MONTANA HAZARDOUS WASTE PERMIT
Permit Number MTHWP-25-01

Issued to:
CHS Inc.

for the
CHS Laurel Refinery
EPA ID Number MTD0068083

MTHWP-25-01 (Third Reissuance)
Issued: September 30, 2025
Expires: September 30, 2035

Previously issued as:
MTHWP-14-02
Reissued: September 12, 2014
MTHWP-02-02
Reissued: June 20, 2001
MTHWP-91-01
Issued: August 2, 1991

Montana Department of Environmental Quality
Waste Management and Remediation Division
Waste Management Bureau
Helena, Montana
406/444-5300

DEQ
Montana Department of Environmental Quality

Montana Hazardous Waste Permit

Permit No. MTHWP-25-01

Permittee: CHS Inc Laurel Refinery
EPA ID# MTD 006238083

Pursuant to the Montana Hazardous Waste Act (MHWA) and regulations promulgated thereunder by the Montana Department of Environmental Quality (hereafter referred to as DEQ), a Permit is hereby issued to CHS Inc Laurel Refinery (hereafter called Permittee) for their post-closure care of a closed Old Landfarm and implementation of facility-wide corrective action.

CHS Inc Laurel Refinery is located south of Laurel, Montana. The facility's legal location is Section 15 and 16, Township 2 South, Range 24 East, Yellowstone County. The coordinates are latitude 45° 39' 20" W, 108° 46' 30" N.

This Permit consists of the conditions contained herein (including those in any attachments and appendices), and the applicable requirements in Title 17, Chapter 53, Administrative Rules of Montana as specified in the Permit. The Permittee must comply with all terms and conditions of the Permit.

DEQ presumes the Permit application and amendments (hereafter referred to as the Application), is accurate. Where portions of the Application are incorporated herein, they are deemed to be part of this Permit.

The Permittee must inform DEQ of any changes in on-site operation or Application information that would affect the Permittee's ability to comply with the Permit conditions or applicable regulations. Any inaccuracies or misrepresentations found in the Application may be grounds for termination, modification, or revocation and reissuance of this Permit.

This Permit is effective as of September 30, 2025, and shall remain in effect through September 30, 2035, unless revoked and reissued, or terminated.

Signed by:

Signature: Sonja Nowakowski Date: 08/26/2025

Sonja Nowakowski, Director
Montana Department of Environmental Quality

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Attachments

MODULE I
STANDARD PERMIT CONDITIONS

I.A. **Citation Convention**

For ease of reading and referencing, where the federal rule under the Code of Federal Regulations (CFR) is incorporated by reference into the Administrative Rules of Montana (ARM), only the federal citation is used. The version of the CFR incorporated by reference is set forth in ARM 17.53.105.

I.A.1. Attachment I.1 is a cross-reference table showing the corresponding CFR and ARM rules.

I.B. **Permittee**

This permit is issued to CHS Inc. (CHS) by Montana Department of Environmental Quality (DEQ) for management of a regulated hazardous waste management unit and implementation of facility-wide corrective action requirements.

I.C. **Facility Description**

I.C.1. *Refinery*

The CHS Laurel Refinery is a petroleum refinery located south of the city of Laurel, Montana (Attachments I.2 and I.3). The legal description of the refinery is Section 15 and 16, Township 2 South, Range 24 East, Yellowstone County, Montana.

I.C.2. *Regulated Unit*

The Old Landfarm (OLF) is a closed land treatment unit, approximately 18 acres in size including roads and berms. The area for land treatment is 13.8 acres. The legal description of the OLF is SW1/4, Section 16, Township 2 South, Range 24 East, Yellowstone County, Montana. The OLF was designated as SWMU 25 during the permit reissuance for MTHWP-14-02 and is included in Attachment II.1a.

I.D. **Applicability**

The conditions of this Module apply to the OLF, and all solid waste management units (SWMUs) and areas of concern (AOCs) described in Condition II.B.4.

I.E. **Definitions**

The terms used in this permit have the same meaning as those in the Montana Hazardous Waste Act (MHWA), ARM Title 17, Chapter 53, Resource Conservation Recover Act (RCRA), 40 CFR 124, 260, 261, 264, 268, 270, and 279, and the Federal Register dated July 27, 1990, unless this permit specifically provides otherwise. Where terms are not defined in the rules and regulations, this permit, or EPA guidance or publications, the terms shall have the meaning of a standard dictionary reference or the generally accepted scientific or industrial meaning of the term. The following terms are specifically defined in this permit.

Area of Concern (AOC) means any area at a facility having a probable release of a hazardous waste or hazardous constituent which may or may not be from a solid waste management unit and is determined by DEQ to pose a current or potential threat to human health or the environment. AOCs include areas that have been contaminated by routine and systematic releases of hazardous waste or hazardous constituents, excluding one-time accidental spills that are immediately remediated and cannot be linked to solid waste management activities. AOCs must be considered equivalent to SWMUs for the purposes of investigation and corrective action.

Below Treatment Zone (BTZ) consists of a soil layer from the bottom of the treatment zone to a half foot below the treatment zone or five to five and a half feet below the land's surface, whichever is smaller.

CHS Part B Application means the information submitted by CHS in the RCRA Part B permit application, attached to the Permittee's letter dated November 7, 1985; the Part B permit renewal application, attached to the Permittee's letter dated August 1, 2000; the Part B permit renewal application, attached to the Permittee's letter dated February 24, 2012; the Part B permit renewal application, attached to the Permittee's letter dated February 21, 2024; and all amendments to those submittals.

Contamination means any hazardous waste or hazardous constituent listed in 40 CFR Part 261 or Appendix IX of 40 CFR Part 264.

Corrective Action Management Unit (CAMU), as defined in 40 CFR 260.10 and 270.2, means an area within a facility that is designated by DEQ under 40 CFR 264 Subpart S, for the purpose of implementing corrective action requirements under 40 CFR 264.101, and MCA 75-10-415 and 416.

Corrective Measures means all corrective actions necessary to protect human health and the environment from all releases of hazardous waste or hazardous constituents from any permitted unit, SWMU, and/or AOC at the facility regardless of the time of placement of the waste in the unit, as required under this permit and 40 CFR 264.101. Corrective measures may address releases to air, soils, subsurface gases, surface water, or groundwater.

Department means the Montana Department of Environmental Quality

Director means the Director of the Montana Department of Environmental Quality.

Facility means contiguous land, structures, other appurtenances, and improvements on the land under the control of the owner or operator seeking a permit under the MHWA and ARM Title 17, Chapter 53.

Hazardous Constituent means any constituent identified in Appendix VIII of 40 CFR Part 261 or Appendix IX of 40 CFR Part 264.

Hazardous Waste means a hazardous waste as defined in 40 CFR 261.3. [40 CFR 270.2]

Hazardous Waste Management Facility means all contiguous land, and structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units. [40 CFR 270.2]

Hazardous Waste Management Unit means a contiguous area of land on or in which hazardous waste is placed or the largest area in which there is significant likelihood of mixing hazardous waste constituents in the same area. Examples include a surface impoundment, a waste pile, a land treatment area, a landfill cell, an incinerator, a tank and its associated piping and underlying containment system, and a container storage area. A container alone does not constitute a unit; the unit includes containers and the land or pad upon which they are placed.

Land Disposal means placement in or on the land, except in a corrective action management unit or staging pile, and includes, but is not limited to, placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, underground mine or cave, or placement in a concrete vault, or bunker intended for disposal purposes. [40 CFR 268.2]

Permit means Montana Hazardous Waste Permit Number MTHWP-25-01, all amendments, and application references.

Permittee means CHS Inc. (CHS).

