil, Inc*, (SEACOR, October 1992).

Based on the results of the soil samples collected as part of the RI, there are three areas that exhibit concentrations of petroleum hydrocarbons in excess of MTCA Method A soil cleanup levels. These areas include soil sampled from the boring for MW-16 located west of the Colville Auto Repair facility, at MW-11 located in Dominion Avenue south of the Whitten Oil facility, and the Minimart site as evidenced in samples from Well MW-10 southwest of the pump islands and by borings located

immediately north of the pump islands. The Minimart appears to be the source(s) for the petroleum hydrocarbons detected in soil at the Minimart and under Dominion Avenue. Colville Auto Repair appears to be the source for the petroleum hydrocarbon detected in the soil at boring MW-16. The highest concentrations of petroleum hydrocarbons in the soil were detected at, or very near the groundwater table which suggests that they may have migrated on top of the water table.

A total of 10 monitoring wells were installed during the RI. Seven monitoring wells had been completed before the RI, for a total of 17 monitoring wells on or near the Minimart site. The results of groundwater sampling and analyses during and subsequent to the RI indicate that the groundwater beneath the southern and western portions of the Minimart site generally contains concentrations of TPH constituents in excess of MTCA Method A cleanup levels.

Water samples from the stormwater conveyance system were also analyzed for TPH constituents. Stormwater samples obtained downgradient of the Minimart contained TPH constituents, but these concentrations did not exceed 1992 USEPA Water Quality Criteria for human consumption of fish or the acute freshwater toxicity concentrations and are not at significant levels.

2.2.3 Feasibility Study

SEACOR's *Final Draft Feasibility Study Report* (FS) was issued to Ecology in June 1993. The study reviewed available data collected during the RI and other prior investigations, and proposed a remedial approach based on development of remedial action objectives. Conclusions of the FS are presented in Section 3.

3.0 PROJECT APPROACH

This section presents the regulatory and technical framework for accomplishing the remediation of surface contamination, subsurface soil and groundwater in compliance with MTCA.

3.1 CHEMICALS AND MEDIA OF POTENTIAL CONCERN

Based on data collected from the RI and other previous studies, TPH constituents exist in various media at the facility.

3.1.1 Chemicals of Potential Concern

The chemicals of concern at the Minimart facility are petroleum hydrocarbon constituents. The chemical constituents include total petroleum hydrocarbons in the gasoline and diesel ranges (TPH-g and TPH-d), benzene, toluene, ethyl benzene, and xylene. Concentrations of lead (associated with leaded gasoline) detected in soil samples did not exceed typical background levels. Therefore, lead is not considered a chemical of potential concern.

3.1.2 Affected Media of Concern

3.1.2.1 Soil

Based on the results of the RI, soil containing petroleum hydrocarbons exceeding MTCA Method A cleanup levels for TPH is confined to a zone of one- to two-feet in thickness, located within the zone of seasonal groundwater fluctuation. The zone containing TPH extended from the area north of the pump islands on the western portion of the site, to the south beneath Dominion Avenue.

3.1.2.2 Groundwater

Groundwater is encountered at a depth of approximately 4 to 6 feet below groundwater surface in shallow silt and sand deposits. Groundwater in wells located on the southwestern quarter of the facility contained TPH exceeding the MTCA Method A cleanup levels.

3.1.2.3 Surface Water

Although all sources of petroleum hydrocarbons being discharged to the stormwater conveyance system are not well defined, available data indicates that TPH-containing groundwater from the Minimart facility may be infiltrating the stormwater conveyance system. Concentrations of TPH-g, TPH-d and BTEX have been detected at manhole locations downgradient of the Minimart site. The detected concentrations of BTEX in the creek have not exceeded federal Ambient Water Quality Criteria for freshwater acute exposures, or for human consumption of aquatic organisms. Therefore, the surface water in the creek is not considered to be a target for active remediation.

3.2 REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) for the Minimart facility are to protect human health and the environment. The contaminants of concern at the site are petroleum hydrocarbon constituents.

The following remedial objectives have been established as goals for remediation of the Minimart facility to protect human health and the environment:

- Remove hydrocarbon constituents in groundwater beneath the site to concentrations acceptable to Ecology and consistent with MTCA (thereby mitigating potential constituent infiltration in the storm drain and unnamed creek); and,
- Remove hydrocarbon constituents which may be adsorbed onto soil particles in the capillary fringe zone to prevent reintroduction of gasoline constituents into groundwater.

Specific cleanup levels for the affected media at the site (i.e., soil and groundwater) that are consistent with the RAOs are presented in Section 5.2.

3.3 CLEANUP ALTERNATIVES

3.3.1 Alternatives Screening

Various cleanup alternatives were evaluated in the FS that protect human health and the environment by eliminating, reducing, or otherwise controlling risks of exposure to chemicals of potential concern. A brief discussion of the cleanup alternatives evaluation process conducted during the FS, and selection of the preferred remedial technology is provided in the following section.

