Engineering Design Report
Coleman Oil Yakima Bulk Fuel

Site Name:	Coleman Oil Yakima Bulk Fuel
Site Address:	1 East I Street, Yakima 98901
Agreed Order:	DE 23182
ERTS ID Nos.:	663825, 670092
Site Cleanup ID:	13200
Facility/Site ID:	4233

Prepared for:
Washington State Department of Ecology
Under Agreed Order DE 23182
Washington State Department of Ecology Toxics Cleanup Program
Central Region Office
Union Gap, WA

PBS Project 41392.000

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PBS has prepared this report for use by Coleman Oil. The site is managed under a State Agreed Order, and it is understood that this report may become available to the public. Findings and recommendations contained in this report represent PBS' professional opinions based on the currently available information and are arrived at in accordance with currently accepted professional standards. This Engineering Design Report will be used to implement the Cleanup Action Plan for compliance with MTCA regulations (WAC 173-340).

Prepared by:
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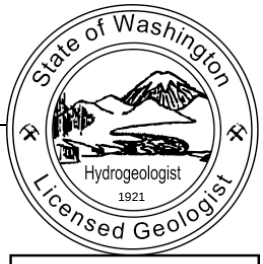

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ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
Bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAP	Cleanup Action Plan
COC	Contaminant/Chemical of Concern
CMP	Compliance Monitoring Plan
CPOC	Conditional Points of Compliance
CSID	Cleanup Site Identification number
CSM	Conceptual Site Model
CUL	Cleanup Levels
DCA	Disproportionate Cost Analysis
DCAP	draft Cleanup Action Plan
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
FS	Feasibility Study
FSID	Facility Site identification number
MPE	Multiphase Extraction
MTCA	Model Toxics Control Act
NAPL	Non-aqueous phase liquid
Order	Agreed Order DE 23182
PAHs	Polycyclic Aromatic Hydrocarbons
PCS	Petroleum contaminated soil
pCOC	potential Contaminants of Concern
PLP	Potential Liable Persons
POC	Point of Compliance
PRB	Permeable Reactive Barrier
RI	Remedial Investigation
RCW	Revised Code of Washington
SEB	Surfactant Enhanced Bioremediation
TPH	Total Petroleum Hydrocarbons
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOCs	Volatile Organic Compounds
WAC	Washington State Administrative Code

EXECUTIVE SUMMARY

This Engineering Design Report (EDR) presents the final remedial design for the Coleman Oil Yakima Bulk Fuel Facility in Yakima, Washington. The report has been prepared in compliance with Agreed Order DE 23182 under the Model Toxics Control Act (MTCA) and provides detailed plans for the implementation of the selected Surfactant Enhanced Bioremediation (SEB) cleanup action.

Background

The Coleman Oil Yakima Bulk Fuel Facility has been used for petroleum storage and distribution for over 60 years. In 2016, two separate releases of diesel and gasoline were identified in the subsurface. Subsequent environmental investigations have confirmed non-aqueous phase liquid (NAPL) contamination in both soil and groundwater, consisting of:

- Fresh and weathered gasoline and diesel fuel
- Weathered diesel fuel only
- Dissolved-phase petroleum hydrocarbons (BTEX, TPH-Gx, TPH-Dx)

Cleanup Action Overview

The Subject Potentially Liable Persons (PLPs) shall conduct a final cleanup action at the Site by implementing and completing the Cleanup Action Plan (CAP) and incorporated in the Order dated August 19, 2024. The cleanup action employs surfactant enhanced bioremediation using a designed injection/recovery treatment system. The surfactants will desorb contamination from soil surfaces, or from NAPL layers making the petroleum more available for in-situ or ex-situ remediation. The liberated contaminated water is then more biologically available for microbial and associated enzymatic degradation.

The selected remedial strategy consists of:

- Surfactant Enhanced Bioremediation (SEB): Using PetroSolv™ surfactant to desorb contaminants and increase bioavailability.
- Dissolved Oxygen In-Situ Treatment (DO-IT™): Recirculating oxygen-enriched water containing PetroBac™ bacterial consortium and CBN™ nutrients to promote in-situ biodegradation.

The remediation system includes six injection wells, and four recovery wells connected to a recirculating groundwater treatment system. A seventh injection well and a fifth recovery well will also be installed but not connected to the piping network. It is expected that the Alternative 2 SEB recirculating system NAPL recovery and supplemental biological treatment may take 5 years of operation to reach the CULs. Achievement of CULs would be evaluated and confirmed by groundwater monitoring performed throughout and following remediation.

1 INTRODUCTION AND PURPOSE

This Engineering Design Report (EDR) presents the remedial design and implementation plan for the cleanup of petroleum hydrocarbon contamination at the Coleman Oil Yakima Bulk Fuel Plant (the Facility) in Yakima, Washington. A 25,000-square-foot portion of the Facility has been impacted by petroleum hydrocarbon contamination in soil, groundwater, and soil vapor (the Site). Environmental investigations have delineated this area as exceeding MTCA cleanup levels, identifying it as the focus of prior remedial efforts and the target of the selected cleanup action.

The mutual objective of the State of Washington, Department of Ecology (Ecology), and the Subject PLPs Coleman Oil Company, LLC (Coleman Oil), BNSF Railway Company (BNSF), and Chevron Environmental Management Company (CEMC) on behalf of Chevron U.S.A. Inc. (CUSA) under Agreed Order DE 23182 (Order) is to provide for remedial action at a facility where there has been a release or threatened release of hazardous substances. This Order requires the Subject PLPs to implement remedial actions as specified in the Cleanup Action Plan (CAP) (Exhibit B) in accordance with WAC 173-340-380. The Site is subject to ongoing environmental assessment and regulatory oversight under Ecology as part of this Order.

The purpose of this EDR is to document the engineering design, system components, and implementation procedures for the selected remedial approach. This report outlines the nature and extent of contamination, provides an overview of the site's geology and hydrogeology, describes the engineering specifications of the remedial system, and establishes the monitoring and compliance requirements necessary to achieve cleanup objectives. The design has been developed based on findings from previous site investigations, the Feasibility Study (FS; PBS, 2023), and pilot testing conducted in 2024.

The selected cleanup action incorporates Surfactant Enhanced Bioremediation (SEB) to mobilize hydrocarbons and a Dissolved Oxygen In-Situ Treatment (DO-IT™) system to accelerate microbial degradation. The remedial approach is designed to address petroleum contamination in soil and groundwater. This EDR provides the framework for system installation, performance monitoring, compliance reporting, and long-term site management.

2 SITE DESCRIPTION AND BACKGROUND

2.1 Property Location and Description

The Facility is located at 1 East I Street in Yakima, Washington, and occupies approximately one acre. It has historically been used for petroleum storage and distribution and remains active. The site includes:

- Aboveground storage tanks (ASTs) with secondary containment.
- A former fueling canopy, no longer in use.
- Onsite office and storage buildings for administrative and operational functions.

The Facility is in a mixed-use industrial and commercial area, bordered by:

- North and West – Commercial businesses and the Burlington Northern Santa Fe (BNSF) Railway right-of-way.
- South – East I Street, a public roadway.
- East – Additional industrial properties.

There are no known surface water bodies in the immediate vicinity. The site's topography is relatively flat, with minor surface drainage toward the BNSF Railway right-of-way.

2.2 Previous Investigations and Remediation

2016 Petroleum Releases and Initial Remedial Actions

During a subsurface investigation in March 2016, a diesel fuel release was discovered near the AST containment area. Later, in December 2016, a gasoline release was identified in another part of the Facility. In response, the following actions were taken:

- 212 tons of petroleum-contaminated soil were excavated and removed.
- Multiple groundwater monitoring wells were installed to track impacts.
- Sampling confirmed non-aqueous phase liquid (NAPL) presence in several wells.

2016–2023 Site Characterization

Between 2016 and 2023, additional site characterization was conducted to delineate contamination. These investigations included:

- 26 soil borings to evaluate subsurface conditions.
- 16 groundwater monitoring wells to assess groundwater impacts.
- Quarterly groundwater monitoring to track contaminant trends.
- Soil gas sampling to assess vapor intrusion risks.

Results confirmed that petroleum hydrocarbons exceeded MTCA cleanup levels in soil and groundwater and NAPL persisted in multiple wells.

Remedial Investigation Report (2023)

The Remedial Investigation (RI) report completed in 2023 concluded that the Site is impacted by two discrete and apparent releases of diesel and gasoline fuels to the subsurface that were identified in March and December 2016, respectively.

- Preexisting TPH as diesel plume in groundwater originating from near the northern property boundary and former ASTs was present at the Site prior to the discovery of the 2016 diesel and gasoline releases.
- The potential for petroleum vapor intrusion was evaluated and found to not be present in the existing on-site structures.
- Nonaqueous phase liquid (NAPL) is present at several locations on the Site including wells: RW-1, MW-3, MW-4, MW-5, MW-8, MW-11 and MW-12.
- Groundwater flow direction is consistently to the southeast with an average gradient of approximately 0.015 feet/foot.
- The extent of groundwater contamination has been defined in the upgradient, downgradient and lateral directions,

Feasibility Study and Cleanup Action Selection (2023–2024)

A Feasibility Study (FS) was completed in 2023 to evaluate remedial alternatives. Four cleanup strategies were considered:

1. Monitored Natural Attenuation (MNA) – Passive approach relying on natural biodegradation.
2. Surfactant Enhanced Bioremediation (SEB) – Selected Remedy – Uses surfactants to mobilize and degrade contaminants.

3. Surfactant Enhanced Dual-Phase Extraction (SEDPE) – Combines SEB with multiphase extraction.
4. Targeted Excavation with Passive Reactive Barrier (PRB) – Involves soil removal and in-situ treatment.

SEB (Alternative 2) was selected as the preferred approach due to its effectiveness in treating both free-phase and dissolved-phase petroleum contamination while being more cost-effective and sustainable than excavation-based alternatives.

2.3 Pilot Test Summary

Three pilot tests were conducted in August and November 2024 to evaluate the feasibility of SEB, Bioventing, and soil vapor extraction (SVE). These tests assessed system performance, contaminant removal efficiency, and radius of influence for each method. Technical Memorandum(s) for each pilot test were delivered to Ecology as a record of the tests results and evaluation.

Surfactant Enhanced Bioremediation Pilot Test (August 2024)

A surfactant injection pilot test was conducted at Recovery Well RW-1 to evaluate the ability of surfactant to mobilize LNAPL. 250 gallons of surfactant mixture were injected into the subsurface via gravity feed and allowed to reside for 40 hours before extraction.

The test confirmed that surfactant injection increased LNAPL recovery while maintaining controlled migration. Monitoring wells within 15 feet of the injection point detected surfactant presence within two hours, while downgradient wells remained mostly unaffected. Surfactant was nearly fully recovered within 6.5 hours, indicating no persistence in the formation.

Bioventing Pilot Test (November 2024)

A bioventing pilot test was conducted to evaluate the effectiveness of oxygen injection in enhancing microbial degradation of hydrocarbons in the vadose zone. Air was injected at 3 liters per minute (L/min) into a dedicated well, with three vapor monitoring points used to measure oxygen distribution.

The test confirmed that oxygen was successfully delivered to the target area, with oxygen concentrations increasing by 4.5% and carbon dioxide levels decreasing by 2.1%, indicating microbial respiration. Total VOC concentrations decreased by 55% at the nearest monitoring point, demonstrating active biodegradation. The estimated radius of influence (ROI) was approximately 30 feet.

Soil Vapor Extraction (SVE) Pilot Test (November 2024)

An SVE pilot test was conducted to assess the ability of vacuum extraction to remove vapor-phase hydrocarbons from the vadose zone. A 1.5-horsepower regenerative blower was connected to a vapor extraction well, with step-test vacuum extraction performed at varying pressure levels.

The test confirmed effective total VOC removal, with peak effluent concentrations of 13.3 ppm and a vacuum influence extending up to 40 feet, with an extrapolated ROI of 46 feet. VOC concentrations in soil gas were significantly reduced post-extraction.

Summary of Pilot Test Findings and Design Implications

The pilot tests confirmed that SEB effectively mobilizes LNAPL, bioventing enhances microbial degradation, and SVE removes vapor-phase contaminants. Based on the observed radius of influence for each technology, the full-scale remediation system has been designed to ensure adequate treatment coverage and will be optimized through ongoing performance monitoring.

3 CONCEPTUAL SITE MODEL AND CLEANUP ACTION SELECTION

3.1 Site Geology and Hydrogeology

The Site is situated within the Yakima Basin, which is composed of unconsolidated alluvial deposits consisting of silty sands, gravels, and cobbles. These sediments were deposited by historical fluvial processes and exhibit varying degrees of permeability, which influence groundwater flow and contaminant migration.