Person means an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof. [40 CFR 270.2]

Regional Administrator means the Region 8 Administrator of the Environmental Protection Agency or his/her designee. [40 CFR 260.10 and 40 CFR 270.2]

Regulated unit means an operational or closed unit used to treat, store, or dispose of hazardous waste. The regulated unit referred to in this permit is one land treatment unit named the Old Land Farm (OLF) as defined in Condition I.C.2.

Release means any spill, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of any hazardous waste or hazardous constituents into the environment.

Remediation Waste means all solid and hazardous wastes, and all media (including ground water, surface water, soils, and sediments) and debris that are managed for implementing clean-up. [40 CFR 260.10]

Solid Waste Management Unit (SWMU) means any discernible unit at which solid waste has been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. SWMUs include MHWA-regulated hazardous waste management units. Such units include any area at a facility at which solid waste has been routinely and systematically released.

Treatment Zone (TZ) is the portion of the unsaturated zone, below and including the land surface, in which the conditions necessary for effective degradation, transformation, or immobilization are maintained. The horizontal dimension of the treatment zone is the area within the perimeter berms shown in Attachment IV.1. The vertical dimension of the treatment zone is from the land's surface to a maximum of five feet below the land's surface. The maximum depth of the treatment zone must be a minimum of three (3) feet above the seasonal high water table.

Unit includes, but is not limited to, any landfill, surface impoundment, waste pile, land treatment unit, incinerator, injection well, contaminated groundwater collection/storage tank, drum, or other storage device, spray device, splash pad, drip pad, skimmer tank, oil water separator, container storage area, septic tank, drain field, lateral underdrain, sump, emulsion aerator device, wastewater treatment unit, elementary neutralization unit, transfer station soil ventilation device, recycling unit, underground lateral drain, french drain, waste transfer routes, pipes, sewers, and/or other interim measure or corrective action structure.

Zone of Incorporation (ZOI) consists of a soil layer within the treatment zone measuring from the land surface to a point twelve (12) inches below the land surface.

I.F. **Effect of Permit**

I.F.1. *General*

I.F.1.a. In accordance with 40 CFR 270.4(a)(1), compliance with this permit during its term constitutes compliance, for purposes of enforcement, with the MHWA except for those requirements not included in the permit which:

I.F.1.a.i. Become effective by statue [40 CFR 270.4(a)(1)(i)];

I.F.1.a.ii. Are later promulgated;

I.F.1.a.iii. Are promulgated under 40 CFR 268 restricting the placement of hazardous wastes in or on the land [40 CFR 270.4(a)(1)(ii)]; or

I.F.1.a.iv. Are promulgated under 40 CFR 265, subpart AA, BB, or CC limiting air emissions. [40 CFR 270.4(a)(1)(iv)]

I.F.1.b. The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege. [40 CFR 270.4(b)]

I.F.1.c. The issuance of this permit does not authorize any injury to persons or property or invasion of other private rights, or any infringement of State or local law or regulations. [40 CFR 270.4(c)]

I.F.2. *Permitted Hazardous Waste Management Unit*
The OLF is a closed land treatment unit. The Permittee shall operate the OLF subject to the conditions of this permit and the limitations described in Condition I.F.2.a.

I.F.2.a. DEQ designated the OLF as a CAMU in 2002. The CAMU may only be used to manage remediation wastes for implementation of corrective action at the facility under 40 CFR 264.101 and MCA 75-10-415 and 416. Management of remediation wastes is restricted to the footprint of the OLF. CHS did not initiate operation of the OLF as a CAMU after the 2002 designation. The OLF was closed in 2015 and is in post-closure care.

I.F.3. *Facility-Wide Corrective Action*
I.F.3.a. The Permittee is required, under the conditions of this permit, 40 CFR 264.101, to institute facility-wide corrective action as necessary to protect human health and the environment for all releases of hazardous waste or hazardous constituents from any SWMU or AOC at the facility, regardless of the time at which waste was placed in such units. [40 CFR 264.101(a)]

I.F.3.b. The Permittee must implement corrective actions beyond the facility property boundary, where necessary to protect human health and the environment, unless the Permittee demonstrates to the satisfaction of the Director that, despite the Permittee's best efforts, the Permittee was unable to obtain the necessary permission to undertake such actions. The Permittee is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis. [40 CFR 264.101(c)]

I.F.3.c. AOCs shall receive the same level of investigation and remediation as that required by rules, regulations and statues for SWMUs. [40 CFR 270.32(b)(2)]

I.G. **Financial Assurance**
I.G.1. *General Requirements*
I.G.1.a. Documentation of financial assurance for RCRA Facility Investigation (RFI), Interim Measures (IM), Corrective Measures Study (CMS), and Corrective

Measures Implementation (CMI) may be combined with financial assurance documentation for the regulated unit defined in Condition I.C.2.

I.G.1.b. The Permittee may meet the financial assurance requirements for facility-wide corrective action with any combination of instrument(s) being used for post-closure pursuant to 40 CFR Part 264, provided the Permittee assures that the monies dedicated for compliance with facility-wide corrective action are separate from monies dedicated to closure and post-closure care for the regulated unit.

I.G.1.c. In sections of the financial assurance documentation referring to facility-wide corrective action, the appropriate term(s) "RFI", "IM", "CMS", and/or "CMI" must be substituted for the word "post-closure" when referring to 40 CFR Part 264 Subpart H. Also, the word "Permittee" must be substituted for the words "owner or operator" when referring to 40 CFR 264 Subpart H.

I.G.1.d. The Permittee shall comply with the requirements of 40 CFR 264.148 with regard to the incapacity of the Permittee, its guarantors or financial institutions issuing financial mechanisms in compliance with the requirements of this permit.

I.G.1.e. DEQ may modify the financial requirements of this permit in the event DEQ incorporates changes to 40 CFR 264 Subpart H into ARM 17.53.801 after the effective date of this permit.

I.G.2. *Cost Estimate, Financial Assurance, and Liability Coverage for the OLF*

I.G.2.a. Cost Estimate for Closure and Post-Closure Care

I.G.2.a.i. The Permittee shall adjust the closure and post-closure care cost estimate for inflation within thirty (30) days after the close of the fiscal year. This annual inflation adjustment must be calculated using the procedure outlined in 40 CFR 264.144.

I.G.2.a.ii. The Permittee shall revise the closure and post-closure care cost estimate no later than thirty (30) days after DEQ has approved a request to modify the closure or post-closure care plan, if the change in the plan increases the cost of closure or post-closure. The revised closure or post-closure care cost estimate must be adjusted for inflation as specified in Condition I.G.2.a.i.

I.G.2.a.iii. The Permittee shall keep the latest closure and post-closure care cost estimate at the offices of the CHS Laurel Refinery.

I.G.2.b. Financial Assurance

The Permittee shall demonstrate continuous compliance with 40 CFR 264.146 by providing documentation of financial assurance, as required by 40 CFR 264.151, in at least the amount of the cost estimates required by Condition I.G.2.a. Changes in the financial assurance mechanism must be approved by DEQ.

I.G.2.c. Liability Requirements

The Permittee shall demonstrate continuous compliance with the requirements in 40 CFR 264.147 and the documentation requirements of Condition I.G., including the requirements to have and maintain liability coverage for sudden and non-sudden accidental occurrences in the amount of at least $1 million per occurrence with an annual aggregate of at least $2 million, exclusive of legal defense costs. Changes in the liability coverage mechanism must be approved by DEQ.

I.G.3. *Financial Assurance and Liability Coverage for Facility-Wide Corrective Action*

The purpose of financial assurance for facility-wide corrective action in this permit is to guarantee performance of and payment for the RFI, IM, CMS and CMI activities. The purpose of liability coverage is insurance for third-party injury and property damage claims resulting from sudden and non-sudden accidental occurrences arising from any activity performed in accordance with the corrective action provisions of this permit.