The following potentially applicable remedial technologies were considered for cleanup of facility soil and groundwater:

- Insitu Soil Treatment
 - Vapor extraction
 - Vapor injection/extraction
 - Bioremediation
- Excavated Soil Treatment
 - Incineration
 - Bioremediation
 - Aeration
 - Off-site disposal at a solid waste landfill
 - Incorporation into asphalt

- Groundwater Treatment
 - Monitoring
 - Sparging
 - Extraction and treatment
 - Groundwater extraction trench and treatment
 - Hydraulic barriers

Potentially applicable remedial alternatives were evaluated based on criteria as presented in MTCA, WAC 173-340-360 for:

- Technical feasibility;
- Protection of human health and the environment;
- Long-term effectiveness;
- Short-term effectiveness;
- Permanent reduction of toxicity, mobility, and volume;
- Compliance with regulatory requirements;
- Cost; and,
- Timeline.

3.3.2 Selection of Alternative

Soil vapor extraction, combined with air sparging was the alternative selected in the FS as the optimal cleanup alternative. A long-term groundwater monitoring program will be implemented to measure progress of the cleanup and assess subsurface conditions throughout the cleanup.

Soil vapor extraction will be accomplished by using the existing trenches located at the southwest portion of the property, and proposed lateral perforated piping to extract hydrocarbon vapors from the subsurface soils. Air sparging will enhance the soil vapor extraction process by increasing the differential pressure in the exposed soil zone. Additionally, sparge air will be introduced to the subsurface below the water table to "sparge" or aerate the groundwater, and increase volatilization of hydrocarbons from groundwater, and subsequent recovery in the vapor extraction system. The application of air injection will also provide an oxygen source for potential enhancement of biodegradation of hydrocarbons.

A vapor extraction pilot test was conducted in October 1993 to confirm the suitability of the technology for site specific conditions, and to provide information for siting additional well sparge and vapor extraction points.

4.0 DESIGN, CONTRACTING AND CONSTRUCTION (ENGINEERING REPORT)

4.1 PROCESS DESCRIPTION

A vapor extraction/air sparge (VE/AS) system will be used for in-situ remediation of soil and groundwater at the Minimart facility. Air sparging (AS) involves injecting compressed air into the aquifer, and stripping volatile compounds (VOCs) from the groundwater into the vadose zone. Air that contains VOCs is then captured by the soil vapor extraction system which operates in the overlying vadose zone. The AS system will also promote natural bioremediation of petroleum hydrocarbon constituents by supplying oxygen to the subsurface.

The proposed VE/AS system consists of nine vapor extraction lateral lines, six air sparging lines, a series of vapor collection and air delivery lines, and the necessary above-ground equipment and electrical facilities to provide vacuum and compressed air to the system. The process configuration, major equipment and pipe routing are shown on project drawings presented in the attached Construction Drawings and Specifications (Appendix A). References to the appropriate construction drawings are provided in the following narrative by designating the appropriate sheet of the attached Construction Drawings and Specifications.

4.1.1 Vapor Extraction (VE)

The vapor extraction system incorporates the use of two existing vapor extraction lateral lines previously installed by Ecology, and seven new lateral sparge lines (Sheet 1). Lateral sparge lines have been located within areas of highest concentration, and at the downgradient boundary of the facility to provide optimal capture of volatile constituents, and to minimize off-site movement of contaminants in groundwater. After completion of the planned VE system, approximately 270 lineal feet of slotted pipe will be placed in service. The slotted pipe VE laterals will be connected via buried PVC pipe to an air blower and VOC recovery equipment, located at the Equipment Storage Shed. Manifold valving for controlling the VE recovery process will be placed in a buried concrete vault (Sheets 1 and 3). The manifold valving located in this vault will provide controls for vapor extraction of separate areas of the facility. For instance, the VE trench located at the southeast corner of the facility may be left operating after other areas of the site have been remediated. A Rotron™ blower will provide a maximum of 250 SCFM vapor recovery. As shown in the schematic diagram (Sheet 2), recovered vapors pass through a water knock-out drum, the blower and four granular activated carbon canisters prior to discharge to atmosphere.

4.1.2 Air Sparge (AS)

The air injection system includes six slotted PVC air sparging laterals located beneath the water table (Sheet 2). Air injection laterals have been located within areas of highest VOC concentration to effect maximum contact with VOCs in groundwater. After completion of the planned AS system, approximately 110 lineal feet of slotted pipe will be placed in service. Manifold valving for controlling the air sparging process will be placed in a buried concrete vault (Sheets 1 and 3). The manifold valving located in this vault will provide controls for air sparging separate areas of the facility. Air will be supplied to the AS laterals by three Gast™ compressors, located in the Equipment Storage Shed. Approximately 2,400 square feet of additional paving (minimum 3" lift)

will be placed on the east side of the facility to prevent "short circuiting" of VE/AS system to the atmosphere.

4.1.3 Structures, Ancillary Equipment and Electrical Service

Mechanical and electrical equipment for the VE/AS system will be located in the Equipment Storage Shed and adjacent fenced area (Sheet 2), located at the rear of the Minimart service building. The shed, approximately 8 feet wide by 12 feet long, will contain all electrical, and most process equipment required for operation of the VE/AS system. An adjacent fenced area located next to the building will be used for placement of all other necessary equipment. Security will be maintained by locking the doors of the building and the fence gate. The building will be a framed wood structure on concrete slab, with painted composite wood product siding with a pitched roof and composite roofing.