The shallow subsurface, from 0 to 5 feet below ground surface (bgs), primarily consists of silty sand with gravel, which has moderate permeability. Beneath this, a coarse-grained gravel and cobble unit extends to depths of 30 feet bgs. The high permeability of this unit facilitates lateral migration of contaminants in both the dissolved and non-aqueous phase.

Groundwater is encountered at depths ranging from 16 to 24 feet bgs, with seasonal fluctuations of up to 2 feet. The groundwater gradient is relatively flat, with a slight south-southeast flow direction. NAPL contamination has been observed in multiple wells, with thicknesses ranging from a sheen to over 4.5 feet. The smear zone, where petroleum hydrocarbons have been retained due to historical groundwater fluctuations, is estimated to extend approximately 8 feet vertically within the subsurface.

3.2 Nature and Extent of Contamination

Contaminants of Concern

Previous investigations have confirmed the presence of petroleum hydrocarbons and benzene, toluene, ethylbenzene, and xylenes (BTEX) in soil, groundwater, and soil vapor. These contaminants exceed MTCA Method A cleanup levels and require active remediation.

Soil Contamination:

Soil impacts primarily consist of residual sorbed-phase petroleum hydrocarbons, primarily within the diesel- and gasoline-range organics. The highest concentrations were detected between 10 and 20 feet bgs, corresponding with the depth of the smear zone.

Groundwater Contamination:

Dissolved-phase petroleum hydrocarbons exceed MTCA groundwater cleanup standards, with measurable NAPL present in multiple monitoring wells. Free-product gasoline and diesel have been observed in MW-3, MW-5, MW-11, MW-12, and RW-1, with maximum thicknesses up to 4.5 feet.

Vapor Contamination

Soil gas sampling results indicate elevated volatile organic compounds (VOCs), including BTEX, in the vadose zone. The highest vapor-phase concentrations were detected in areas where NAPL is present. These results indicate a potential vapor intrusion risk, particularly in enclosed structures or confined spaces.

3.3 Contaminant Transport and Fate

Petroleum hydrocarbons at the Site are subject to transport multiple pathways. The primary pathways include:

- Dissolution into Groundwater – As fuel hydrocarbons degrade, water-soluble compounds such as benzene and toluene dissolve into groundwater, leading to a downgradient dissolved-phase contaminant plume.
- LNAPL Migration – The presence of free-phase petroleum hydrocarbons within the smear zone suggests lateral migration potential, especially during fluctuations in groundwater levels.

- Vapor Intrusion – Volatile hydrocarbons in the vadose zone migrate upward, increasing the potential for indoor air impacts in nearby structures.

Natural attenuation processes, including biodegradation, volatilization, and sorption are occurring at the site, but at rates insufficient to meet MTCA cleanup standards within a reasonable timeframe. Therefore, active remediation is required.

3.4 Exposure Pathways and Risk Assessment

A conceptual site model was developed to evaluate potential exposure pathways for human and ecological receptors. The primary exposure risks at the Site include:

- Inhalation of vapor-phase contaminants in indoor air, representing a potential vapor intrusion risk for site workers or occupants of nearby buildings.
- Direct contact with contaminated soil during excavation, utility maintenance, or other subsurface activities.
- Ingestion of impacted groundwater, though this pathway is currently incomplete as groundwater is not used for drinking water in the area.

Risk assessment results indicate that vapor intrusion and groundwater ingestion pose the most significant potential exposure risks. The selected cleanup action is designed to mitigate these risks by reducing contaminant concentrations in groundwater and removing volatile-phase hydrocarbons in the vadose zone.

3.5 Cleanup Action Area

The remediation system will target the 25,000-square-foot Site footprint, focusing on areas where NAPL and dissolved-phase hydrocarbon contaminants exceed MTCA cleanup levels.

3.6 Selected Cleanup Action

The selected remedial strategy is a Surfactant Enhanced Bioremediation treatment, using the Dissolved Oxygen In-Situ Treatment (DO-IT™) system to accelerate biodegradation. This approach was selected based on pilot test results, feasibility study findings, and cost-effectiveness evaluations.

Surfactant Enhanced Bioremediation

The SEB system will utilize PetroSolv™, a biodegradable surfactant, to mobilize residual NAPL and enhance contaminant recovery. Once mobilized, the extracted groundwater will be treated using the ETEC Super-Ox™ system, which:

- Provides a water separator unit to collect potential NAPL.
- Oxygenates extracted water to support aerobic biodegradation.
- Adds PetroBac™ and CBN™ nutrients to enhance microbial activity.
- Recirculates treated water back into the subsurface through strategically placed injection wells.

Soil Vapor Extraction (Contingent Remedy)

A SVE system may be implemented as a contingent remedy component based on the performance criteria metrics after the 5-year performance review. The SVE system would remove vapor-phase hydrocarbons from the vadose zone using a vacuum blower and a network of extraction wells. The extracted air/vapor would pass through an activated carbon vessel(s) to remove VOCs prior to ventilation to the atmosphere.

Bioventing (Contingent Remedy)
Bioventing may be implemented as a contingent remedy component based on the performance criteria metrics after the 5-year performance review. Bioventing would be applied in areas where petroleum hydrocarbons remain sorbed to soil but are not effectively treated by SEB. This approach would involve oxygen injection into the subsurface to enhance microbial degradation.

4. POINTS OF COMPLIANCE AND REMEDIATION MONITORING

4.1 Soil Cleanup Standards and Points of Compliance

The cleanup criteria for soil at the Site are the MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses (MTCA Method A) as defined in WAC 173-340-740 and 173-340-747.

Standard points of compliance for soil are established to evaluate the cleanup action. The standard point of compliance for soil is defined as throughout the Site from ground surface to 15 feet bgs. Soil CULs are provided in Table 1.

4.2 Groundwater Cleanup Standards and Points of Compliance

Groundwater cleanup levels are established based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions. Ecology has determined that at most sites the use of groundwater as a source of drinking water is the beneficial use requiring the highest quality of groundwater and that exposure to hazardous substances through ingestion of drinking water and other domestic uses represents the reasonable maximum exposure.

MTCA Method A groundwater cleanup levels (CULs) were determined to be applicable to Coleman Oil site cleanup actions. The cleanup criteria for groundwater at the Site are the MTCA Method A Groundwater CULs as defined in WAC 173-340-704, 173-340-720, and 173-340-740. Groundwater CULs are provided in Table 1.

Groundwater standard points of compliance are for protection of drinking water and would extend vertically from the uppermost level of the saturated zone to the lowest depth potentially impacted by the releases. Standard points of compliance for groundwater were established under the CAP. The groundwater points of compliance include all monitoring well locations at the Site. The compliance monitoring program is further detailed with sample locations, frequency, and sample analysis in the Compliance Monitoring Plan (CMP) included in Appendix A.

Table 1. Cleanup Levels and Remediation Levels

Chemicals of Concern	Groundwater Cleanup Levels (MTCA Method A[a]) (µg/L)	Soil Cleanup Levels (MTCA Method A[b]) (mg/kg)	Remediation Level (inches)
TPH-D	500	2,000	N/A
TPH-G	800	30	
Benzene	5	0.03	
Toluene	1,000	7	
Ethylbenzene	700	6	
Total Xylenes	1,000	9	
Naphthalene	160	5	

Chemicals of Concern	Groundwater Cleanup Levels (MTCA Method A[a]) (µg/L)	Soil Cleanup Levels (MTCA Method A[b]) (mg/kg)	Remediation Level (inches)
Cadmium	5	2	
Lead	15	250	
NAPL	N/A	N/A	0.5

Notes:
a. Groundwater cleanup levels are based on MTCA Method A Groundwater cleanup levels
b. Soil cleanup levels are based on MTCA Method A Soil cleanup levels for unrestricted land use
MTCA – Model Toxics Control Act
mg/kg – milligrams per kilogram
N/A – not applicable. CAP does not establish remediation levels for COCs or cleanup standards for NAPL.
NAPL – nonaqueous phase liquid
TPH – Total Petroleum Hydrocarbons
TPH-D – Diesel range TPH
TPH-G – Gasoline range TPH
µg/L – micrograms per liter

5 CLEANUP ACTION IMPLEMENTATION

5.1 Preliminary Groundwater Monitoring

Before full-scale system installation, a baseline groundwater monitoring event will be conducted to establish pre-treatment conditions. Samples will be collected from all 16 monitoring wells plus recovery well RW-1 from the Site's well network and analyzed for BTEX, TPH-Gx, TPH-Dx, dissolved oxygen, and other geochemical indicators. If a NAPL layer is present in the well, the thickness will be recorded, and no sample will be collected or analyzed form that well. Compliance Monitoring Plan is included in Appendix A.

5.2 Preparatory Activities

Prior to system deployment, several site preparation activities will be completed, including:

- Installation of six injection wells and four recovery wells at depths of 15–30 feet bgs. A fifth recovery well will be installed near MW-11 but will not be connected to the system. This well (RW6) will be used for separate NAPL and total fluid extraction on a periodic basis using a vacuum truck. A seventh injection well will be installed north of MW-5 and RW5. This well will not be connected to the piping network but will be used for manual injection of surfactant and enriched oxygenated and nutrient water.
- Construction of subsurface piping and trenching to connect wells to the treatment system. The trenching will be completed using a vacuum excavation technique to promote safe excavation of areas with known or undocumented utilities in the project area. The dimension of the trenches will be approximately 2 feet wide by 3.5 feet deep to accommodate the piping systems.
- Setup of the ETEC Super-Ox™ system, including power supply and enclosures.

The design drawings presented in Appendix C provide details of the well installation, trench and piping specifications and system pad and electrical power components.

5.3 Injection and Extraction System Design

The remediation system will operate as a closed-loop recirculation system, consisting of the following components:

- Surfactant Enhanced Bioremediation (SEB): Using PetroSolv™ surfactant to be injected to groundwater in upgradient wells to desorb contaminants and increase bioavailability
- Groundwater extraction and treatment via four recovery wells.
- Dissolved Oxygen In-Situ Treatment (DO-IT™): Recirculating oxygen-enriched water containing PetroBac™ bacterial consortium and CBN™ nutrients to promote in-situ biodegradation

The Dissolved Oxygen In-Situ Treatment (DO-IT™) system information presented in Appendix B provides design details of the components and installation requirements for the system.

5.4 Injection and Extraction Implementation

The system will operate in staged treatment cycles, with surfactant injection events followed by bioremediation treatment phases. The extracted water will be oxygenated and amended with microbial nutrients before reinjection.

The initial surfactant will be injected into the six injection wells prior to implementation of the full recirculation process. Groundwater conditions will be monitored during and daily after the surfactant injections to track the movement of the surfactant, including field indicators for surfactants and measurement of NAPL thickness in the downgradient wells using an interface probe. The NAPL and surfactants will be captured by pumping of the four recovery wells and water will be passed through the onsite oil/water separator. Separated water will be further treated by oxidation and in-line carbon filtration. Additional surfactant injections will be performed on a 3-month schedule based on the measured NAPL thickness in the monitoring wells and the volume of NAPL recovered by the oil/water separator.

Following the initial surfactant injection cycle, the full recirculation system will be implemented by injection of the oxygenated bio-enhanced water through the Do-It system. The injection and extraction pumping rates will be adjusted in the field, starting with a low flow rate and increasing as needed to optimize the capture zone of the recovery wells to the injection pumping rates. The expected total flow rate through the system will be around 10 gallons per minute. The injection and extraction flow rates will be set to provide a net in/out balance. Performance monitoring (see Section 6) in the groundwater monitoring and recovery wells will be used to assist with calibrating the treatment system.

5.5 Handling of NAPL and Investigation-Derived Waste

The surficial soils to depths of 5 feet below ground surface are not expected to contain contaminated materials. This soil may be used as a backfill for onsite purposes. If transported off-site the soil will be managed as a solid waste and disposed of at a regulated landfill facility.

The soil cuttings generated from drilling for installation of the injection and recovery wells will be containerized, tested and managed as petroleum-contaminated soil. Soils will be transported to Subtitle C (hazardous waste) or Subtitle D (non-hazardous waste) landfill according to WAC 173-303, Dangerous Waste regulation. for disposal or treatment. IDW consisting of sampling materials and PPE will be bagged and disposed of as solid waste under the state Solid Waste regulations.

All recovered NAPL collected in the oil/water separator or from discrete purging from monitoring wells or vacuum extraction processes will be managed as petroleum waste by a licensed hazardous waste contractor, e.g., Republic Services. The groundwater passing through the DO-IT System will be treated using oil/water separation, oxidation and in-line carbon filtration prior to re-injection. Spent carbon and other waste materials will be disposed of by regulatory requirements.