I.G.3.a. Facility-Wide Corrective Action Financial Assurance

I.G.3.a.i. The Permittee shall comply with the financial assurance requirements of 40 CFR 264.144 regarding the cost estimates for all corrective action measures required by this permit, including studies, reports and plan submissions. The financial assurance requirements of 40 CFR 264.144 continue throughout the term of the permit and must be based on third party costs (40 CFR 264.144(a)(1)), annual inflation adjustments (40 CFR 264.144(b)), and revision of the cost estimate when there has been a change in the RFI, IM, CMS, and CMI activities and work plans which results in an increase in the cost of such activities, even though the facility may have had closure certification accepted by DEQ (40 CFR 264.144(c)).

I.G.3.a.ii. Within forty-five (45) calendar days after receipt of written Department approval of the work plan for the current phase of activity required under Module II (e.g., RFI, IM, CMS or CMI), the Permittee shall provide financial assurance for that phase of activity in accordance with 40 CFR 264.144 through 148.

I.G.3.a.iii. If the Permittee is using a financial test or guarantee under 40 CFR 264.145(f), all facilities owned by the Permittee in the United States and its territories that are also being covered by the financial test or guarantee of the Permittee must be listed, and the amounts covered must be included in Alternative I or Alternative II as worded in 40 CFR 264.151(g), as appropriate.

I.G.3.b. Liability Insurance Coverage

The Permittee shall provide liability coverage as follows:

I.G.3.b.i. Within forty-five (45) days after receipt of written Department approval of the work plan for the current phase of activity, the Permittee shall provide liability coverage using one or a combination of mechanisms allowed under 40 CFR 264.147(f) through (j). The liability coverage for sudden and non-sudden occurrences arising solely from RFI, IM, CMS and/or CMI activities must consist

of $5 million per occurrence with $10 million annual aggregate exclusive of legal defense costs and must be in addition to liability insurance required under any other section of the hazardous waste regulations. Requirements for use of a financial test or corporate guarantee are the same as those stated in Condition I.G.3.a.iii.

I.G.3.c. Adjustment of Liability Coverage

If DEQ determines that the levels of financial responsibility required by Condition I.G.3.b. are not consistent with the degree and duration of risk associated with the RFI/CMS/CMI and/or Interim Measure activities at the facility, DEQ may adjust the level of financial responsibility required under Condition I.G.3.b. as necessary to protect human health and the environment. This adjusted level will be based on DEQ's assessment of the degree and duration of risk associated with RFI, CMS, CMI, and/or IM activities at the facility. The Permittee shall furnish to DEQ information that DEQ requests related to RFI, CMS, CMI, and IM activities to determine whether cause exists for such adjustments of level or type of coverage.

I.G.3.d. Departmental Draw on Financial Instrument

If DEQ determines the Permittee has failed to perform closure, post-closure, or corrective action activities in accordance with any of the terms or conditions of this permit, DEQ will provide written notification to the Permittee of its intent to utilize the Permittee's financial responsibility instruments for the purpose of undertaking or supplementing such performance. Notification of intent to draw on the Permittee's financial instrument will specify in detail DEQ's reasons for taking such action.

I.H. General Permit Application Requirements

I.H.1. *Permit Application*

Any person who is required to have a permit (including new applicants and permittees with expiring permits) shall complete, sign and submit an application to the Director as described in 40 CFR 270.10 and 40 CFR 270.70 through 270.73. [40 CFR 270.10(a)(3)]

I.H.2. *Reapplications*

I.H.2.a. The Permittee shall submit a new application at least 180 days before the expiration date of the effective permit, unless permission for a later date has been granted by the Director, or

I.H.2.b. If the Permittee intends to be covered by a standardized permit, the Permit may submit a Notice of Intent as described in 40 CFR 270.51(e)(1) at least 180 days before the expiration of the effective permit unless the Director allows a later date. The Director may not allow the Permittee to submit applications or Notices of Intent later than the expiration date of the existing permit, except as allowed by 40 CFR 270.51(e)(2). [40 CFR 270.10(h)]

I.H.3. *Fees*
DEQ will assess filing and review fees to an applicant of a hazardous waste permit as specified in ARM 17.53.112.

I.I. **Signatories to Permit Applications and Reports**

I.I.1. All permit applications shall be signed as specified in 40 CFR 270.11(a).

I.I.2. All reports required by permits and other information requested by DEQ shall be signed by a person described in 40 CFR 270.11(a) or by a duly authorized representative of that person. [40 CFR 270.11(b)]

I.I.2.a. A person is a duly authorized representative only if:

I.I.2.b. The authorization is made in writing by a person described in 40 CFR 270.11(a);

I.I.2.c. The authorization specifies either an individual or a position having responsibility for overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, environmental section chief, remedial project manager, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

I.I.2.d. The written authorization is submitted to DEQ. [40 CFR 270.11(b)]

I.I.2.e. If an authorization under Condition I.I.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Condition I.I.2. must be submitted to DEQ prior to or together with any reports, information, or applications to be signed by an authorization representative. [40 CFR 270.11(c)]

I.I.2.f. As stated in 40 CFR 270.11(d), any person signing a document under Condition I.I.1. and I.I.2. must make the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

I.J. **Conditions Applicable to All Permits**
The conditions of 40 CFR 270.30 apply to all MHWA permits and are hereby incorporated into this permit.

I.J.1. *Duty to Comply*

The Permittee must comply with all conditions of this permit, except that the Permittee need not comply with the conditions of this permit to the extent and for the duration such noncompliance is authorized in an emergency permit (40 CFR 270.61). Any permit noncompliance, except under the terms of an emergency permit, constitutes a violation of the appropriate Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. [40 CFR 270.30(a)]

I.J.2. *Duty to Reapply*

If the Permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the Permittee must apply for and obtain a new permit. [40 CFR 270.30(b)]

I.J.3. *Need to Halt or Reduce Activity not a Defense*

It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [40 CFR 270.30(c)]

I.J.4. *Duty to Mitigate*

In the event of noncompliance with the permit, the Permittee shall take all reasonable steps to minimize releases to the environment, and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment. [40 CFR 270.30(d)]

I.J.5. *Proper Operation and Maintenance*

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facility or similar systems only when necessary to achieve compliance with the conditions of this permit. [40 CFR 270.30(e)]

I.J.6. *Permit Actions*

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition. [40 CFR 270.30(f)]

I.J.7. *Property Rights*

The permit does not convey any property rights of any sort, or any exclusive privilege. [40 CFR 270.30(g)]

I.J.8. *Duty to Provide Information*
The Permittee shall furnish to DEQ within a reasonable time, any relevant information which DEQ may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to DEQ, upon request, copies of records required to be kept by this permit. [40 CFR 270.30(h)]

I.J.9. *Inspection and Entry*
The Permittee shall allow DEQ, or an authorized representative, upon the presentation of credentials and other documents as may be required by law to:

I.J.9.a. Enter at reasonable times upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

I.J.9.b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

I.J.9.c. Inspect at reasonable times any faculties, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

I.J.9.d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by MWHA, any substances or parameters at any locations. [40 CFR 270.30(i)]

I.J.10. *Monitoring, Sampling and Analytical Requirements*
Samples and measurements taken for the purposes of monitoring must be representative of the monitoring activity. The method used to obtain a representative sample of wastes to be analyzed must be the appropriate method from Appendix I of 40 CFR Part 261 or an equivalent method approved by DEQ. Laboratory methods for wastes or other media must be those specified in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), (third edition, 1986 and most recent updates); *Standard Methods for the Examination of Water and Wastewater*, (twenty-first edition, 2005); or an equivalent method approved by DEQ. [40 CFR 270.30(j)(1)]

I.J.10.a. <u>Monitoring Well and Sampling Requirements</u>

I.J.10.a.i. The Permittee shall maintain a consistent sampling and analysis program that ensures reliable monitoring results. At a minimum, the program must include appropriate procedures and techniques for sample collection, sample preservation and shipment, chain-of-custody control, and sample analysis.