Mechanical and electrical components are located inside the shed for weather protection and noise attenuation. The VE water knock-out drum and blower will be located in the shed. The AS compressor, associated piping, and electrical equipment have been placed a separate room. To protect electrical components from contact with fugitive vapors from the VE system, separate ventilation systems have been provided for each room. Four granular activated carbon canisters for capture of extracted VOCs, and the emission stack will be located outside the shed in the adjacent fenced area.

4.2 SYSTEM OPERABILITY AND WEATHER PROTECTION

The VE/AS system is designed to operate 24 hours a day, 365 days per year, including during severe winter weather. All rotating equipment and most electrical components have been placed inside the equipment storage shed to protect them from sub-freezing weather. Mechanical ventilators, and ventilation louvers have been placed on the walls of the shed to maintain a temperature range between approximately 40 and 100 degrees F in the shed.

The vapor phase granular activated carbon canisters and piping that will contain volatile hydrocarbon vapors have been located outside, away from the electrical system components and rotating equipment located in the shed, to avoid potentially hazardous conditions. Electrical heat tape has been provided around the bottom of the VE liquid knock-out drum to prevent freezing of the anticipated small amount of collected condensate. No other equipment, piping or vessels located outside will handle liquids which could freeze, expand and damage equipment and piping. Additionally, routine inspections (at least quarterly), will be conducted to identify any other problems associated with the harsh winter weather. Should problems develop, such as excess accumulated frozen water vapor on the vapor stack, field modifications will be made to correct the problem.

4.3 PERMITTING

SEACOR will submit a Notice of Construction permit for operation of the VE system to Ecology's Eastern Regional Office. Electrical permits, as required by local authorities will be obtained by the electrical subcontractor.

4.4 CONTRACTING APPROACH

SEACOR will act as the prime contractor, and provide design/build turnkey services for installation and start-up of the VE/AS system. All major mechanical equipment, most piping, valving, consumables and supplies will be provided by SEACOR. SEACOR will select local subcontractors in the Colville area, as needed, for completion of the work. The local subcontractors used will include a licensed electrical contractor, and a grading and paving contractor for installation of the shed's concrete slab and new asphalt paving.

4.5 CONSTRUCTION APPROACH

SEACOR and the selected subcontractors will perform the work in accordance with the project specifications and plans. Unknown site conditions, such as buried obstructions discovered during construction may require that changes be made in the field. Any such changes to the construction plans will be made under the direct supervision of a professional engineer licensed in the State of Washington, and will be made under the client's direction in conformance to all regulatory and state and local agency requirements.

Performance of the work will require field engineering personnel for field oversight. The site engineer will also be health and safety coordinator for the remediation activities. Continuous site monitoring, field supervision, and inspection services are necessary during installation of the VE/AS system. The field engineer will direct all field activities. A detailed field log will be maintained and construction "as built" drawings will be produced to document field activities and the final configuration of the VE/AS system.

The performance requirements of each construction component are discussed below.

4.6 CONSTRUCTION COMPONENTS

4.6.1 Mobilization and Site Controls

The SEACOR will mobilize to the site. Services such as potable water, toilet facilities, and temporary fencing will be set up before commencing the work. Surface water run-on and run-off controls will be installed in accordance with local requirements. This may include strategic placement of plastic sheeting and hay bails to prevent soils and particulate from entering the adjacent stormwater conveyance system. A decontamination area for personnel, equipment, vehicles, and construction debris will be set up.

Buried utility lines will be identified to the extent practicable by a local utility locator service. Based on this information, and the project plans and specifications, the site engineer will delineate areas for trenching and excavation with spray paint and stakes. The pipe routing and corners of the Treatment Equipment Shed will also be marked.

The site engineer will designate a soil stockpile area with plastic sheeting and hay bails. During the excavation, soils will be excavated and placed into the stockpile area. Stockpiled soil will be used for backfill of the VE/AS trenches to the extent practicable. Remaining soil will be covered and managed with other soil stockpiles presently located behind the Minimart service building.

4.6.2 Soil Excavation and Trenching

Approximately 350 to 375 lineal feet of trenching will be necessary to install the VE/AS piping. Existing sections of asphalt pavement will be cut, as necessary. As shown on the Project Drawings and Specifications, Sheet 2 of 4, extraction and supply lines will be installed at least 18 inches below ground surface (Sheet 2). VE and AS laterals and the VE/AS vault will be placed at depths shown on the project drawings. Stockpiled soil will be stockpiled west of the Minimart station building on plastic sheeting.

It is the intent to use the maximum amount of excavated soil as backfill, if it meets the standards for backfill specified on the project drawings. Excavated soil will be characterized using field screening techniques (visual and field vapor sensors). Potentially impacted soil will be segregated from clean soil, and placed in segregated stockpiles. Potentially impacted soil will only be used as backfill in trenches above the slotted lateral lines, i.e. in the areas where active remediation will occur. Clean soils will be placed in other areas, as needed. Excess soils, if any, will be characterized for gasoline, diesel, and BTEX prior to transportation and disposal at a permitted off-site disposal facility.