6 COMPLIANCE MONITORING PLAN

A Compliance Monitoring Plan (CMP) has been developed for the cleanup action that meets the requirements of WAC 173-340-410. Compliance monitoring for the cleanup actions includes protection monitoring (during construction), performance monitoring (collection of soil and groundwater samples) following implementation of the cleanup action, and confirmation monitoring (long-term groundwater monitoring until cleanup levels are achieved). The details of the monitoring are specified in the CMP presented as Appendix C.

6.1 Protection Monitoring

Protection monitoring is short-term monitoring conducted to "confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of a cleanup action as described in the safety and health plan" (WAC 173-340-420(a)).

During implementation of the cleanup action, interim engineering controls including construction fencing/securing the work area; stormwater runoff prevention measures, utility clearance including air knife clearance to a 5-foot depth would be used to minimize exposure to subgrade utilities. Visual inspection and air quality monitoring using a photoionization detector will be used to identify potential inhalation hazards.

Monitoring for protection of human health and the environment will be addressed in a project-specific health and safety plan (HASP) and specific Best Management Practices (BMPs) to be presented prior to initiation of site activities. The HASP will be prepared prior to site construction and system implementation.

6.2 Performance Monitoring

Performance monitoring is short-term monitoring that confirms that the cleanup action has attained cleanup standards (WAC 173-340-410(b)). Performance monitoring will begin with semiannual events during the quarter prior to the start of the in-situ bioremediation system. Performance monitoring during the SEB system starting in the fourth quarter of 2025 will continue with semiannual events during spring and fall until the COCs concentrations are below the CULs for two sequential events. The Compliance Monitoring Plan (CMP) is included in Appendix A.

6.3 Compliance and Confirmational Monitoring

Compliance groundwater monitoring will be required during and following completion of the cleanup action. When groundwater monitoring results indicate that cleanup objectives have been met, a Groundwater Completion Report will be prepared and submitted to Ecology for their review and approval. After the cleanup standards have been met, the monitoring wells will be removed and closed in accordance with the Minimum Standards for Construction and Maintenance of Wells, WAC 173-160- 151 and Water Well Construction, Chapter 18.104.040 of the Revised Code of Washington.

Groundwater confirmation monitoring will be conducted as specified in the CMP. It is anticipated that groundwater compliance monitoring will include groundwater sampling and analysis of TPH as diesel and gasoline, naphthalene, and BTEX. Compliance monitoring will be based on the monitoring well network described in the CMP.

7 REMEDY PERFORMANCE CRITERIA

7.1 Restoration Timeframe

It is expected that the Alternative 2 SEB recirculating system NAPL recovery and supplemental biological treatment may take 5 years of operation to reach the CULs. Achievement of CULs would be evaluated and confirmed by groundwater monitoring performed throughout and following remediation.

7.2 Performance Assessment Metrics

Groundwater remediation performance metrics are used to assess the effectiveness of cleanup efforts and track progress toward achieving remediation goals. These metrics focus on contaminant concentrations, mass reduction, and plume dynamics.

A performance metric provides a specific measurable indicator of remedy performance and can be measured and evaluated to distinguish successful remedial progress from insufficient progress. The performance metrics to be used for the Coleman Oil Site include:

- Demonstrate attainment of site objectives by measuring the contaminant concentration trends in monitoring wells.
- Demonstrate attainment of site objectives by measuring the thickness of NAPL trends in recovery and monitoring wells.
- Demonstrate reduction in groundwater plume footprint
- Demonstrate distribution of the bioremediation indicator parameters in the aquifer system.
- Demonstrate efficiency of the groundwater treatment by measurement of influent and effluent water concentrations processed through the DO-IT treatment system.

The established interim objectives and associated performance metrics distinguish acceptable from unacceptable remedial progress at key milestones. Establishing criteria for insufficient remedy progress as early as possible in the planning process prevents wasted efforts. Furthermore, if performance outcomes lag the design predictions beyond a threshold milestone identified as a trigger point, then contingency actions can be identified and implemented.

Table 2: Interim Objectives and Performance Metrics

Site Objectives	Source Area		Plume	
	Remedy Components	**Interim Objective / Performance Metric**	**Remedy Components**	**Interim Objective / Performance Metric**
Remediate contamination	In-situ bioremediation treatment/NAPL recovery	Reduce LNAPL thickness to 0.5 inches in all wells. Reduce contaminant concentrations in groundwater by one order of magnitude in MW-1	In-situ bioremediation treatment	Reduce contaminant concentrations by one order of magnitude in MW-13 and MW-15
Control migration and	In-situ treatment	Reduce LNAPL thickness to 0.5 inches		Reduce LNAPL thickness to 0.5 inches

Site Objectives	Source Area		Plume	
	Remedy Components	**Interim Objective / Performance Metric**	**Remedy Components**	**Interim Objective / Performance Metric**
prevent off-site impacts	Pump system	Demonstrate capture using multiple lines of evidence; COCs trends, radius of influence and specific monitoring of MW-11 and MW-12 NAPL thickness	Bio Augmentation / Quarterly Monitoring	Measure bioremediation indicator parameters in groundwater. Confirm stable or decreasing plume size, no detections at sentinel wells MW-10, MW-14 and MW-16; target attenuation rate to meet site objectives in estimated timeframe
Prevent exposure	Engineering Controls	Maintain engineering surfaces and fencing per O&M plan		

7.3 Contingency Actions:

The contingency actions that are triggered by observing actual performance data values below the acceptable threshold depend on specific conditions. Typically, data below the acceptable threshold either trigger process modifications to improve the current approach or contingency actions that are substantially different from the initial approach.

In general, the contingency trigger takes the form of an if/then statement such as: "if contaminant concentration is not reduced to a value below "X" by a certain milestone date, then contingency action or system reconfiguration will then be implemented."

Contingency Triggers include:

1. IF the NAPL levels do not trend toward the interim remediation performance level of 0.5 inches, then adjust frequency of surfactant flush in aquifer for NAPL reduction.

2. IF contaminant concentration trends in monitoring wells do not approach the CULs after a 5-year period of semi-annual reviews, then consider implementing contingent treatment such as bioventing or soil vapor extraction to enhance removal of petroleum volatiles from the soil/groundwater interface.

3. IF reduction in groundwater plume footprint does not show contraction, then consider adjustment to extraction flow rates in specific wells to create a larger radius of influence,

4. IF distribution of the bioremediation indicator parameters does not fully affect the aquifer system, then adjust injection flow rates, biochemical additives or additional injection points to capture the plume area.

5. IF reduction in groundwater plume footprint does not show contraction, then consider injection of bioremediation solutions to address downgradient contaminant concentrations, or long-term monitoring of groundwater.

7.4 Periodic Evaluations

So long as remedial action continues at the Site, the PLPs agree to review the progress of remedial action at the Site, and to review the monitoring data accumulated from the Site as often as is necessary and appropriate under the circumstances. Unless otherwise agreed to by Ecology, at least every five (5) years after the initiation of cleanup action at the Site the Parties shall confer regarding the status of the Site and the need, if any, for further remedial action at the Site.

At least ninety (90) days prior to each periodic review, the Subject PLPs shall submit a report to Ecology that documents whether human health and the environment are being protected based on the factors set forth in WAC 173 340 420(4).

7.5 Potential Outcomes

Potential decision outcomes of periodic evaluations include the following

- Performance is found protective and adequately progressing towards interim and site objectives, so the remedy will continue to operate as is.
- Interim objectives have been met that allow for transition to a less aggressive remedy component (for example, long term monitoring).
- Remedy optimization is needed to improve the operation of engineered remedy components or revise the remedial approach. In this case, the CSM would be revised to reflect the latest knowledge of site conditions. Remedy revision may be needed due to one the following identified conditions:
    - Operating conditions are outside the expected design range or specifications.
    - Contaminant concentrations are not decreasing as anticipated.
    - Plumes are expanding or migrating unexpectedly.
    - Treatment efficiencies are not being met (for example, extraction/injection rates are not being met, or discharge limitations have been exceeded)

8 OPERATIONS AND MAINTENANCE

The Operation and Maintenance (O&M) Plan will be prepared for the system operation once the Do-It System components (pumps, blowers flow meters, etc.) are specified in the bid process and prior to system implementation. These specific components are needed to prepare an accurate O&M Plan for the Site.

In general, PBS will conduct bi-weekly site visits for system maintenance, data collection, and adjustments. Routine activities include:

- Checking and adjusting injection flow rates.
- Adding nutrients and surfactants as needed. Monitor nutrient and oxygen levels in the groundwater monitoring wells to optimize the nutrient load or injection flow rate.
- Replacing or cleaning of filters. Monitor pressure values for backflow pressures that may trigger the replacement or cleaning.
- Inspect and maintain pumps. Downhole extraction pumps will be routinely inspected to check for biofouling and function of the electric/piping connections. The pumping components in the above ground system will be routinely inspected for proper operation.
- If activated carbon water filters are used in the Do-It System, monitor pressure gauges for backflow issues, also collect quarterly water samples pre and post GAC vessels to determine effective removal of contaminants in water. Schedule replacement as required.

- Monitor and measure fluid in the oil/water separator holding tank. When recovered NAPL reaches 70% capacity of the tank, schedule a vacuum truck pickup and disposal for the NAPL.

9 ENGINEERING COST ESTIMATE

9.1 Breakdown of Estimated Cleanup Costs

The estimated costs to implement, operate and monitor the selected SEB cleanup action is derived from the FS (PBS-2023) as summarized below.

Table 3: Engineering Cost Estimate

Capital Direct Costs	$735,400
Capital Indirect Costs	$425,353
Total Capital Estimated Cost	*$1,161,000*
Total O&M Costs	*$1,076,000*
Years of O&M	5
Annualized O&M Costs	$215,200
Total Project Estimated Cost	**$2,237,000**

9.2 Assumptions and Contingencies

The present worth cost to implement Alternative 2, assuming a 2.0% interest rate as per Circular A-94 and an O&M period of 5 years, is approximately $2.2M (OMB 2023). The total costs include capital costs of $1.2M and total O&M costs of $1.0M (accounting for present worth).

The 5-year O&M period includes O&M of the injection/recovery treatment system, semi-annual groundwater monitoring for the first 3 years, and quarterly groundwater monitoring for the final two years.

10 REPORTING REQUIREMENTS

10.1 Periodic Compliance Reports

The Subject PLPs shall submit to Ecology written monthly Progress Reports that describe the actions taken during the previous month to implement the requirements of this Order. All Progress Reports shall be submitted by the tenth (10th) day of the month in which they are due after the effective date of this Order. Unless otherwise specified by Ecology, Progress Reports and any other documents submitted pursuant to this Order shall be sent by electronic mail to Ecology's project coordinator. If requested in writing by Ecology, the Subject PLPs shall send progress reports via certified U.S. mail, return receipt requested.

During active remediation, progress reports will be prepared and submitted to Ecology. These reports will summarize:

- System operational data, including injection and extraction flow rates.
- Groundwater monitoring results, including contaminant concentrations and dissolved oxygen levels.
- SVE system performance metrics, such as vapor-phase hydrocarbon recovery rates.
- Maintenance activities and any system modifications.
- An assessment of remediation progress and recommendations for system optimization.

10.2 Long-Term Monitoring and Maintenance Reports

After active remediation is complete, the site will transition to quarterly groundwater confirmation monitoring to confirm the contaminant concentrations. Quarterly groundwater monitoring reports will be prepared during this phase to document:

- Groundwater sampling results and trends over time.
- Verification that contaminant concentrations remain below cleanup levels.
- Recommendations for continued monitoring or site closure.

10.3 As-Built Report

At the completion of construction, the engineer responsible for the oversight of construction shall prepare as-built drawings and a report documenting all aspects of facility construction. The report shall also contain an opinion from the engineer, based on testing results and inspections, as to whether the cleanup action has been constructed in substantial compliance with the plans and specifications and related documents.