I.J.10.a.ii. The sampling and analytical methods must be appropriate for waste, soil, and surface and groundwater sampling and must accurately measure hazardous constituents in media and waste samples.

I.J.10.a.iii. Samples must be collected, preserved and transported and a chain-of-custody record maintained in accordance with the procedures specified in *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods,* (SW-846) (third edition 1986 and most recent updates). Quality assurance and quality control (QA/QC) procedures for field sampling must be followed as specified in SW-846.

I.J.10.a.iv. Monitoring wells must be maintained in operational condition. Access must be controlled at all times. Monitoring well caps must be locked and secure when wells are not being sampled or maintained.

I.J.10.b. Analytical Parameters Definitions
Background Values represent the quality of groundwater from a hydrogeologically equivalent source upgradient from the facility.

Estimated Quantitation Limit (EQL) is the lowest concentration of a parameter in water and soil that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions. EQLs are based on a general estimate for the method and are generally 5 to 10 times the method detection limit. Analytical laboratories may also refer to this term as the Practical Quantitation Limit (PQL) or Reporting Limit (RL).

Method Detection Limit (MDL) is defined as the sample and method-specific concentration at which there is a specified assurance of the presence and identity of a given parameter in a sample. The analytical laboratory follows the procedures in SW-846 to obtain the method detection limit. Based on nationwide laboratory experience, the U.S. Environmental Protection Agency has developed estimated method detection limits for specific parameters and methods in SW-846.

Reportable Value is defined as any measured concentration for an analyte which equals or exceeds the method detection limit as determined by the analytical laboratory.

I.J.10.c. Analytical Reporting Requirements
All analytical reports submitted to DEQ must at a minimum include the following:

I.J.10.c.i. Laboratory used and name of laboratory contact person;

I.J.10.c.ii. Date of sample receipt, extraction, and analysis;

I.J.10.c.iii. A copy of the signed chain-of-custody document;

I.J.10.c.iv. Sample matrix (water, soil, etc.);

I.J.10.c.v. Sample preservation, preparation and/or analytical method(s) used by the laboratory, including method number references;

I.J.10.c.vi. Analytical data results provided by the laboratory;

I.J.10.c.vii. Estimated quantitation limits (EQLs) actually achieved by the test method used by the laboratory for every parameter in each sample;

I.J.10.c.viii. Method detection limits (MDLs) for every parameter tested;

I.J.10.c.ix. Low concentration groundwater data reported as follows:

Analyte Concentration	Report
<MDL	Provide MDL value for analyte
>MDL but <EQL	Detected but reported as an estimated value
>EQL	Numerical concentration quantified

I.J.10.c.x. Quality control information pertinent to analysis including blanks, duplicates, matrix spike recoveries and acceptance limits for the inorganic parameters analyzed; surrogate compound identity; recovery and acceptance limits for the organic parameters analyzed; and calibration verification results; and

I.J.10.c.xi. Description of any deviations from the permit requirements and/or method guidelines or laboratory Quality Assurance Plan (QAP).

I.J.11. *Monitoring Records*

I.J.11.a. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, the certification required by 40 CFR 264.73(b)(9) and records of all data used to complete the application for this permit, for a period of at least three (3) years from the date of the sample, measurement, report, certification, or application, or until corrective action is completed, whichever date is later. This period may be extended by request of DEQ at any time. The Permittee shall maintain records for all ground water monitoring wells and associated ground water surface elevations, for the active life of the facility, and for disposal facilities for the post-closure care period as well. [40 CFR 270.30(j)(2)]

I.J.11.b. Records for monitoring information shall include:

I.J.11.b.i. The date, exact place, and time of sampling or measurements;

I.J.11.b.ii. The individual(s) who performed the sampling or measurements;

I.J.11.b.iii. The date(s) the analyses were performed;

I.J.11.b.iv. The individual(s) who performed the analyses;

I.J.11.b.v. The analytical techniques or methods used; and

I.J.11.b.vi. The results of such analyses. [40 CFR 270.30(j)(3)]

I.J.11.b.vii. The Permittee shall retain, either at the laboratory or at the facility, the raw organic information for required sampling and analysis including organic chromatographic printouts, mass spectral analyses, QA/QC surrogate and spiking results, etc.

I.J.12. *Signatory Requirements*
All applications, reports, or information submitted to DEQ shall be signed and certified as specified in Condition I.I. [40 CFR 270.30(k)]

I.J.13. *Reporting Requirements*

I.J.13.a. Planned Changes: The Permittee shall give notice to DEQ as soon as possible of any planned physical alterations or additions to the permitted facility which will affect the regulated unit or any SWMUs and/or AOCs included in the facility-wide corrective action process. [40 CFR 270.30(l)(1)]

I.J.13.b. Anticipated Noncompliance: The Permittee shall give 30-days advance written notice to DEQ of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. [40 CFR 270.30(l)(2)]

I.J.13.c. Transfers: This permit is not transferable to any person except after notice to DEQ. DEQ may require modification or revocation and reissuance of the permit to change the name of the Permittee and incorporate such other requirements as may be necessary under MHWA. [40 CFR 270.30(l)(3)]

I.J.13.d. Monitoring Reports: Monitoring results shall be reported at the intervals specified elsewhere in this permit. [40 CFR 270.30(l)(4)]

I.J.13.e. Compliance Schedules: Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date unless this permit specifies a different date, or the Permittee has made prior written arrangement with DEQ. [40 CFR 270.30(l)(5)]

I.J.13.e.i. DEQ may modify this permit when it determines good cause exists for modification of a compliance schedule, such as an act of God, strike, flood, or materials shortage or other events over which the Permittee has little or no control

and for which there is not reasonably available remedy in accordance with Condition I.S. [40 CFR 270.41(a)(4)]

I.J.13.f. Twenty-Four Hour Reporting: Pursuant to 40 CFR 270.30(1)(6), the Permittee shall report any noncompliance which may endanger health or the environment. The Permittee shall report any situation that poses or presents an imminent, potential, or existing hazard to public health or the environment from any release of hazardous waste or hazardous constituents. Any such information must be reported to DEQ verbally within twenty-four (24) hours from the time the Permittee becomes aware of the circumstances.

I.J.13.f.i. The oral report must include:

I.J.13.f.i.1. Information concerning release of any hazardous waste or hazardous constituents that may cause an endangerment to public drinking water supplies.

I.J.13.f.i.2. Any information of a release or discharge or hazardous waste or of a fire or explosion from the HWM facility, which could threaten the environment or human health outside the facility.