4.6.3 Underground Piping

Prior to backfilling trenches, PVC Schedule 40 piping will be installed according to project drawings. When assembled, pipe will be clean and dry, with all visible debris and moisture removed. Pipe spools will be fabricated with solvent welded joints. Joints will be made in accordance with manufacturer's instructions. All piping and seams will be visually inspected for workmanship prior to backfill.

4.6.4 Backfill and Compaction

Excavated material will be used as fill if the native material meets WSDOT specifications. All backfill shall be placed in 12-inch loose lifts and compacted to 95 percent of the ASTM D-698 maximum dry density. Backfill and compaction to 95 percent will be conducted in accordance with WSDOT specifications. The excavation shall be backfilled to match existing grade. A three-inch lift of asphaltic concrete will replace paving removed for excavation, and match existing paving.

4.6.5 Treatment Equipment Shed

The treatment equipment shed will be constructed on a four-inch concrete slab as shown on project drawings. The building will contain two rooms for electrical and process equipment. Mechanical ventilation will be supplied to each room to remove heat generated by the mechanical and electrical components. A secure fenced area is adjacent to the building for placement of the VE granular activated carbon adsorption drums.

4.6.6 Mechanical Systems

Mechanical components for the VE/AS system are shown on the Project Plans and Specification sheet 2 of 4. All rotating equipment has been located inside the Treatment Equipment Shed for noise attenuation and weather protection. Equipment will be installed and connected in accordance with supplier's guidelines.

4.6.7 Electrical Supply

A 220-volt, 200 amp, single-phase power supply is currently available at the facility. A new meter, provided by the electrical subcontractor will be installed outside the Treatment Equipment Shed. Breakers, disconnect switches, and other electrical components have been consolidated, wherever possible, in the compressor room to isolate unclassified electrical components from potential VOC releases in the adjacent VE blower room. However, an explosion-proof local lock-out switch for the blower is located in the blower room, as necessary per national and local electrical codes.

4.6.8 Construction Cleanup and Demobilization

Throughout the construction, proper housekeeping will be maintained to mitigate public hazards and potential stormwater contamination. This will include collection and stockpiling of excavated soil and construction debris. Plastic sheeting and hay bails will be used as necessary prior to placement of soil and debris. Soil and debris piles will be covered overnight. Final cleanup will involve transport and disposal of solid waste and construction debris to the Stevens County landfill or other permitted facility, as appropriate.

4.6.9 Mechanical Start-up and Inspection

Full-time, continuous supervision and inspection will be performed by the field engineer during construction. Specific components to be inspected for conformance to project plans and specifications include:

- Excavation depth and pipe bedding preparation;
- PVC pipe installation and system integrity;
- Backfill and compaction of trench cover;
- Vault placement and perforation seals;
- Concrete foundation;
- Shed construction and painting;
- Asphalt paving; and
- Installation of mechanical equipment, electrical connections, the electrical panel.

Mechanical start-up of the mechanical and electrical systems will be completed by SEACOR personnel. Functional operation of each component will be demonstrated. System repairs and corrections will be made as necessary. An Operation and Maintenance Plan [WAC 173-340-400(4)(C)] will be prepared upon completion of installation and successful startup.

5.0 SAMPLING, ANALYSIS AND COMPLIANCE MONITORING PLAN

The Sampling and Analysis and Compliance Monitoring Plans have been combined and prepared in accordance with WAC 173-340-410, and WAC 173-340-820. The Sampling and Analysis Plan specifies the procedures for collecting and testing recovered vapors and groundwater during remediation to confirm that cleanup has met the remedial objectives. The Compliance Monitoring Plan provides methods for monitoring progress and assessing effectiveness of the cleanup action.

5.1 PURPOSE

The purpose and content of Compliance Monitoring Requirements (WAC 173-340-410) and Sampling and Analysis Plans (WAC 173-340-820) are to provide specific methods and procedures for the following monitoring requirements:

- **Baseline Data Collection** - Assess site conditions prior to start-up of active remediation.
- **Performance Demonstration** - Initial operation and chemical sampling of the VE/AS system to demonstrate that the system is performing as intended; and monitoring and documentation of operation of the VE/AS system for process control, and optimal system performance.
- **Confirmational Monitoring** - This is described in WAC 173-340-410 as monitoring that confirms cleanup performance standards are being met. This includes periodic sampling of groundwater wells to assess progress toward meeting cleanup standards.

5.2 CLEANUP STANDARDS

Objectives have been established to determine when the area of concern is considered clean. The following have been considered:

- The methods used to confirm the cleanup standards must be technically feasible and defensible to Ecology;
- The data used to establish the cleanup standards must be reproducible and of sufficient quality; and,
- The cleanup standard must be acceptable to Ecology.

The cleanup standards must ensure long-term protection of the groundwater, soil, and surface water. The cleanup standards discussed below are based on the current MTCA Method A tables for

groundwater and soil and are consistent with current Ecology cleanup policy for petroleum hydrocarbon sites.