The As-Built Report will be completed by Melanie Young, the engineer of record and will include:

- A summary of the installation activities and components, including well logs, electric power supply, utilities, pumps, gauges, and other equipment components.
- Construction methods and list of any variance to design specifications
- As-built drawings
- Opinion from the engineer of substantial compliance

11 IMPLEMENTATION SCHEDULE

The schedule to implement and operate the cleanup action is as follows:

Table 4: Implementation Schedule

	Activity
June 5, 2025	**Engineering Design Report, 100% Final**
June – August 2025	**Pre System Installation**
	Obtain and Review Contractor bids
	Obtain permits (City right of way, grading, electrical, UIC, other)
	Contractor agreements and insurance
	Site Specific Health and Safety Plan (HASP)
September to November 2025	**System Installation**
	Well Installation
	Construction work, trenching, piping
	System Pad and enclosure, electrical
	ETEC DO-IT system
	SVE equipment
	Baseline groundwater monitoring – November 2025
	Initial System Test and Calibration
	System Operation and Maintenance (O&M) Plan
December 2025	**System Operation and Monitoring**
	Start Full Scale System
	Performance Monitoring on bi-weekly basis
	Multiphase Extraction Event (MW-12) Q1-2026
	Monthly Progress reports by 10th of month
June 2026	Semi-Annual Groundwater Monitoring
December 2026	Semi-Annual Groundwater Monitoring

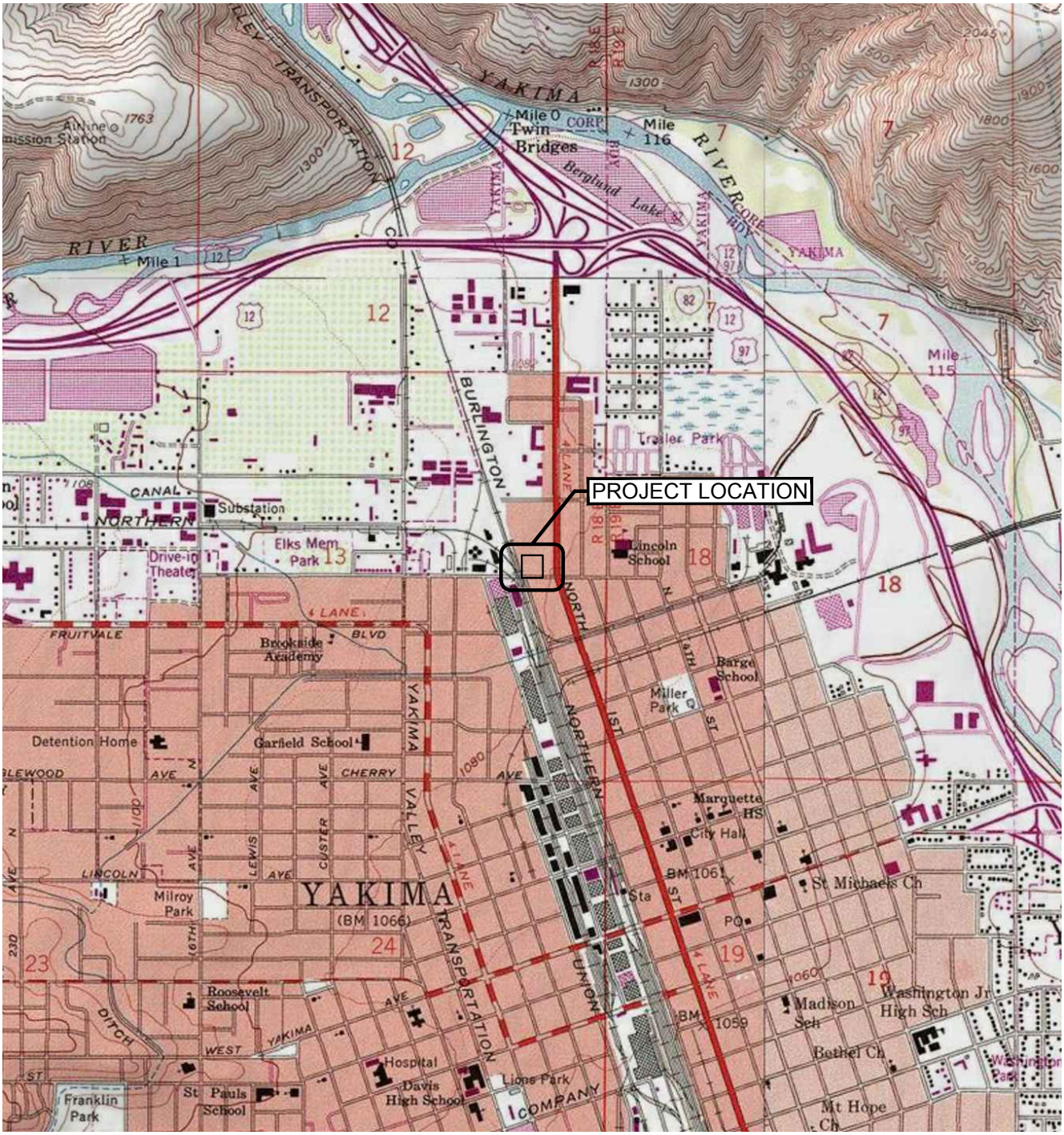
12 REFERENCES

PBS Engineering and Environmental, LLC [PBS] (2023a). *Remedial Investigation and Interim Action Report, Coleman Oil Yakima Bulk Fuel*, October 11, 2023,

PBS Engineering and Environmental, LLC [PBS] (2023b). *Feasibility Study – Coleman Oil Yakima Bulk Fuel*. October 6, 2023.

Washington Department of Ecology, (Ecology 2024). *Coleman Oil Bulk Plant Cleanup Action Plan Agreed Order DE 23182*, August 19, 2024.

Figures



SOURCE: USGS YAKIMA WEST, WA QUADRANGLE 1985

WASHINGTON

Scale 1" = 2,000'

0' 1,000' 2,000' 4,000'

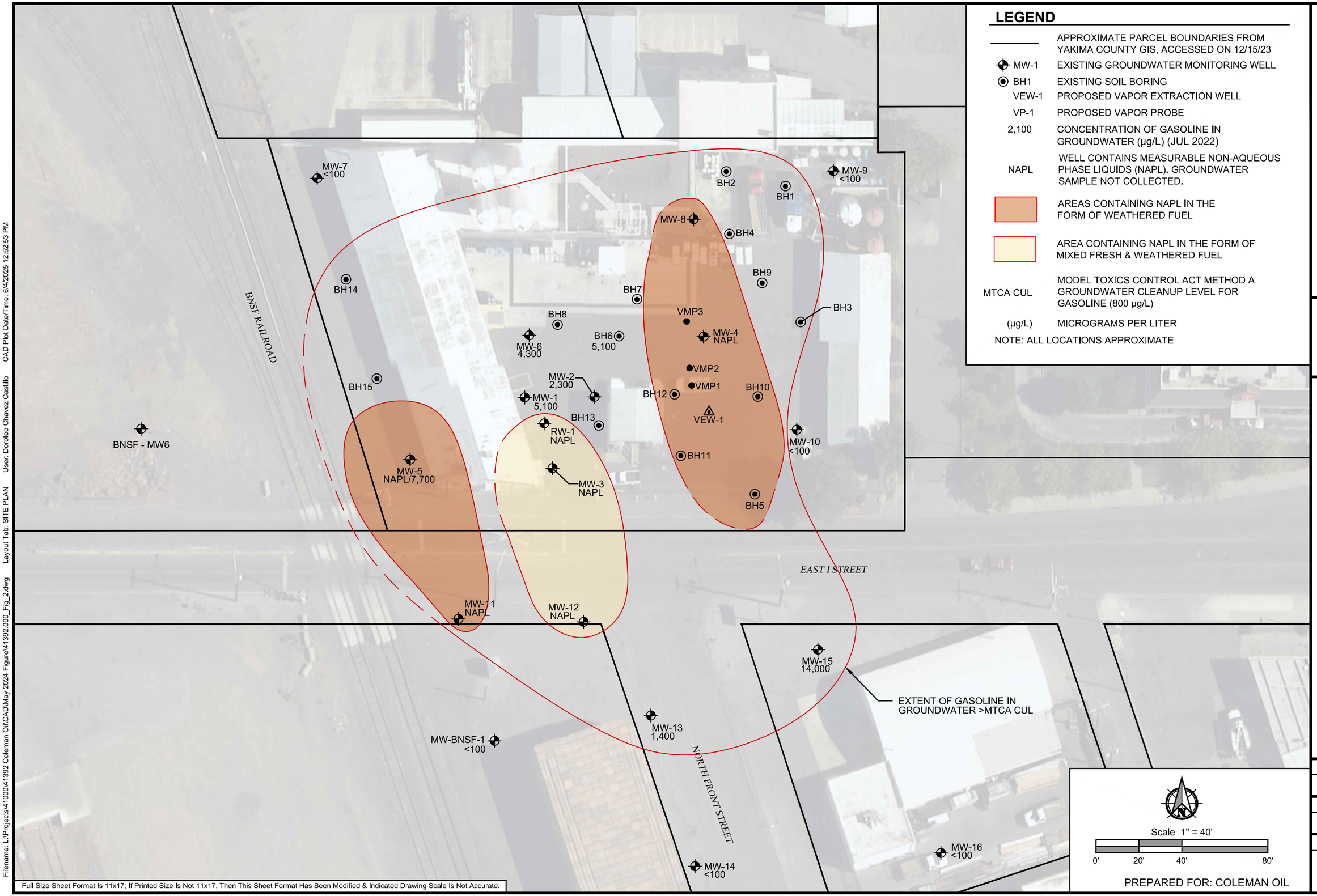
PREPARED FOR: COLEMAN OIL

VICINITY MAP

1 EAST I STREET
YAKIMA, WASHINGTON

MAR 2025
41392.000

FIGURE
1



LEGEND

	APPROXIMATE PARCEL BOUNDARIES FROM YAKIMA COUNTY GIS, ACCESSED ON 12/15/23
MW-1	EXISTING GROUNDWATER MONITORING WELL
BH1	EXISTING SOIL BORING
VEW-1	PROPOSED VAPOR EXTRACTION WELL
VP-1	PROPOSED VAPOR PROBE
2,100	CONCENTRATION OF GASOLINE IN GROUNDWATER (µg/L) (JUL 2022)
NAPL	WELL CONTAINS MEASURABLE NON-AQUEOUS PHASE LIQUIDS (NAPL). GROUNDWATER SAMPLE NOT COLLECTED.
	AREAS CONTAINING NAPL IN THE FORM OF WEATHERED FUEL
	AREA CONTAINING NAPL IN THE FORM OF MIXED FRESH & WEATHERED FUEL
MTCA CUL	MODEL TOXICS CONTROL ACT METHOD A GROUNDWATER CLEANUP LEVEL FOR GASOLINE (800 µg/L)
(µg/L)	MICROGRAMS PER LITER

NOTE: ALL LOCATIONS APPROXIMATE

Scale 1" = 40'

0' 20' 40' 80'

PREPARED FOR: COLEMAN OIL

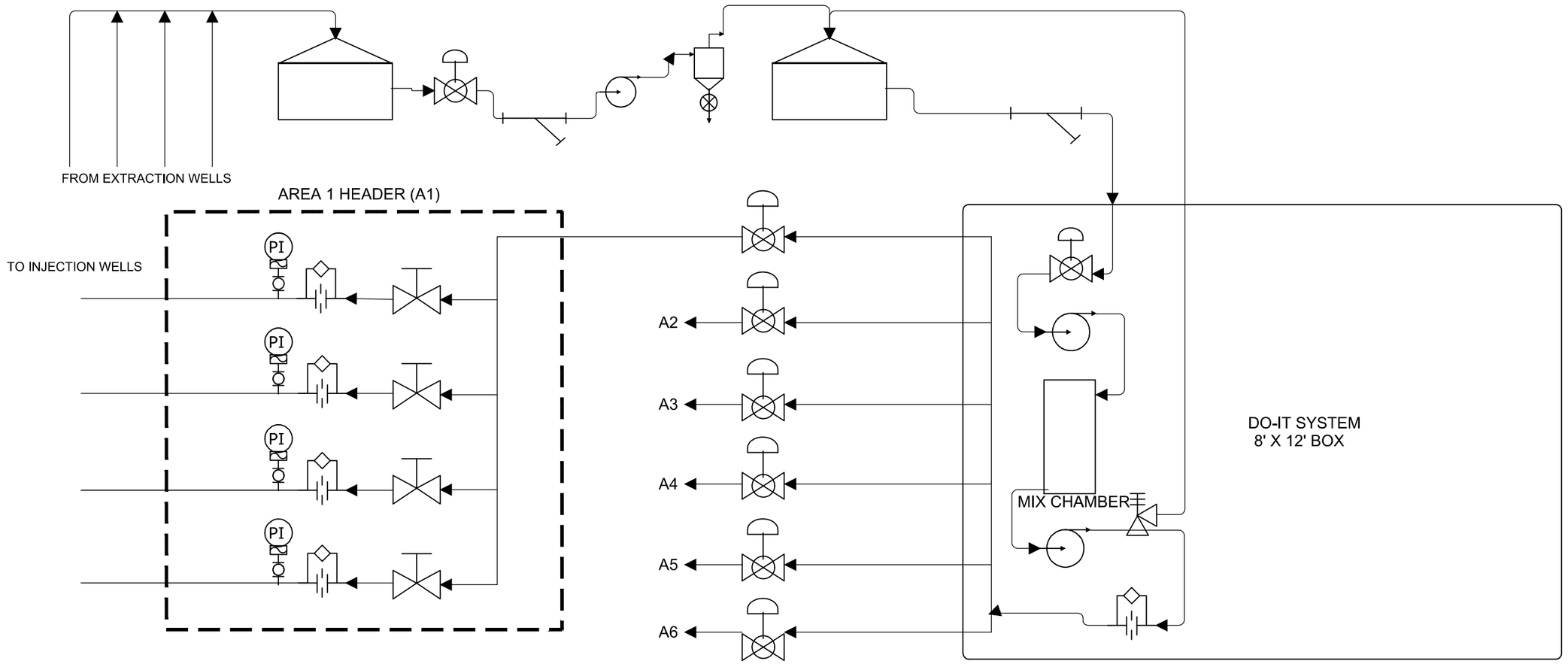
PBS Engineering and Environmental Inc.
214 East Galer Street, Ste. 300
Seattle, WA 98102
206.233.9639
pbsusa.com

SITE PLAN
COLEMAN OIL
1 EAST I STREET, YAKIMA, WASHINGTON

PROJECT	41392.000
DATE	JUNE 2025
SHEET ID	2

Full Size Sheet Format Is 11x17; If Printed Size Is Not 11x17, Then This Sheet Format Has Been Modified & Indicated Drawing Scale Is Not Accurate.