I.J.13.f.i.3. The description of the occurrence and its cause must include:

I.J.13.f.i.4. Name, address, and telephone number of the owner or operator;

I.J.13.f.i.5. Name, address, and telephone number of the facility;

I.J.13.f.i.6. Date, time, and type of incident;

I.J.13.f.i.7. Name and quantity of material(s) involved;

I.J.13.f.i.8. The extent of injuries, if any;

I.J.13.f.i.9. An assessment of actual or potential hazards to the environment and human health outside the facility, where this is applicable; and

I.J.13.f.i.10. Estimated quantity and disposition of recovered material that resulted from the incident. [40 CFR 270.30(l)(6)]

I.J.13.f.ii. A written submission shall also be provided within five (5) calendar days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the non-compliance and its cause; the period of noncompliance including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. DEQ may waive the five-day written notice requirement in favor of a written report within fifteen (15) calendar days. [40 CFR 270.30(l)(6)]

I.J.13.g. Manifest Discrepancy Report

If a significant discrepancy in a manifest is discovered, the Permittee must attempt to reconcile the discrepancy. If not resolved within twenty (20) days, the Permittee must submit a letter report, including a copy of the manifest, to DEQ. After December 1, 2025, the Permittee must submit a discrepancy report through the U.S. Environmental Protection Agency e-Manifest System describing the discrepancy and attempts to reconcile it, and a copy of the manifest or shipping paper at issue. (See 40 CFR 264.72.) [40 CFR 270.30(l)(7)]

I.J.13.h. Other Noncompliance

The Permittee shall report all instances of noncompliance not reported under Conditions I.J.13.d., I.J.13.e., and I.J.13.f. at the time monitoring reports are submitted. The reports shall contain the information listed in Condition I.J.13.f. [40 CFR 270.30(l)(10)]

I.J.13.i. Other Information

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to DEQ, it shall promptly submit such facts or information. [40 CFR 270.30(l)(11)]

I.J.14. *Information Repository*

DEQ may require the Permittee to establish and maintain an information repository at any time, based on the factors set forth in 40 CFR 124.33(b). The information repository will be governed by the provisions in 40 CFR 124.33(c) through (f). [40 CFR 270.30(m)]

I.K. Changes to Permit

I.K.1. *Transfer*

I.K.1.a. A permit may be transferred by the Permittee to a new owner or operator only if the permit has been modified or revoked and reissued under 40 CFR 270.40(b) or 40 CFR 270.41(b)(2) to identify the new Permittee and incorporate such other requirements as may be necessary under MHWA. [40 CFR 270.40]

I.K.1.b. Changes in the ownership or operational control of the facility may be made as a Class 1 modification with prior written approval of the Director in accordance with 40 CFR 270.42. [40 CFR 270.40(b)]

I.K.1.c. The new owner or operator must submit a revised permit application no later than 90 calendar days prior to the scheduled change. A written agreement containing a specific date for transfer of permit responsibility between the current and new permittees must also be submitted to DEQ. [40 CFR 270.40(b)]

I.K.1.d. Before transferring ownership of the facility, the Permittee shall notify the new owner or operator in writing of the requirements of this permit, and 40 CFR Parts

264 and 270. The Permittee shall demonstrate to DEQ that the new owner or operator has been notified of these requirements by sending a copy of the written notification to DEQ within 30 days of new owner or operator notification.

I.K.2. *Modification or Revocation and Reissuance*

I.K.2.a. This permit may be modified, revoked and reissued, or terminated by DEQ for cause as specified in 40 CFR 270.4, 270.30, 270.41 through 270.43.

I.K.2.b. When a permit is modified, only the conditions subject to the modification are reopened. [40 CFR 270.41]

I.K.2.c. If a permit modification is requested by the Permittee, DEQ shall approve or deny the request according to the procedures of 40 CFR 270.42. Otherwise, a draft permit must be prepared and other procedures in 40 CFR Part 124 followed. [40 CFR 270.41]

I.K.3. *Permit Modification at the Request of the Permittee*

I.K.3.a. Class 1 Modification: Class 1 modifications are listed in Appendix I of 40 CFR 270.42. For Class 1 modifications, the Permittee shall follow the procedures specified in 40 CFR 270.42(a).

I.K.3.a.i. Class 1 permit modifications identified in Appendix I by a footnote may be made only with the prior written approval of DEQ.

I.K.3.b. Class 2 Modifications: Class 2 modifications are listed in Appendix I of 40 CFR 270.42. For Class 2 modifications, the Permittee shall follow the procedures specified in 40 CFR 270.42(b).

I.K.3.c. Class 3 Modifications: Class 3 modifications are listed in Appendix I of 40 CFR 270.42. For Class 3 modifications, the Permittee shall follow the procedures in 40 CFR 270.42(c).

I.K.3.d. Other Modifications: In the case of modifications not explicitly listed in Appendix I of 40 CFR 270.42, the Permittee shall follow the procedures in 40 CFR 270.42(d).

I.K.3.e. Temporary Authorizations: Upon request of the Permittee, DEQ may, without prior public notice and comment, grant the Permittee a temporary authorization in accordance with 40 CFR 270.42(e). The temporary authorization must have a term of not more than 180 days.

I.K.4. *Termination of Permits*

DEQ may terminate a permit during its term, or deny a permit renewal application for the causes listed in 40 CFR 270.43.

I.L. **Expiration and Continuation of Permits**

I.L.1. *Duration of Permits*

I.L.1.a. This permit shall be effective for a fixed term not to exceed 10 years. [40 CFR 270.50(a)]

I.L.1.b. Except as provided in 40 CFR 270.51, the term of this permit shall not be extended by modification beyond 10 years. [40 CFR 270.50(b)]

I.L.2. *Continuation of Expiring Permits*

I.L.2.a. Pursuant to 40 CFR 270.51, the conditions of an expired permit continue in force until the effective date of a new permit if:

I.L.2.a.i. The Permittee has submitted a timely application under 40 CFR 270.14 and the applicable sections in 40 CFR 270.15 through 40 CFR 270.29 which is a completed (under 40 CFR 270.10(c)) application for a new permit; and

I.L.2.a.ii. DEQ through no fault of the Permittee, does not issue a new permit with an effective date under 40 CFR 124.15 on or before the expiration date of the previous permit.

I.L.2.b. Permits continued under 40 CFR 270.51 remain fully effective and enforceable. [40 CFR 270.51(b)]

I.L.2.c. When the Permittee is not in compliance with the conditions of the expiring or expired permit, DEQ may choose to do any or all of the options specified in 40 CFR 270.51(c).

I.L.2.d. Pursuant to 40 CFR 270.51(d), if a Permittee has submitted a timely and complete application, the terms and conditions of an EPA-issued RCRA permit continue in force beyond the expiration date of the permit, but only until the effective date of DEQ's issuance or denial of a MHWA permit.

I.M. **Personnel Training**

The Permittee shall conduct personnel training as required by 40 CFR 264.16. The CHS training program is outlined in Attachment I.4. The Permittee shall maintain training records and documents as required by 40 CFR 264.16(d) and (e).

I.N. **Preparedness and Prevention**

I.N.1. At a minimum, the Permittee shall maintain equipment, communications and alarm systems as set forth in the *CHS Refinery Emergency Response Plans and Agreements* (part of the *One Plan)*. [40 CFR 264.32 and 264.33]

I.N.1.a. The Permittee shall maintain preparedness and prevention arrangements with state and local authorities as set forth in the *CHS Refinery Emergency Response Plans and Agreements*. If state or local officials refuse to enter into these arrangements,

the Permittee shall document this refusal in the operating record. [40 CFR 264.37]

I.O. **Contingency Plan and Emergency Procedures**

I.O.1. The Permittee shall immediately carry out the provisions of the *CHS Emergency Response Plan* (part of the *One Plan)* whenever there is a fire, explosion, or release of hazardous waste or hazardous constituents which threaten human health or the environment. [40 CFR 264.51]

I.O.2. Hazardous waste management provisions of 40 CFR 264, Subpart D must be included in the *CHS Emergency Response Plan* in order to fulfill the requirements of Condition I.O.

I.P. **Recordkeeping and Reports**

I.P.1. *Operating Record*
Pursuant to 40 CFR 264.73, the Permittee must keep a written operating record at the offices of CHS Laurel Refinery, Laurel, Montana. At a minimum, the following information must be recorded and maintained in the operating record for the time specified below:

I.P.1.a. <u>Records Retained Until Facility Closure</u>

I.P.1.a.i. The description and quantity of each hazardous waste historically applied to the OLF and the method(s) and date(s) of storage, treatment, and disposal at the OLF.