Constituent	Groundwater Cleanup Level ($\mu\text{g/l}$)	Soil Cleanup Level (mg/kg)
TPH-g	1,000	100
TPH-d	1,000	200
Benzene	5	0.5
Toluene	40	40
Ethyl Benzene	30	20
Xylenes	20	20

5.3 SAMPLING PROGRAM

This section provides sampling procedures in conformance with Ecology guidelines.

This sampling program identifies:

- The location and frequency of sampling;
- Constituents and chemical parameters of concern;
- Procedures for sample collection and handling;
- The method of analysis for the samples; and,
- Description of the quality assurance program.

5.4 SAMPLING FOR BASELINE DATA COLLECTION

Prior to starting up the VE/AS system, necessary data will be collected to establish the initial subsurface condition. This information will be used with, and compared against data collected during the active remediation phase of the project. Comparison of ongoing operating data with this baseline data will help assess progress toward meeting final cleanup standards.

Data from the current quarterly monitoring program will be used to assess baseline conditions. The quarterly monitoring program is described in the *Revised Final Draft Remedial Investigation Report* (October 1992).

5.5 PERFORMANCE DEMONSTRATION

The initial start-up of the VE/AS system will be implemented after completion of the mechanical system check and start-up. The data collected will be used to gain understanding and knowledge of the VE/AS system. This will allow more efficient routine operation of the system and may result in simple operational modifications to improve overall system performance. It is anticipated that system start-up and data collection will be completed in one to two days. The following data will be collected during start-up of the VE/AS system:

- One recovered vapor sample upstream and downstream of the granular carbon adsorption drums. Samples will be analyzed for TPH-g and BTEX per methods noted on Table 1.
- Vacuum and pressure readings at gages and selected monitoring wells to assess radius of influence and subsurface response to vapor extraction and air sparging. Readings will be collected with only the VE system operating, and with both VE and AS systems operational.

5.6 PERFORMANCE AND CONFIRMATIONAL MONITORING

5.6.1 Routine Monitoring

Vapor samples will periodically be collected from the VE discharge, and groundwater samples will be collected from selected monitoring points to assess system performance. The vapor and groundwater samples will be analyzed to check that the VE/AS system is removing volatile constituents from subsurface groundwater, to track progress toward achieving cleanup standards, and to project breakthrough of the granular activated carbon canisters. A thorough system check will also be conducted, along with any necessary system adjustments to maintain optimal recovery. Sampling and operations and maintenance inspections will be conducted quarterly. The following will be performed during field visits:

- Collect subsurface pressure readings at and around the VE/AS system to assess area of influence;
- Collect VE vapor samples before and after the granular activated carbon canisters, and analyzed for TPH-g, TPH-d and BTEX;
- Inspect system and make necessary repairs; and
- Collect groundwater samples from selected groundwater wells and stormwater points for analysis of TPH-g, TPH-d and BTEX.

Monitoring data and work performed (including start-up and periodic performance testing) will be summarized and transmitted to the client and Ecology approximately two weeks after laboratory results are received. The analytical methods for analysis of performance monitoring samples are presented in Section 5.6.3. Sample collection procedures and sampling points are further discussed in Section 5.6.4.

5.6.2 Confirmational Monitoring and System Shut-Down

When the results of ongoing performance and confirmational monitoring program indicate that the cleanup levels have been achieved, confirmation groundwater samples will be collected from the monitoring wells nearest the downgradient site boundary. The analytical methods for analysis of confirmational samples are presented in Section 5.6.3. Sample collection procedures and sampling points are further discussed in Section 5.6.4.

When cleanup standards have been achieved in groundwater, five soil borings will be completed, and soil samples will be collected and analyzed for gasoline, diesel, and BTEX. Selection of the appropriate boring locations will be made with Ecology's concurrence prior to sampling. Soil confirmation sampling can be performed within one week of receiving authorization to proceed following receipt of sufficient acceptable groundwater data indicating that cleanup standards for groundwater have been met. Active cleanup will cease when it can be demonstrated to Ecology that cleanup standards have been achieved for both soil and groundwater, and that ongoing operation of the remediation system may cease.

5.6.3 Analytical Testing Parameters

The analytical parameters that have been selected for this project are based on the previous analytical results and the media of concern. Constituents of concern are TPH (in both the gasoline and diesel ranges), benzene, toluene, ethyl benzene and xylenes in site groundwater and soil. The analytical testing requirements defined in the plan addresses these constituents.

The analytical testing parameters and methods are as follows:

- TPH-g by WTPH-G;
- TPH-d by WTPH-D; and
- BTEX by EPA Method 8020.

5.6.4 Sample Collection and Handling Procedures

The sample collection procedures for groundwater and vapors are described below. Sample collection, handling, preservation and holding times for samples analyzed by an independent laboratory are outlined below and summarized in Table 1.

5.6.4.1 Sample Collection

All groundwater and stormwater will be collected from existing monitoring wells and stormwater system access points located at or near the Minimart site. The samples will be collected using a clean disposable bailer.