Filename: L:\Projects\41000\41392 Coleman Oil\CAD\May 2024 Figure\41392.000_Fig_2.dwg Layout Tab: SITE PLAN User: Doroteo Chavez Castillo CAD Plot Date/Time: 6/4/2025 12:52:53 PM



LEGEND

WATER TANK		GATE VALVE (MANUAL)	
AIR ACTUATED BALL VALVE		FLOW METER	
Y-STRAINER		PRESSURE GAUGE	PI
WATER PUMP		RELIEF VALVE	
BAG FILTER		PI	PRESSURE INDICATOR

PREPARED FOR: COLEMAN OIL

Full Size Sheet Format Is 11x17; If Printed Size Is Not 11x17, Then This Sheet Format Has Been Modified & Indicated Drawing Scale Is Not Accurate.

PBS Engineering and Environmental Inc.
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PROCESS FLOW DIAGRAM FOR
COLEMAN OIL
1 EAST I STREET, YAKIMA, WASHINGTON

PROJECT
41392.000
DATE
MAR 2025
SHEET ID
3

Appendix A
Compliance Monitoring Plan

Appendix B
ETEC Do-IT TREATMENT SYSTEM

PMB 133, 3307 Evergreen Way, Ste 707
Washougal, WA 98671
(971) 222-3616 • (971) 222-3903 Fax
www.etec.bio

January 22, 2025

Mr. Tom Mergy, RG, LHG
PBS Engineering and Environmental
214 E Galer Street, Suite 300
Seattle, WA 98102

RE: PROPOSAL FOR DISSOLVED OXYGEN IN-SITU TREATMENT (DO-IT™)
COLEMAN OIL YAKIMA BULK PLANT, YAKIMA, WASHINGTON

Mr. Mergy:

As requested, this proposal provides recommendations for implementing an in-situ remediation approach at the referenced site and is based on current data that was available at the time of this proposal. Based on our evaluation of data, we believe that this site is an excellent candidate for our Dissolved Oxygen In-situ Treatment (DO-IT™) technology. The DO-IT™ Process utilizes extracted groundwater as a carrier for high concentrations of dissolved oxygen along with bioremediation products. This treatment water is then re-distributed into the subsurface for increased contact and movement throughout the treatment area. Using a multiple electron acceptor approach, our DO-IT™ Process can work efficiently to degrade petroleum constituents biologically, while also increasing hydraulic gradients and movement of biological solutions throughout the plume.

PROJECT UNDERSTANDING

Based on the provided information, we understand that:

- Gasoline and/or diesel has impacted the groundwater onsite and downgradient.
- The July 2022 groundwater analytical data was used to develop the remedial plan outlined in this proposal.
- The onsite area of the has a plume with COCs greater than regulatory limits is proximately 25,000 square feet.
- LNAPL, BTEX, and TPH-Gx are the contaminants of concern.
- Wells MW-3, MW-5, MW-11, MW-12, and RW-1 have contained free-product gasoline and/or diesel
- DTW is 16 to 24 feet bgs, with a smear zone thickness of up to 8 feet.
- The site has silty sand with gravel from 0 to 5 feet bgs with underlying gravel, sand, and cobbles.
- This proposal is based on the use two 10- to 20-gpm Dissolved Oxygen In-situ Treatment (DO-IT™) system for treatment of the saturated soil and groundwater onsite.

This data and the associated assumptions were used to determine appropriate biological product and equipment requirements, and to provide recommendations for site-specific application.

DESCRIPTION OF PROPOSED PRODUCTS

A combination of biodegradation promoting products will be injected into the recirculation stream and distributed along with the dissolved oxygen. The recommended bioremediation products include ETEC's PetroBac™ product bundle along with CBN™ nutrients. ETEC's CBN™ consists of a high percentage of electron acceptors that promote nitrate-reducing conditions in the absence of dissolved oxygen, to biochemically reduce the petroleum to CO_2 and water.

Mr. Tom Mergy, RG, LHG 1025-002
PBS Engineering and Environmental
January 22, 2025

DESCRIPTION OF ETEC'S DO-IT™ PROCESS AND INSTALLATION REQUIREMENTS

The DO-IT™ process utilizes extracted groundwater as a carrier for high concentrations of dissolved oxygen (up to 40 ppm) coupled with ETEC's bioremediation products to create subsurface conditions that are optimal for the in-situ microbial degradation of petroleum hydrocarbons. Groundwater is recirculated through a series of injection galleries/wells to ensure contact with contaminants both in the soil and groundwater, while encouraging hydraulic gradients to mitigate migration of the contaminant plume.

General requirements/details for our 10/20-A unit (up to 20 gallon per minute rate) include the following:

Power Requirement: The 10/20-A unit requires a minimum of single-phase 120/220V, 100-Amp service. The electrical power supply will need to be installed prior to ETEC arriving to complete the final installation. The installation contractor will need to pull wire (12 gauge) through the conduit runs that extend from the equipment compound to each extraction well and install appropriate junction boxes inside each extraction well vault/hand-hole. Direct bury wire may be used but care must be taken to not damage the wire during installation. ETEC will provide the pumps and make the final connections.

Injection Trenches, Injection Wells and Extraction Wells (installed by others)**:** ETEC will assist PBS in the layout and planning of the injection trenches, injection wells and extraction wells. It is important that the well installation contractor ensures a substantial well seal is completed on each of the injection wells to facilitate pressure injections. Piping should be stubbed up at the system compound for final connection made by ETEC.

Groundwater Extraction System: ETEC will provide 3-inch "run-dry" submersible pumps for this project. The motor leads, flow meters, sample ports and control panel will be provided by ETEC. A ~500-gallon influent holding tank is included with the extraction system.

Groundwater Pre-Treatment: If pre-treatment be required by the regulators, GAC vessels (high pressure) can be added. ETEC will plumb the vessels as part of the installation and include pressure gauges, sample ports, and valves. Carbon vessels can be provided in the attached cost table. Carbon changeouts and disposal are not included and will be part of PBS's O&M component of the project.

Installation and Startup: PBS will be responsible for providing the injection/extraction wells/galleries, piping, conduit, and wiring (extraction wells and potential extraction wells only), connecting the wells to the equipment building and all associated site work (trenching, electrical service, etc.). ETEC will supply technicians to connect piping at the equipment compound, perform start-up and adjust the remediation system. During the startup, ETEC will train PBS technicians to operate the system. Installation, startup, adjustment, and training will take approximately 5 days. PBS is responsible for preparing a level pad/cleared area for the enclosure.

Performance Monitoring: For system performance monitoring data, we recommend that groundwater collected from the monitoring wells be analyzed for target COCs, TPH, and inorganic nutrient analysis as required (e.g., ammonia, nitrate/nitrite, sulfate, phosphate, orthophosphate dissolved iron, and dissolved manganese). In addition, groundwater quality parameters (i.e., DO, ORP, Temp. and pH) should be taken during sampling events. During the treatment, ETEC recommends these parameters be sampled and analyzed from site wells quarterly. GW monitoring will be the responsibility of PBS. Baseline sampling should be completed prior to system startup.

Training and Operations & Maintenance: ETEC can train our client partners to operate and maintain our systems. PBS should estimate bi-weekly site visits, consisting of up to 4-hours onsite per visit, taking readings, making system adjustments, perform minor cleaning, and add bioremediation products. ETEC provides support throughout the entire project to ensure project success.

Estimated Treatment Timeframe: With the presence of LNAPL and current contaminant concentrations, possible unidentified contamination and MTCA cleanup standards, ETEC estimates that successful full-

scale remediation will require 36 months or more. This estimate is based on treatment area identified by the client as well as our experience with comparable sites. The treatment time assumes that the recommended infrastructure be installed as presented in the planning phase and if any changes to the system are needed throughout the project, they are completed without delay.

Additional information about our DO-IT™ process can be found on our website at www.etec.bio.

BULK PLANT PROPERTY AREA

Extraction wells - Up to ten 4-inch groundwater extraction wells should be installed throughout the impacted area. The screen interval for the new extraction well should be 15 ft. to 30 ft. bgs. with bentonite from 0.5 ft. to 14.5 ft. bgs and finished with a grout seal. Pitless adapters should be installed below the frost line if applicable.

Injection wells – Up to twenty-five 4-inch groundwater injection wells should be installed throughout the impacted area. The screen interval for the new extraction well should be 15 ft. to 25 ft. bgs. with bentonite from 0.5 ft. to 14.5 ft. bgs and finished with a grout seal. Installing pitless adapters and burying wires to the injection wells should be considered to allow for extraction well conversion if desired.

Prior to equipment fabrication, an extended pump test should be conducted to provide extraction rates estimates. This information will allow us to determine if a 10- or 20-gpm equipment system is appropriate for the site.

ADDITIONAL DATA PRIOR TO IMPLEMENTATION

ETEC highly recommends an extended pump test for the site to size the equipment system. Also, when drilling new wells, fraction of organic content and TPH soil data should be collected. This will provide the best contaminant mass estimate possible.

DO-IT™ SYSTEM COST

The following table summarizes the products and equipment proposed above.

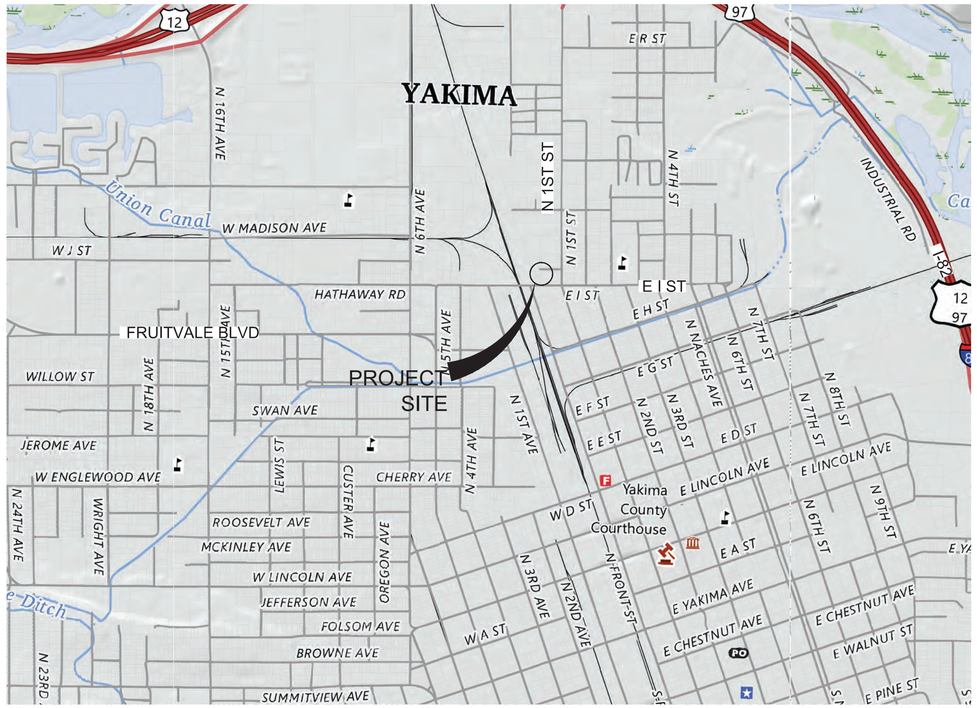
Since we lease our equipment, we supply replacement parts (at no cost) throughout the rental period including damaged pumps, valves, carbon vessel issues etc. (extraction pump replacement is limited to 2 pumps per year). ETEC's costs include up to 2 site visits (1-2 days) per year, project calls, data analysis, telemetry, engineering support and all the products and equipment needed for successful remediation.