I.P.1.a.ii. Records and results of waste analysis and waste determinations performed as specified in 40 CFR 264.73(b)(3).

I.P.1.a.iii. Monitoring, testing, analytical, and QA/QC data for all monitoring conducted at the site, including corrective action documentation where required by 40 CFR 264, Subpart F and 40 CFR 264.280 as specified in Module I, II, and IV.

I.P.1.a.iv. All post-closure plan(s) as required by this permit.

I.P.1.a.v. All closure cost estimates required under 40 CFR 264.142 and post-closure cost estimates required under 40 CFR 264.144.

I.P.1.b. <u>Records Retained for Three Years</u>

I.P.1.b.i. Summary reports and details of all incidents that require implementing the contingency plan as specified in 40 CFR 264.56(i).

I.P.1.b.ii. Records and results of inspections as required by 40 CFR 264.15(d) and Condition IV.C.4.b.

I.P.1.b.iii. A certification by the Permittee no less often than annually, that the Permittee has a program in place to reduce the volume and toxicity of hazardous waste that he generates to the degree determined by the Permittee to be economically

practicable; and the proposed method of treatment, storage or disposal is that practicable method currently available to the Permittee which minimizes the present and future threat to human health and the environment. [40 CFR 264.73(b)(9)]

I.P.1.b.iv. All notices, certifications, waste analysis date, and other documentation produced pursuant to 40 CFR 268.7 for at least three years from the date that the waste that is the subject of such documentation was last sent to on-site or off-site treatment, storage, or disposal. [40 CFR 268.7(a)(8)]

I.P.2. *Other Records*
The Permittee must maintain the following documents and any and all amendments, revisions, and/or modifications to these documents:

I.P.2.a. A current copy of this permit;

I.P.2.b. The Part B application for this permit;

I.P.2.c. Personnel training documents and records as required by 40 CFR 264.16(d) and (e);

I.P.2.c.i. Training records on current personnel must be kept until closure of the facility; training records on former employees must be kept for at least three years from the date the employee last worked at the facility. [40 CFR 264.16(e)]

I.P.2.d. All progress reports, work plans and reports required in Module II (Corrective Action); and

I.P.2.e. All other documentation as required by this permit.

I.P.3. *Availability, Retention, and Disposition of Records*

I.P.3.a. All records, including plans, required under 40 CFR 264 must be furnished upon request, and made available at all reasonable times for inspection by DEQ or any representative of DEQ. [40 CFR 264.74(a)]

I.P.3.b. The retention period for all records required by this permit is extended automatically during the course of any unresolved enforcement action regarding the facility or as requested by DEQ. [40 CFR 264.74(b)]

I.P.4. *Reports*

I.P.4.a. <u>Annual Report from Facilities</u>
Pursuant to ARM 17.53.803, the Permittee must submit an annual report to DEQ, on forms obtained from DEQ.

I.P.4.b. Generator Reporting and Annual Fee Requirements
The Permittee shall comply with the hazardous waste generator registration and reporting requirements of ARM 17.53.111, 113, 603, and 604.

I.P.4.c. Facility-Wide Corrective Action
All reports and work plans required in Module II (Facility-Wide Corrective Action) must be submitted within the timeframes specified within that module, unless the Permittee obtains prior approval from DEQ.

I.P.4.d. Planned Changes and Anticipated Non-Compliance
The Permittee shall comply with the reporting requirements of Conditions I.J.13.a. and I.J.13.b. for planned changes to the OLF or any anticipated non-compliance with permit conditions.

I.P.4.e. Twenty-Four Hour Reporting
The Permittee shall comply with the reporting requirements in Condition I.J.13.f. for any non-compliance which may endanger health and/or the environment.

I.P.4.f. Reporting for the Old Landfarm (OLF)

I.P.4.f.i. *Annual OLF Soil and Groundwater Monitoring Report*
Annually, by April 1, the Permittee shall submit to DEQ a soil and groundwater monitoring report for the previous calendar year. The annual report must include, but not be limited to, the following information:

I.P.4.f.i.1. Any LTU closure and/or post-closure activities conducted during the year.

I.P.4.f.i.2. Soil and groundwater sampling results, including laboratory reports of ZOI, TZ, and BTZ soil monitoring and groundwater monitoring.

I.P.4.f.i.3. Static water level measurements taken at all wells at the site throughout the year, summarized as piezometric maps showing lines of equipotential for each sampling event;

I.P.4.f.i.4. Summary of semi-annual and quarterly (if applicable) sampling results, with appropriate QA/QC data included;

I.P.4.f.i.5. Summary of any statistically significant increases of hazardous constituents in BTZ soils or groundwater; and

I.P.4.f.i.6. Results of annual measurements of the depth to the bottom of each monitoring well identified in Condition III.B.

I.P.4.f.ii. *OLF Groundwater Sampling Event Reports*
When a determination has been made that there has been a statistically significant increase, as per Condition III.G.4.b., the Permittee shall follow the notification and reporting requirements of Condition III.G.4.c.

I.P.4.f.iii. *OLF Corrective Action Effectiveness Report*
The Permittee shall submit an annual corrective action effectiveness report for the OLF to DEQ. Information required for the effectiveness report may be included in the Annual Soil and Groundwater Monitoring Report required by Condition I.P.4.f.i. The report must include, but not be limited to, the following information:

I.P.4.f.iii.1. Monitoring well analytical results, location and number of wells or piezometers, dates sampled, depths measured, LNAPL thickness;

I.P.4.f.iii.2. New LNAPL recovery activities at monitoring or recovery wells;

I.P.4.f.iii.3. The volume of recovered LNAPL, repairs or down-time for the recovery system; and

I.P.4.f.iii.4. An evaluation of the system including the ability to recover free phase hydrocarbons, biodegradation of contaminants in both on-site and off-site groundwater, changes to projected time frames for compliance with ground water protection standards, other pertinent evaluations, and recommendations (if warranted) for modifications to the corrective action measures to enhance effectiveness.

I.P.4.f.iv. *OLF Progress Summary in Module II Progress Reports*
A progress summary of any corrective actions or closure and/or post-closure activities at the OLF must be included in Facility-wide Corrective Action Progress Reports required in Conditions II.I.4., II.J.5., and II.M.5.

I.Q. **Confidential Information**
The Permittee may claim confidential any information required to be submitted by this permit in accordance with ARM 17.53.208.

I.R. **Dispute Resolution**

I.R.1. DEQ and Permittee shall work by consensus and when a dispute arises concerning specific activities required by this permit, shall first attempt to resolve the matter informally.

I.R.2. Remedy approval as set forth in Condition II.L. may not be included in the formal dispute resolution process. To ensure public comment and involvement on remedy approval, DEQ shall modify the permit. The Permittee may choose to comment on the remedy selection through the modification process.

I.R.3. Review Period: If no resolution is reached and the Permittee further objects or if the Permittee objects in whole or in part to any Department notice of disapproval or other decision or directive made pursuant to this permit, the Permittee shall notify DEQ in writing of its objections within ten (10) calendar days after its

receipt of DEQ's notification. This notification must include the reasons for the objection with any supporting documentation, and the Permittee's preferred alternate solutions.

I.R.4. Negotiation Period: DEQ and the Permittee shall endeavor to meet promptly and work in good faith for a period of fourteen (14) calendar days from DEQ's receipt of the Permittee's written notification of objection, in an effort to reach a mutually agreeable resolution of the dispute. If the dispute is resolved, the Permittee shall submit a revised submission or implement the agreed-upon action(s) in accordance with an agreed-upon schedule.