The following wells and stormwater access points as shown on Figure 2 will be monitored to assess performance of the system:

<u>Stormwater</u>	<u>Monitoring Well</u>
SD-1	MW-7
SD-3	MW-10
SD-4	MW-11
SD-6	MW-12
	MW-13
	MW-15

The following monitoring wells as shown on Figure 2 will be monitored to confirm compliance with the established cleanup levels:

- MW-3
- MW-7
- MW-8
- MW-10
- MW-11

The water level in all monitoring wells will be measured prior to purging the wells selected for sampling. Each well to be sampled will be purged with a stainless steel or PVC bailer or a surface centrifugal pump to remove three casing volumes or until the well is effectively dewatered, whichever is less. The wells will be allowed to recover to approximately 80 percent of their pre-purged water level before sampling with a dedicated disposable polyethylene bailer. All purge water will be contained on-site in labeled 55-gallon DOT drums pending proper off-site disposal.

Vapor samples will be collected at two sampling ports in the remediation system. One port will be upstream of the carbon units and the other port will be downstream of the carbon units. The vapor samples will be collected with a hand operated pump which will discharge the sampled vapor into a 1-liter Tedlar® bag for shipment to the laboratory. All sample containers will be supplied by analytical laboratory.

The sample containers will be clearly labeled denoting the sample location, date, time, job number and sampler's name. Labels will be securely taped to the container. All lids will be screw-threaded, Teflon-lined, and secured in-place with tape.

5.6.4.2 Sample Handling

Samples will be stored on ice at 4°C in coolers during field sampling and in transit to the laboratory. Chain-of-custody procedures will be followed and custody forms will be relinquished upon sample delivery to the laboratory.

5.6.4.3 Equipment Decontamination

All usable equipment that comes into contact with potentially contaminated groundwater or vapors will be decontaminated prior between each sample collected. Decontamination of groundwater sampling equipment will consist of cleaning in an aqueous solution of Liqui-Nox® cleanser, rinsing with tap water and rinsing a second time with distilled water. Fluids generated during the decontamination process will be contained, characterized, and disposed of properly. Air sampling equipment will be decontaminated by purging the air pump with clean ambient air in an upgradient location.

5.7 SAMPLE DOCUMENTATION

Sample documentation forms will be used to document each sampling event and will include: sample identity; analytical parameters; sample collection method; and chain-of-custody when samples are sent to an independent laboratory. Specific forms will be used to provide documentation. The forms include:

- Field notebooks;
- Field report forms;
- Sample labels; and
- Chain-of-custody forms.

Labels will be filled out by the sample personnel in water-proof ink and affixed to the sample containers prior to shipment. The sample labels and chain-of-custody forms will include:

- Name of sampler;
- Date and time of sample collection;
- Station number;
- Sample number;
- Sample matrix and collection method; and
- Analyses required.

5.8 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance and quality control (QA/QC) measures will be implemented in the field and at the laboratory. These quality "checks" are used to assess the performance of the laboratory's analytical procedures. The QA/QC checks include controlled samples introduced into the sample analysis stream to evaluate the precision and accuracy of the chemical analysis.

The quality control samples will include:

- Field blanks;
- Lab blanks;
- Lab replicates; and
- Lab matrix and collection method; and
- Analyses required.

Field blanks monitor sample cross-contamination and contaminants which may be present in the sample containers. Field blanks are prepared by filling sample containers with media of known chemical character. A groundwater field blank will be submitted to the laboratory in the sample stream but not identified as a blank.