Item	Cost
Initial Costs	
PetroBac™ & CBN™ Product Bundle – 60/2000	
PetroSolv™ Biosurfactant (100 gallons)	
Super-Ox™ Model 10/20-A Unit – Monthly Rental	
Extraction Panel and Pumps – Monthly Rental	
Oil/Water Separator	
Carbon Vessels (Two 500-lb.)	
Installation/Set-Up/Training (5 Days)	
Initial Shipping (estimated)	
Sales Tax 8.3%	
INITIAL TOTAL	
Monthly Costs	
PetroBac™ & CBN™ Product Bundle – 15/500	
PetroSolv™ Biosurfactant (as needed, 25 gal.)	
Super-Ox™ Model 10/20-A Unit – Monthly Rental	
Extraction Panel and Pumps – Monthly Rental	
Oil/Water Separator	
Carbon Vessels (Two 500-lb.)	
Monthly Shipping/Delivery	
Sales Tax 8.3%	
MONTHLY TOTAL	
24-MONTH TOTAL	
Demobilization	
Return Shipment	TBD
Other Considerations for PBS (not in ETEC Scope)	
Insulated Shed for Tanks & Carbon	
New Injection/Extraction Wells/Trenches	TBD
Trenching and Piping Costs to New Wells	TBD
Electrical Power Drop	TBD
Monthly Electrical Costs – (est. at $800-$1,000/month)	TBD
GAC Replacement (estimated using 10-gpm flow rate)	TBD
GAC Disposal (as necessary)	TBD
Performance Monitoring Analytical Costs	TBD
Weekly/Bi-monthly Site Visits by PBS	TBD

Appendix C

Groundwater Treatment 100% Design Drawings

COLEMAN OIL YAKIMA BULK FUEL FACILITY
GROUNDWATER BIOREMEDIATION TREATMENT SYSTEM



SITE VICINITY MAP

SCALE: 1" = 1000' (@ 22X34)

GENERAL NOTES:

1. BEST MANAGEMENT PRACTICES (BMPS) SHALL BE USED TO PREVENT THE RELEASE OF CONTAMINATED MATERIALS TO THE ENVIRONMENT AND MINIMIZE DISTURBANCE TO THE SURROUNDING AREAS.
2. CONTRACTOR SHALL PROTECT ALL EXISTING WELLS, STRUCTURES, AND UTILITIES FROM DAMAGE WHETHER INDICATED ON THE DRAWINGS OR NOT.
3. A MINIMUM OF TWO FULL BUSINESS DAYS PRIOR TO BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL CALL 1-800-424-5555 OR 811 (WASHINGTON UTILITY NOTIFICATION CENTER), FOR LOCATION MARK-UP OF THOSE EXISTING UTILITIES PARTICIPATING IN ONE-CALL. FOR ALL OTHER AFFECTED UTILITIES WITHIN THE RIGHT-OF-WAY AND ON PRIVATE PROPERTY, UTILITY PROVIDERS SHALL BE CONTACTED DIRECTLY FOR LOCATING. FOLLOWING THE PUBLIC LOCATE, CONTRACTOR SHALL CONDUCT A PRIVATE LOCATE TO VERIFY UTILITY LOCATIONS IN THE WORK AREA.
4. THE CONTRACTOR SHALL LOCATE AND VERIFY OTHER UNDERGROUND IMPROVEMENTS PRIOR TO CONSTRUCTION.
5. SUBSURFACE WORK AREAS LOCATED WITHIN 15 FEET OF KNOWN UTILITIES AND LOCATE MARKS SHALL BE CLEARED WITH AIR KNIFING OR HAND DIGGING. PROPOSED TRENCH ALIGNMENTS ORIENTED PARALLEL TO KNOWN UTILITIES AND LOCATED MARKS SHALL BE CLEARED OR THE UTILITY EXPOSED EVERY 50 FEET. ALL EXCAVATIONS THAT HAVE NOT BEEN AIR KNIFED SHALL BE COMPLETED WITH A SPOTTER FOR THE FIRST 5 FEET OF DEPTH OR TO DEEPEST UTILITY DEPTH WITHIN THE VICINITY OF THE SITE (WHICH COULD EXTEND TO A DEPTH OF 10 FEET OR MORE BELOW GROUND SURFACE.)
6. ALL MATERIALS AND EQUIPMENT SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.
7. CONTRACTOR SHALL MATCH THE GENERAL ROUTING OF PIPING LAYOUT. ALTERNATIVE ROUTING SHALL BE APPROVED BY THE OWNER.
8. CONTRACTOR SHALL WORK WITH COLEMAN OIL TO MAINTAIN CONSISTENT FACILITY ACCESS DURING THE WORK. THIS SHALL INCLUDE USING STEEL PLATES OVER PIPING TRENCHES WHEN POSSIBLE AND MINIMIZING THE AMOUNT OF TRENCH THAT IS OPEN AT ANY ONE TIME.
9. SAWCUT ASPHALT FOR TRENCH INSTALLATION. RESURFACE OF TRENCHES TO BE MINIMUM 3-INCH ASPHALT.
10. DURING PROJECT CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE AND MAINTAIN ALL TEMPORARY CONSTRUCTION SIGNS, TRAFFIC CONTROL SIGNS, DELINEATORS AND TEMPORARY MARKINGS AS REQUIRED. ALL SIGNS, TRAFFIC CONTROL SIGNS, DELINEATORS AND TEMPORARY MARKINGS SHALL BE ACCORDING TO THE CURRENT MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).

EROSION AND SEDIMENT CONTROL NOTES:

1. PRIOR TO ANY SITE EXCAVATION, ALL STORM DRAINAGE INLETS SHALL BE PROTECTED TO PREVENT SEDIMENT FROM ENTERING THE STORM DRAINAGE SYSTEM. CLEAN FILTER FABRIC AS NECESSARY TO MAINTAIN DRAINAGE. REMOVE FILTER AND CLEAN CATCH BASINS FOLLOWING COMPLETION OF SITE WORK.
2. THE CONTRACTOR SHALL NOT ALLOW SEDIMENT OR DEBRIS TO ENTER NEW OR EXISTING PIPES OR CATCH BASINS.
3. TEMPORARY STRAW TO PROTECT RUNOFF FROM OPEN TRENCHES.
4. SILT FENCING SURROUNDING THE WORK AREA.
5. OIL ABSORBENT PADS AVAILABLE AND ACCESSIBLE FOR SPILLS.
6. PLASTIC SHEETING AND SAND BAGS TO COVER STOCKPILES TO PREVENT EROSION.
7. CATCH BASIN/INLET PROTECTION USING FILTER FABRIC INSERTS.
8. REGULAR STREET CLEANING AND DUST CONTROL.

ELECTRICAL NOTES:

1. POWER REQUIRED IS MINIMUM SINGLE-PHASE 120/220 V, 100-AMP SERVICE FOR POWERING A 10/20-A UNIT.
2. ELECTRICAL CONDUITS SHALL BE INSTALLED WITH 12-GAUGE WIRING FROM JUNCTION BOXES IN EACH WELL VAULT THROUGH CONDUIT TO THE EQUIPMENT COMPOUND. REMEDIATION CONTRACTOR (ETEC) WILL MAKE THE FINAL CONNECTION BETWEEN THE WIRES/CONDUIT THAT IS BROUGHT TO THE EQUIPMENT COMPOUND AND THE EQUIPMENT.
3. ALL ELECTRICAL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CITY OF YAKIMA ELECTRICAL CODE, CHAPTER 11.16.

PROJECT DESCRIPTION

CONSTRUCTION OF A GROUNDWATER BIOREMEDIATION SYSTEM THAT IS REQUIRED AS PART OF A CLEANUP ACTION UNDER AN AGREED ORDER WITH THE WASHINGTON STATE DEPARTMENT OF ECOLOGY. THE SYSTEM WILL INCLUDE AN ENHANCED BIOREMEDIATION SYSTEM USING INJECTION OF PRODUCTS TO REDUCE PETROLEUM PRODUCTS TO CO_2 AND WATER. EXTRACTED GROUNDWATER WILL BE TREATED AND COMBINED WITH DISSOLVED OXYGEN. SYSTEM CONSTRUCTION INCLUDES INSTALLATION OF INJECTION WELLS, RECOVERY WELLS, TRENCHING AND INSTALLATION OF INJECTION PIPING, VAPOR EXTRACTION PIPING, AND RECOVERY PIPING, INCLUDING ELECTRICAL CONDUIT AND WIRING, REPLACEMENT OF ASPHALT PAVEMENT, AND SITE RESTORATION

SURVEY NOTES:

UTILITY LOCATIONS SHOWN HEREIN ARE BASED UPON AS-BUILT FIELD LOCATIONS OF EXISTING STRUCTURES. FIELD LOCATION OF UTILITIES BASED ON LOCATOR PAINT MARKINGS AND LOCATIONS BASED ON UTILITY MAPS FROM CITY AND UTILITY DRAWINGS INDICATING REPORTED UTILITY INSTALLATIONS. OTHER UTILITIES MAY EXIST. NO SUB-SURFACE EXPLORATION WAS MADE TO VERIFY UTILITY ROUTINGS AND THE ROUTING OF ALL BURIED UTILITIES SHOULD BE CONFIRMED WITH THE UTILITY PURVEYOR AND EXPOSED IN AREAS CRITICAL TO DESIGN FOR VERIFICATION

811 Know what's below. Call before you dig.

CONTACT INFORMATION:

OWNER:
COLEMAN OIL COMPANY
335 MILL ROAD,
LEWISTON, IDAHO 83501

CONTACT:
MR. JIM CACH

ENGINEER:
PBS ENGINEERING AND ENVIRONMENTAL LLC
214 E. GALER STREET, SUITE 300
SEATTLE, WASHINGTON 98102

REMEDIATION SYSTEM VENDOR/INSTALLER:
ETEC, INC.
PMB 133
3307 EVERGREEN WAY, SUITE 707
WASHOUGAL, WA 98671
971.222.3616

Sheet List Table		
Sheet No.	**Sheet ID**	**Sheet Title**
1	G01	Cover Sheet & General Notes
2	C01	Existing Conditions
3	C02	Treatment System Layout
4	C03	Treatment System Trench & Equipment Pad Details
5	C04	Treatment System Well Details & Process Flow Diagram

100% DESIGN DRAWINGS

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COVER SHEET & GENERAL NOTES FOR:

YAKIMA BULK FUEL FACILITY

1 EAST I STREET, YAKIMA, WASHINGTON 98901

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	41392
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SHEET	1 OF 5