I.R.5. If agreement is not reached within the negotiation period, DEQ shall, within twenty-one (21) calendar days of receipt of the Permittee's written objection, provide a written statement of its decision and the reasons therefore to the Permittee signed by the Director of DEQ. Within ten (10) calendar days after receiving the written statement of decision from DEQ, if the Permittee continues to disagree with the decision, the Permittee may seek, by written request, a meeting with DEQ. If the Permittee requests such a meeting with DEQ, such request shall stay enforcement actions or determinations of noncompliance until a decision is rendered or for up to fourteen (14) calendar days following the date of receipt by DEQ of the request, whichever occurs first.

I.R.6. During the negotiation period, the Permittee shall be excused from performing only the requirement under this permit that is specifically the subject of such dispute. DEQ's consideration of matters placed into dispute shall not excuse, toll, or suspend any compliance obligation or deadline required pursuant to this permit. The Permittee shall take any actions required by this permit that DEQ determines are not substantially affected by the dispute.

I.R.7. Notwithstanding the other provisions of this permit, any agreement or decision made by DEQ pursuant to Condition I.R. shall be reduced to writing, shall be deemed incorporated into this permit without further order or process, and shall be binding to the parties. Nothing herein precludes the Permittee's right to notice and hearing before the Board of Environmental Review or to judicial review after attempting resolutions pursuant to Conditions I.R.1. through I.R.4.

I.S. **Force Majeure**

I.S.1. The Permittee shall perform the requirements of this permit within the time limits set forth herein, unless the performance is prevented or delayed by events which constitute a force majeure. A force majeure is defined as any unforeseeable event such as an act of God, strike, flood, or materials shortage or other events over which the Permittee has little or no control and for which there is not a reasonably available remedy.

I.S.2. If any event occurs or has occurred that may delay the performance of any obligation under this permit, whether or not caused by a force majeure event, the

Permittee shall notify DEQ in writing within ten (10) calendar days thereafter, including the reasons for the delay, the anticipated duration of the delay, all actions taken or to be taken to prevent or minimize the delay and a schedule for the implementation of any measure to be taken to mitigate the effect of the delay.

I.S.3. Failure to comply with the notice provisions of this section as to any individual event will constitute a waiver of the Permittee's right to assert a force majeure claim as to that event.

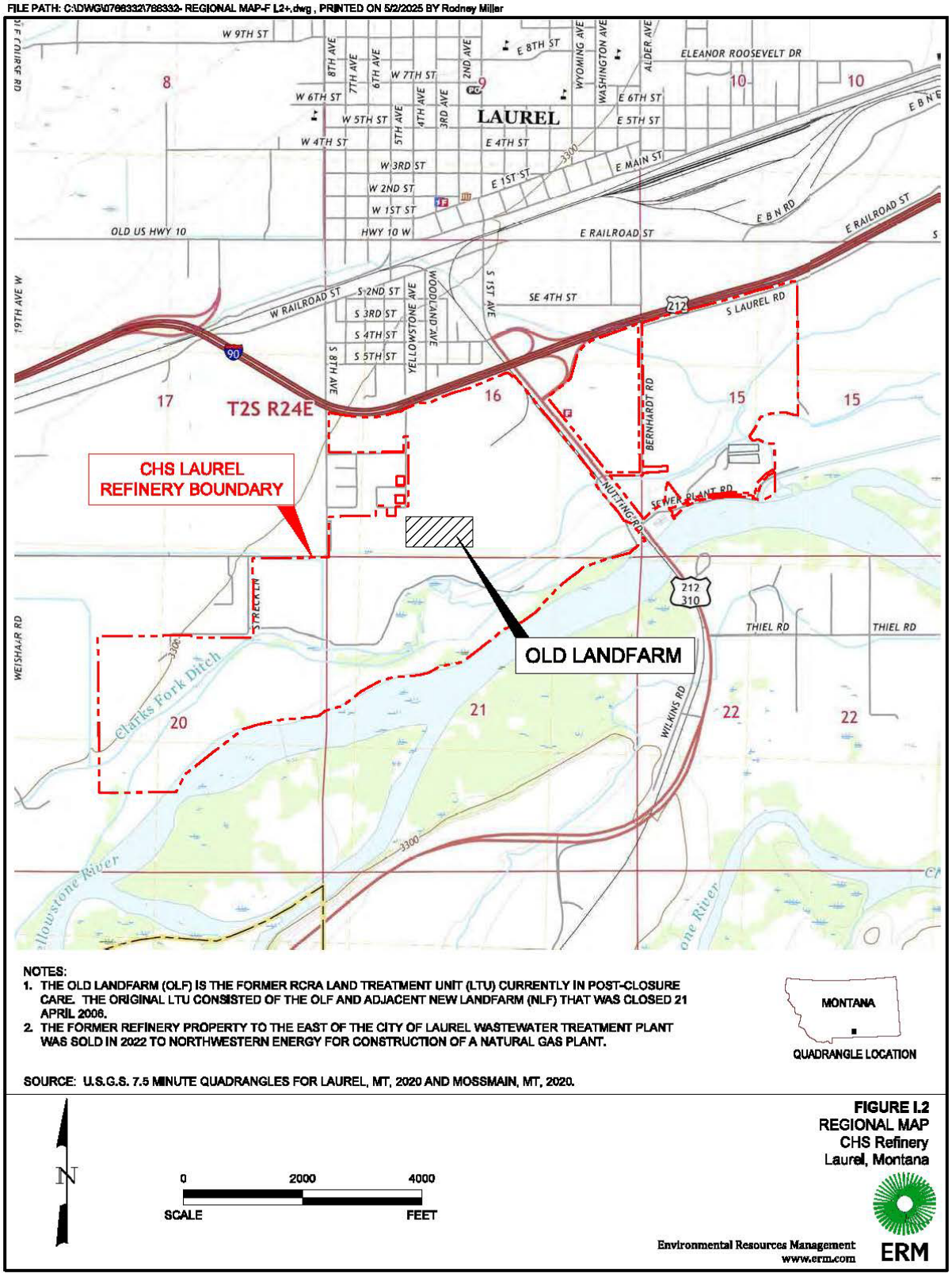
I.T. **State and Federal Laws**

Nothing in this permit may be construed to preclude the institution of any legal action or to relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 3009 of the RCRA, as amended.