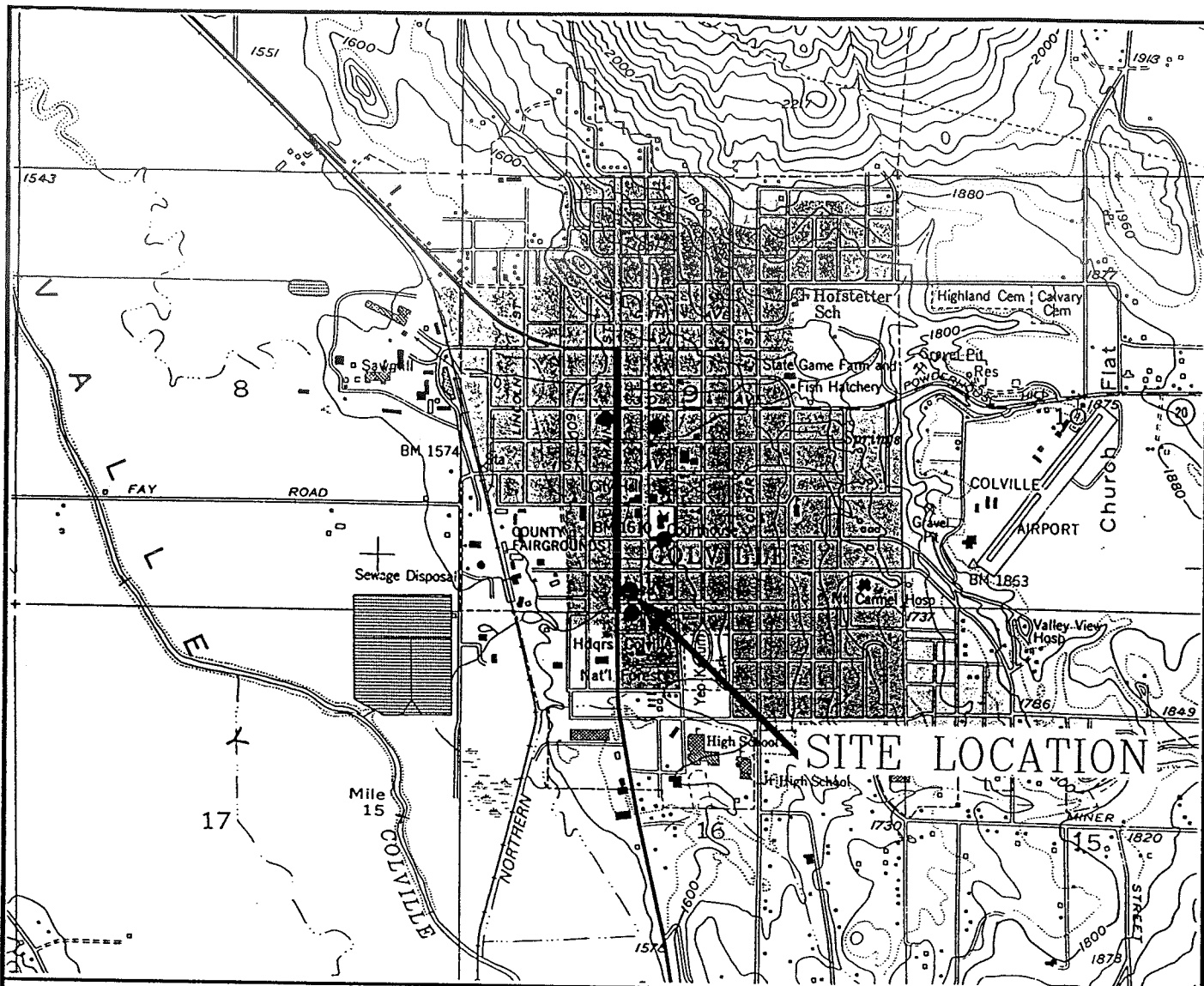
Laboratory matrix spikes provide one measure of analytical accuracy. A sample is fortified or spiked with a known constituent of concern. The spike recovery is used to quantify interferences that may occur due to the sample matrix and other factors. These interferences may affect accurate measurements of the constituent.

These methods are used to predict the accuracy, precision and sensitivity of the chemical analysis. The QC samples will indicate whether corrective measures should be taken in the field collection or in the laboratory. The QC measures should also indicate whether representative samples are taken, if the data shows comparability.

Approximately one in ten, or ten percent of the samples collected in the field will be QA/QC samples. Results of all QA/QC tests will be included with analytical data submitted to Ecology.

6.0 HEALTH AND SAFETY

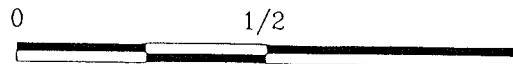
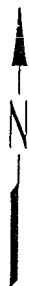
A health and safety plan for all Minimart assessment and remediation activities has been provided in the Remedial Investigation Work Plan. This plan has been reviewed by Ecology and is incorporated by reference in this remedial action plan.