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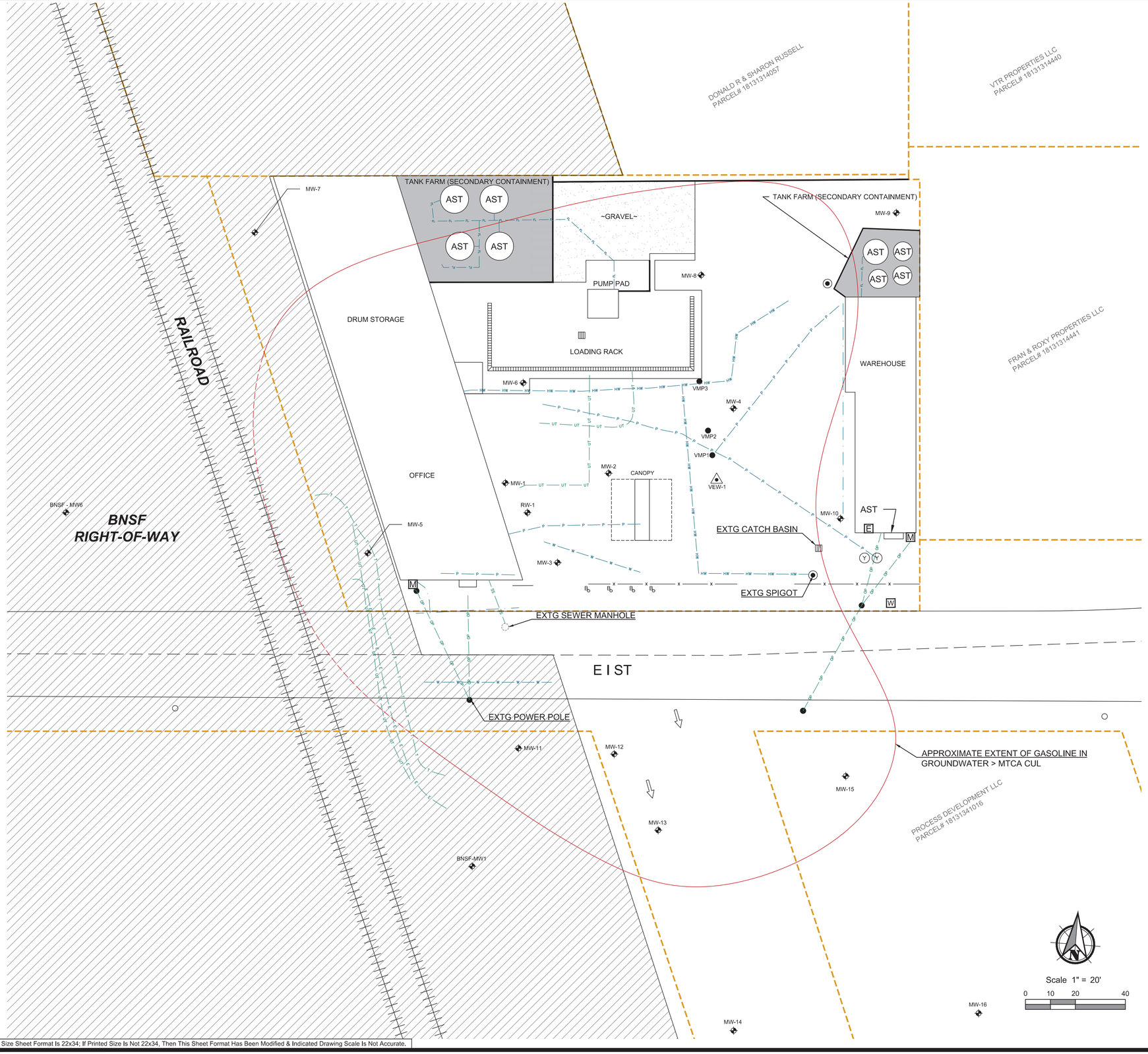
Filename: L:\Projects\41000\41392 Coleman OilCAD\EDR_Figures_2025\Sheets\1_41392-000_G01-G02.dwg Layout Tab: G01 COVER SHEET & INDEX User: Dorotea Chavez Castillo CAD Plot Date/Time: 6/5/2025 9:08:28 AM



LEGEND

- EXISTING OVERHEAD POWER
- EXISTING POWER
- EXISTING HOT WATER LINE
- EXISTING FUEL LINE
- EXISTING UTILITY LINE
- EXISTING ELECTRICAL LINE
- EXISTING TELEPHONE LINE
- EXISTING WATER LINE
- EXISTING SANITARY SEWER LINE
- EXISTING FENCE LINE
- PROPERTY/LINE PARCEL
- VAPOR EXTRACTION WELL (VEW)
- MONITORING WELL (MW)
- VAPOR MONITORING POINT (VMP)
- WATER METER
- ELECTRICAL METER
- ELECTRICAL EQUIPMENT
- LIGHT POLE
- BOLLARD
- POWER/UTILITY POLE
- CATCH BASIN
- GROUNDWATER FLOW DIRECTION
- SEWER MANHOLE
- ABOVE GROUND STORAGE TANK
- SURFACE DRAIN GRATE
- POTENTIAL DRY WELL VAULT W/ CONCRETE LID
- BNSF RAILROAD RIGHT-OF-WAY
- MTCA CUL — MODEL TOXICS CONTROL ACT CLEANUP LEVEL

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EXISTING CONDITIONS FOR: YAKIMA BULK FUEL FACILITY

1 EAST I STREET, YAKIMA, WASHINGTON 98901

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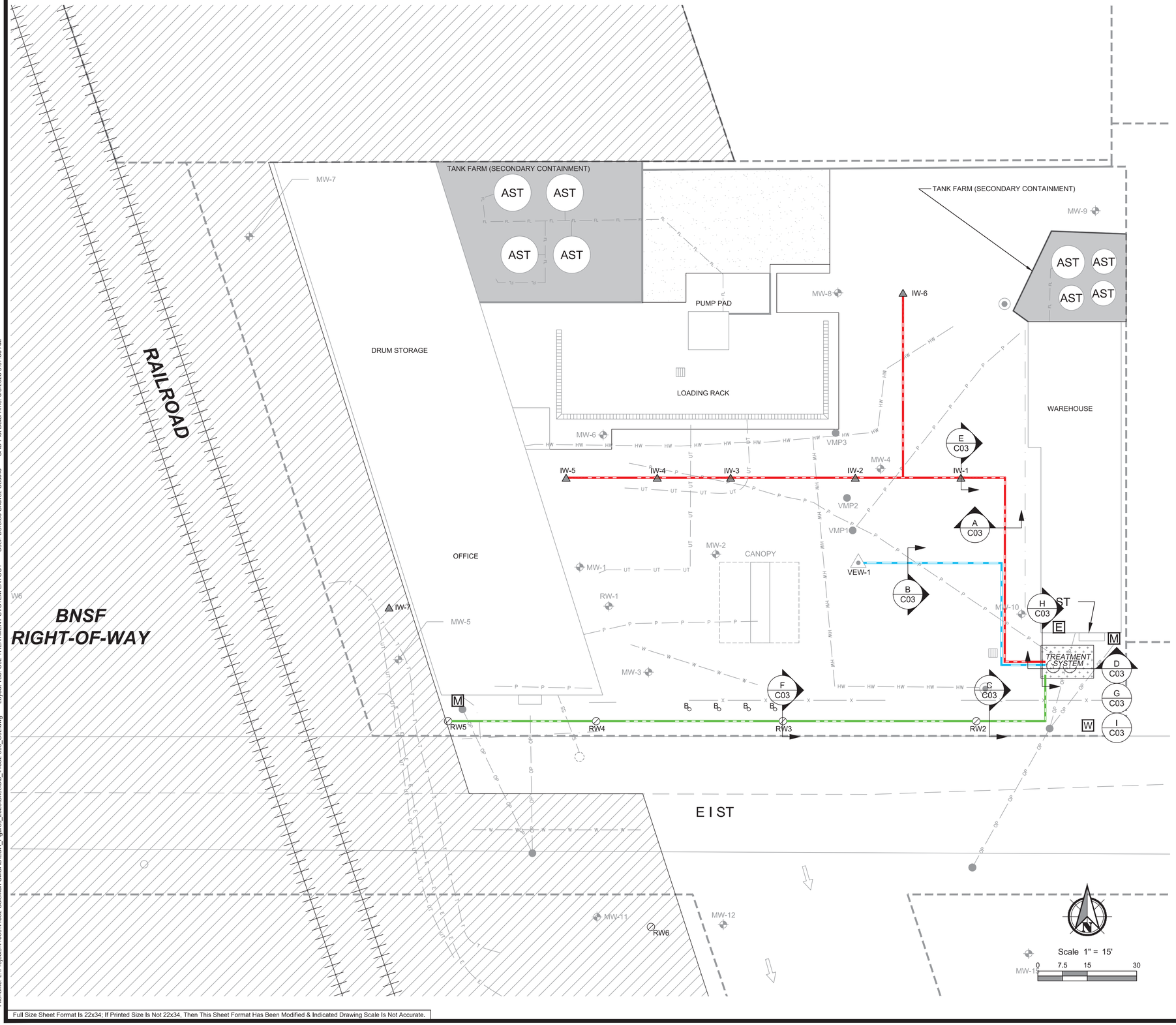

GENERAL NOTES:

1. INSPECT ALL PIPES FOR CUTS, SCRATCHES, GOUGES, OR SPLIT END UPON DELIVERY TO SITE AND PRIOR TO INSTALLATION. DO NOT USE DAMAGED SECTIONS OF PIPE.
2. STORE AND HANDLE PIPING IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
3. FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR PIPE SOLVENT CONNECTIONS AND CURE TIMES.
4. TEST PIPES FOR LEAKS BEFORE BACKFILLING. IF LEAKS ARE FOUND, CONTRACTOR SHALL REPAIR PIPE CONNECTION AND REPEAT TEST UNTIL NO LEAKS ARE FOUND.
5. FOLLOW PVC PIPING MANUFACTURER'S RECOMMENDATIONS FOR SNAKING BURIED PIPE TO COMPENSATE FOR THERMAL EXPANSION/CONTRACTION.

LEGEND

- TRENCH LINE TO INJECTION WELLS
- TRENCH LINE TO VAPOR EXTRACTION WELL (POTENTIAL FUTURE USE)
- TRENCH LINE TO RECOVERY WELLS
- VEW-1 — VAPOR EXTRACTION WELL (VEW)
- RW1 — RECOVERY WELL (RW)
- IW-1 — INJECTION WELL (IW)
- TREATMENT PAD

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TREATMENT SYSTEM LAYOUT FOR: YAKIMA BULK FUEL FACILITY

1 EAST I STREET, YAKIMA, WASHINGTON 98901

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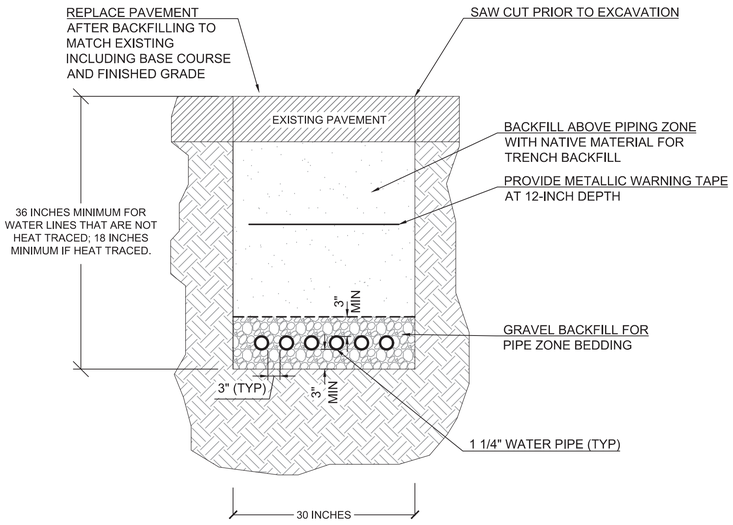
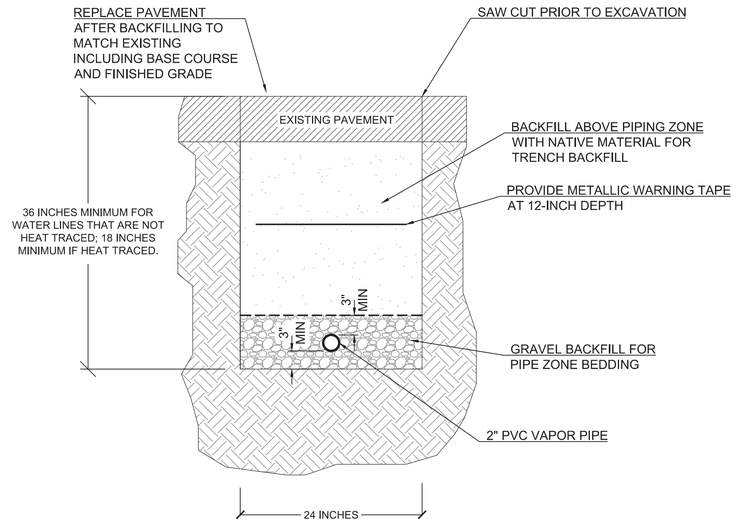


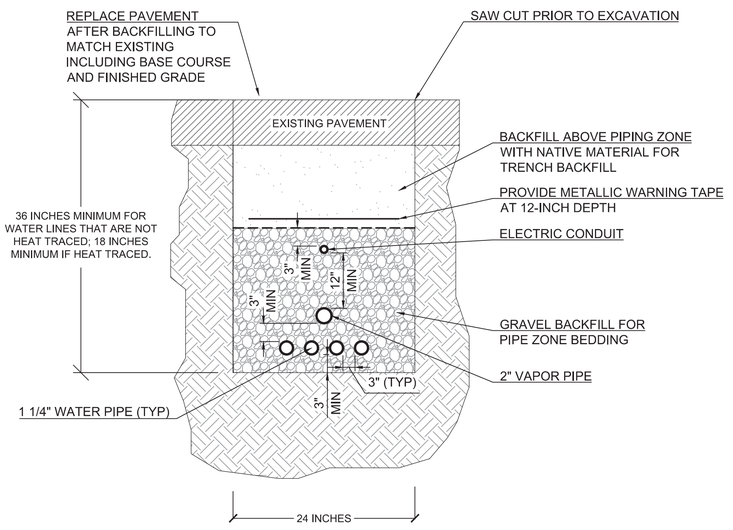
A **TYPICAL INJECTION PIPE TRENCH**



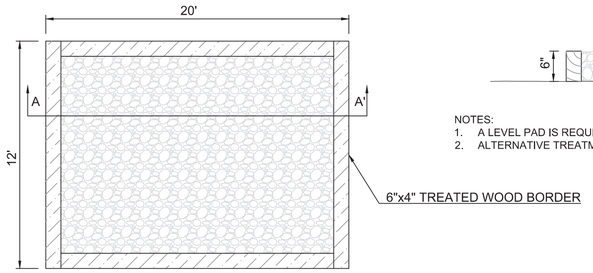
B **TYPICAL VAPOR EXTRACTION PIPE TRENCH**

GENERAL NOTES:

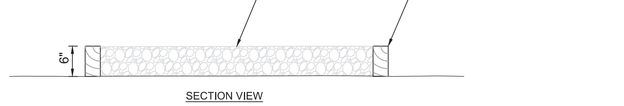
1. PIPE ZONE BEDDING SHALL MEET THE REQUIREMENTS OF WSDOT STANDARD SPECIFICATIONS, SECTION 9-03.12(3) GRAVEL BACKFILL FOR PIPE ZONE BEDDING.
2. BACKFILL ABOVE THE SPECIFIED PIPE ZONE BEDDING ZONE SHALL MEET THE REQUIREMENTS OF WSDOT STANDARD SPECIFICATIONS, SECTION 9-03.15 NATIVE MATERIAL FOR TRENCH BACKFILL.
3. ASPHALT PAVEMENT REPLACEMENT IN TRENCHED AREAS SHALL CONSIST OF 6 INCHES OF HOT MIX ASPHALT (HMA) CL 1/2 PER WSDOT STANDARD SPECIFICATIONS OVER MINIMUM 6 INCHES OF CRUSHED BASE COURSE PER WSDOT STANDARD SPECIFICATIONS.



C **TYPICAL RECOVERY PIPE TRENCH**



PLAN VIEW



SECTION VIEW

NOTES:
1. A LEVEL PAD IS REQUIRED FOR PLACING THE ETEC-SUPPLIED EQUIPMENT COMPOUND.
2. ALTERNATIVE TREATMENT PAD OPTIONS MAY BE CONSIDERED FOR APPROVAL.

D **TREATMENT PAD**

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TREATMENT SYSTEM TRENCH & EQUIPMENT PAD DETAILS FOR:

YAKIMA BULK FUEL FACILITY

1 EAST I STREET, YAKIMA, WASHINGTON 98901

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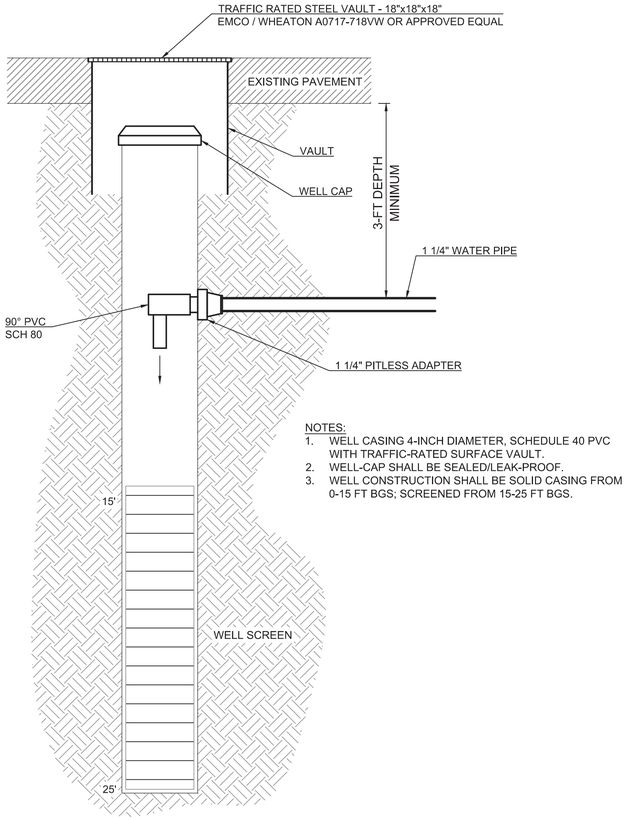
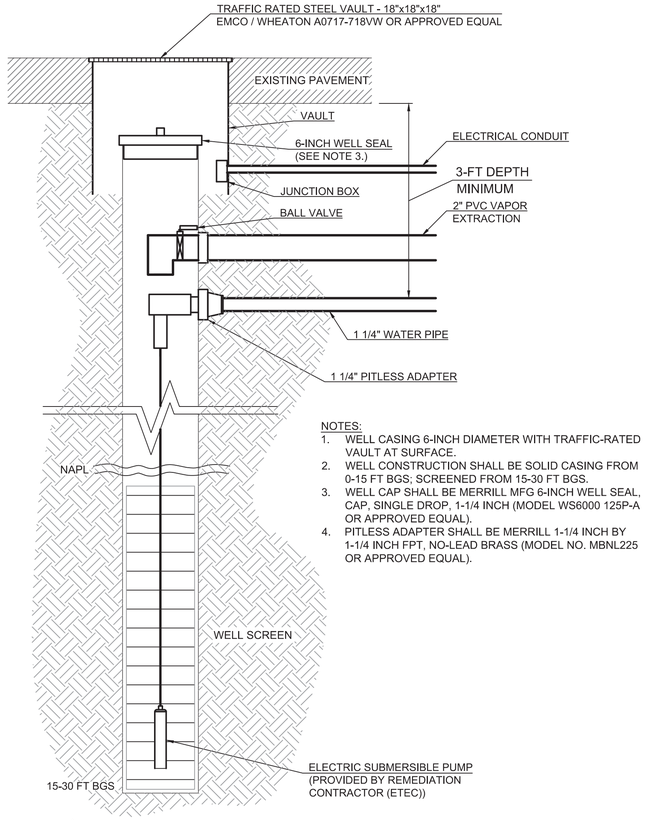
SHEET	4 OF 5



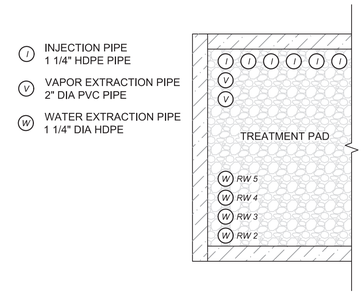
NOTES:
1. WELL CASING 4-INCH DIAMETER, SCHEDULE 40 PVC WITH TRAFFIC-RATED SURFACE VAULT.
2. WELL-CAP SHALL BE SEALED/LEAK-PROOF.
3. WELL CONSTRUCTION SHALL BE SOLID CASING FROM 0-15 FT BGS; SCREENED FROM 15-25 FT BGS.

E **TYPICAL INJECTION WELL DETAIL**

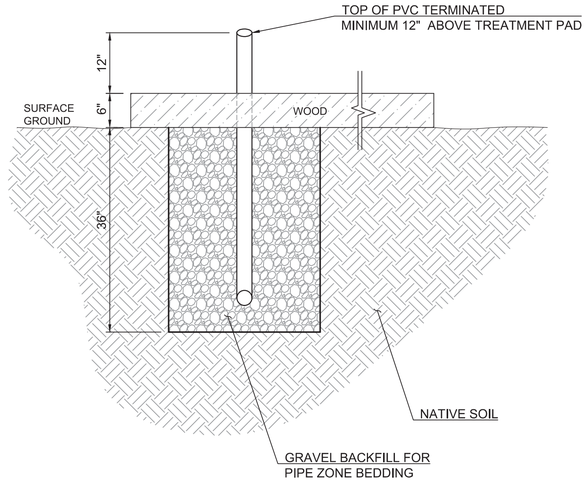


NOTES:
1. WELL CASING 6-INCH DIAMETER WITH TRAFFIC-RATED VAULT AT SURFACE.
2. WELL CONSTRUCTION SHALL BE SOLID CASING FROM 0-15 FT BGS; SCREENED FROM 15-30 FT BGS.
3. WELL CAP SHALL BE MERRILL MFG 6-INCH WELL SEAL, CAP, SINGLE DROP, 1-1/4 INCH (MODEL WS6000 125P-A OR APPROVED EQUAL).
4. PITLESS ADAPTER SHALL BE MERRILL 1-1/4 INCH BY 1-1/4 INCH FPT, NO-LEAD BRASS (MODEL NO. MBNL225 OR APPROVED EQUAL).

F **TYPICAL RECOVERY WELL DETAIL**

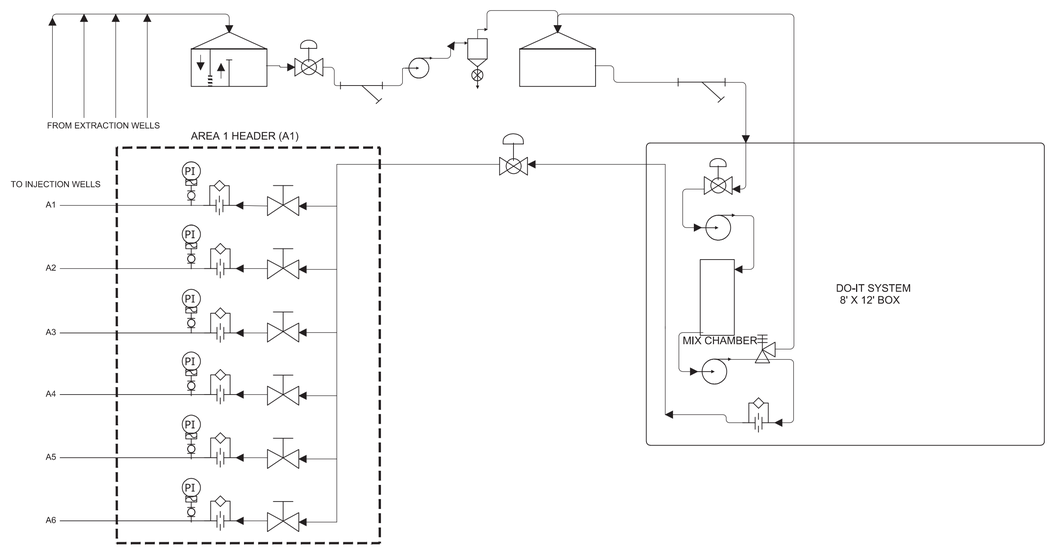


H **VERTICAL PIPE CONFIGURATION TREATMENT PAD**

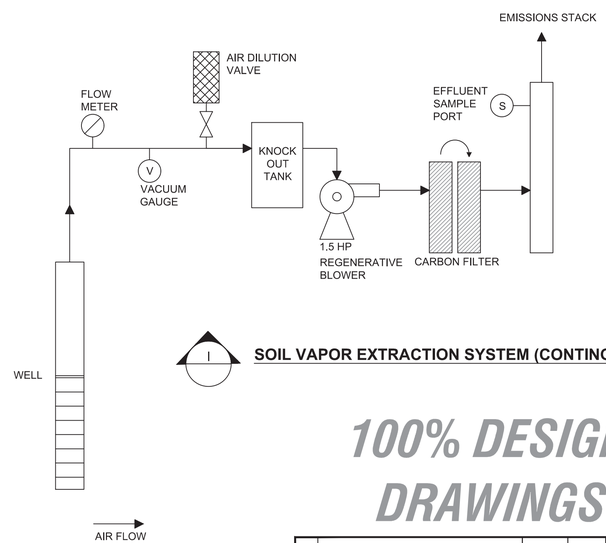


LEGEND

WATER TANK SEPARATOR		GATE VALVE (MANUAL)	
AIR ACTUATED BALL VALVE		FLOW METER	
Y-STRAINER		PRESSURE GAUGE	PI
WATER PUMP		RELIEF VALVE	
BAG FILTER		PI	PRESSURE INDICATOR
		A1	INJECTION WELL



G **PROCESS FLOW DIAGRAM**



I **SOIL VAPOR EXTRACTION SYSTEM (CONTINGENT)**

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TREATMENT SYSTEM WELL DETAILS & PROCESS FLOW DIAGRAM FOR:

YAKIMA BULK FUEL FACILITY

1 EAST I STREET, YAKIMA, WASHINGTON 98901

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