REFERENCE: USGS 7.5 MINUTE QUADRANGLE, COLVILLE, WASHINGTON, 1986



WASHINGTON

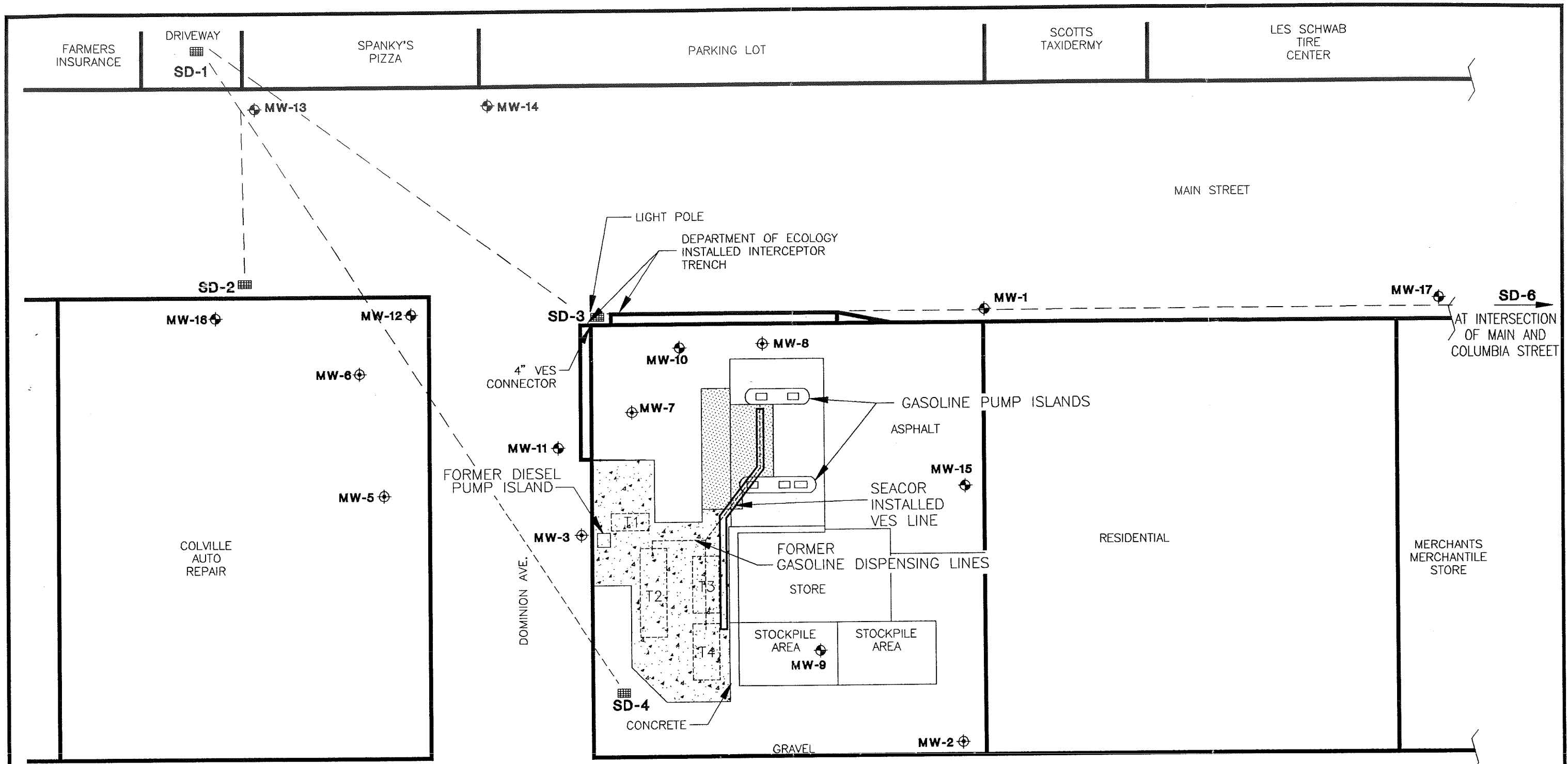


SCALE (MILES)

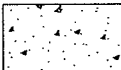
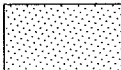
SEACOR

DWN/CK CC
APPR
DATE 7/92
JOB#
00004-008-01

FIGURE 1
SITE LOCATION MAP
WHITTY'S MINIMART
COLVILLE, WASHINGTON

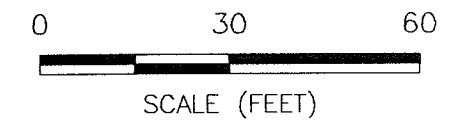


LEGEND

-  CRUSHED ROCK BACKFILL
-  SOIL BACKFILL

- MW-01**  SEACOR MONITORING WELL
- MW-3**  SAIC MONITORING WELL
- SD-1**  STORM DRAIN SAMPLING POINT
- T1 = FORMER LOCATION OF 2,000 GALLON DIESEL UST
- T2 = FORMER LOCATION OF 10,000 GALLON UNLEADED UST
- T3 = FORMER LOCATION OF 6,000 GALLON REGULAR UST
- T4 = FORMER LOCATION OF 6,000 GALLON SUPER UST
- — — APPROXIMATE LOCATION OF STORM DRAIN LINES BASED ON RECOLLECTION OF CITY PERSONNEL. SUBSURFACE UTILITY MAPS WERE NOT AVAILABLE.

ALLEYWAY



SEACOR

DWN AJW
APPR *[Signature]*
DATE 6/15/94
JOB#
00004-026-01

FIGURE 2
SITE PLAN
WHITTY'S MINIMART
COLVILLE, WASHINGTON

TABLE 1
SAMPLE CONTAINERS AND HANDLING PROTOCOL

Sample Matrix	Type of Analysis	Reference Method	Type and Size of Container	Number of Containers and Sample Volume (per sample)	Preservation	Maximum Holding Time
Vapor	TPH in the gasoline range	WTPH-g	1-liter Tedlar bag	One (1); bag is completely filled	Cool to 4°C (ice in cooler)	14 days
Vapor	BTEX	EPA Method 8020	1-liter Tedlar bag	One (1); bag is completely filled	Cool to 4°C (ice in cooler)	14 days
Groundwater	TPH in the gasoline range	WTPH-G	40 ml glass vial with Teflon-lined cap	Two (2); jars are completely filled	Cool to 4°C (ice in cooler)	14 days
Groundwater	BTEX	EPA Method 8020	40 ml glass vial with Teflon-lined cap	Two (2); jars are completely filled	Cool to 4°C (ice in cooler)	14 days
Groundwater	TPH in the diesel range	WTPH-D	1-liter glass jar with Teflon-lined lid	One (1); jar is completely filled (Allow 1 inch head space)	Cool to 4°C (ice in cooler)	14 days