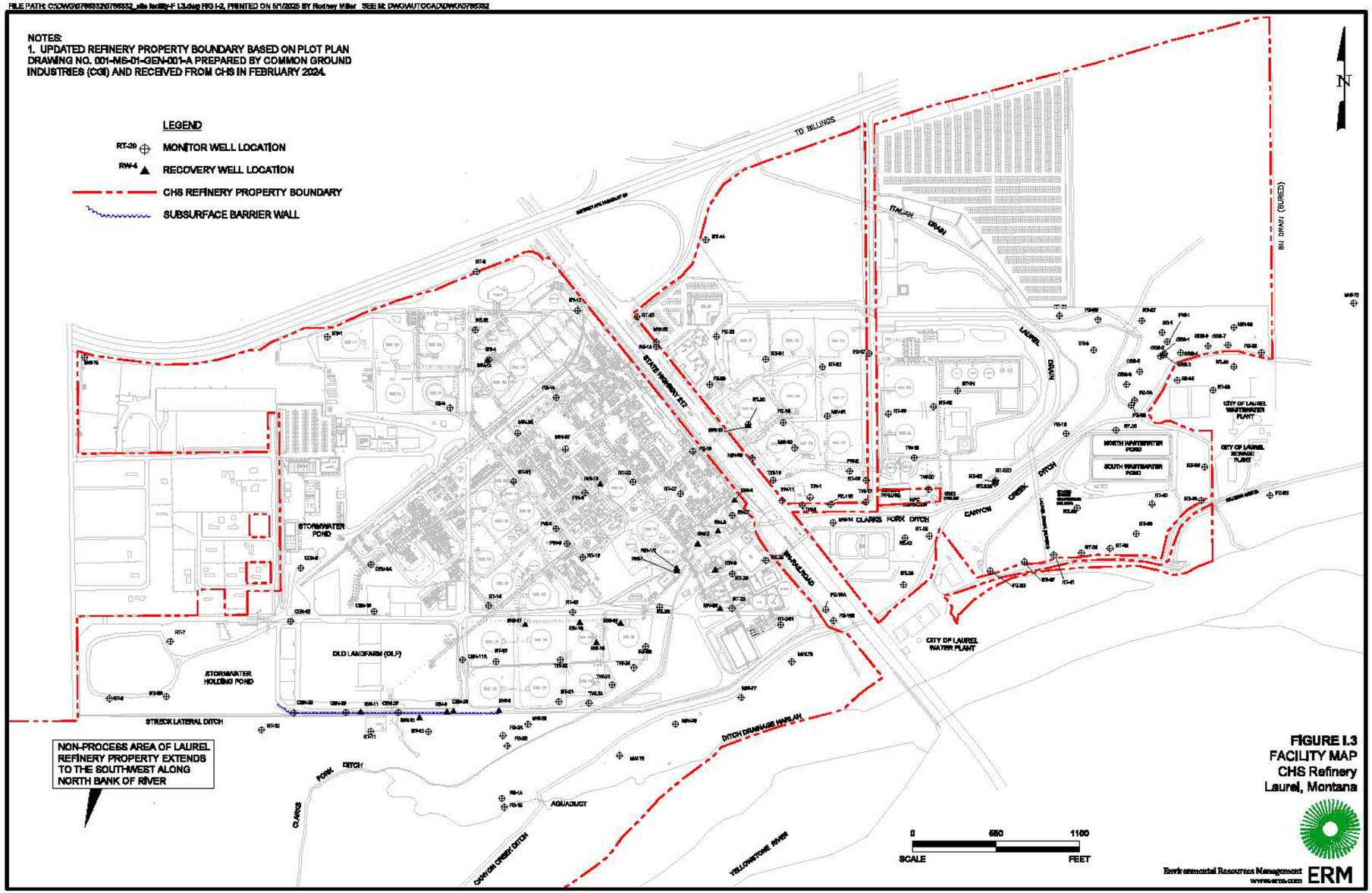
Attachment I.1
CFR to ARM Cross Reference Table

Federal Citation Incorporated by Reference Code of Federal Regulations (CFR)	State Citation Administrative Rules of Montana (ARM)
40 CFR 124	17.53.1201 17.53.1202
40 CFR 260	17.53.404 17.53.405
40 CFR 261	17.53.501 17.53.502
40 CFR 262	17.53.601 17.53.602
40 CFR 263	17.53.701 17.53.702
40 CFR 264	17.53.801 17.53.802
40 CFR 265	17.53.901 17.53.902
40 CFR 266	17.53.1001 17.53.1002
40 CFR 268	17.53.1101 17.53.1102
40 CFR 270	17.53.1201 17.53.1202
40 CFR 273	17.53.1301 17.53.1302
40 CFR 279	17.53.1401 17.53.1402

Attachment I.2
Regional Map



Attachment I.3
Facility Map



Attachment I.4
Personnel Training

From: Report VII, Section 6.0
RCRA Permit Renewal Application
Closed Land Treatment Unit
CHS Refinery, Laurel, Montana
February 21, 2024

6.0 PERSONNEL TRAINING - 40 CFR § 270.14(b)(12); § 264.16

6.1 *Introduction*

This section documents the training required of personnel responsible for operation, inspection, monitoring, and maintenance of the OLF throughout the post-closure period. Classroom instruction and on-the-job training directed by the waste management subject matter expert (SME) engineer at the Laurel, Montana refinery is required of personnel maintaining the OLF. This program is designed to enable them to operate these facilities properly and respond effectively to emergencies.

The training defined in this section is given to new personnel (*i.e.*, transferred or new employees) and is also reviewed annually (in a refresher course) with all personnel involved in the maintenance of the OLF. This annual review also allows for the review of any changes to the various RCRA plans of which the operators should be aware. Records kept by the waste management SME until closure of the hazardous waste facility, as required by regulation, include job titles, qualifications, and responsibilities, training programs, and continuing hazardous waste education.

6.2 *Training Course Outline*

The following is an outline of the subjects covered by the hazardous waste training program at the Laurel, Montana refinery:

- RCRA Overview
- Hazardous Waste – General
- Hazardous Waste Applied to OLF
- OLF Operations and Training
- Post-Closure Inspection and Maintenance
- Applicable sections of the Facility Response Plan (One Plan)

This training will be in addition to other regular health and safety training that is provided at the refinery. Table I-4 summarizes the training elements for each personnel category.

6.3 *Training Frequency*

Facility personnel will successfully complete the training program within six months of assignment to the jobs related to the OLF. Employees do not work in unsupervised positions until they have completed the training requirements. Facility personnel take part in an annual training review.

6.4 *Training Records*

Training records are kept on file at the refinery in the office of the Environmental Director. These records are maintained until closure for current personnel and for three years from the date a former employee last worked at the OLF.

6.5 *Summary*

The Training Program outlined above is the means by which comprehensive, up-to-date information concerning all of the OLF maintenance activities are conveyed to all personnel working in these areas. This allows for the proper operation of the facilities and the minimization of the effect of emergency situations. The program is designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems.

TABLE I-4

Summary of Personnel Training Requirements
Closed RCRA Land Treatment Unit

Training Element	Personnel Category							
	Environmental Director[a]	**Waste Management SME [a]**	**Site Emergency Responder [c]**	**Unit Maintenance Driver [d]**	**Sampling Equipment Operator [e]**	**Environmental Specialist [f]**	**Hazardous Waste Generator [g]**	**General Office Personnel [h]**
Hazardous waste regulations	X	X	X			X	X	X
Making waste determinations	X	X						
Properties of facility wastes	X	X	X	X	X	X	X	
Waste minimization	X	X	X	X	X	X	X	X
Reporting and recordkeeping	X	X				X	X	
Inspections	X	X		X		X		
Waste packaging procedures	X	X				X	X	
Pre-transportation (manifests/labels)	X	X				X		
Contingency plan implementation/ emergency response procedures	X	X	X	X	X	X	X	
Emergency equipment use, inspection, repair	X	X	X			X	X	
Site shutdown procedures	X	X				X		
Communication, alarms, and evacuation routes	X	X	X	X	X	X	X	X

NOTES:
[a] Environmental director is responsible for the overall unit management functions at the facility.
[b] Waste management subject matter expert (SME) is responsible for the daily unit management functions with other personnel at the facility.
[c] Site emergency responder is responsible for implementing the emergency response activities at the facility.

[d] Unit maintenance driver is responsible for driving equipment for operations activities (*e.g.*, tilling, fertilizer application, *etc.*) at the unit.
[e] Sampling equipment operator is responsible for operating the equipment (*e.g.*, excavator, backhoe, *etc.*) during sampling activities at the unit.
[f] Environmental specialist is responsible for performing compliance and investigatory sampling activities at the unit.
[g] Hazardous waste generator is a general plant worker that has no direct contact with activities at the unit but may potentially generate waste in their day-to-day activities outside of the unit.
[h] General office personnel is based in the administrative buildings and has no direct contact with activities at the unit.

MODULE II
FACILITY-WIDE CORRECTIVE ACTION

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Attachments

MODULE II
FACILITY-WIDE CORRECTIVE ACTION

II.A. Framework for Corrective Action

The framework for corrective action requirements in this Module is based upon the guidance contained in the Federal Registers dated July 27, 1990 (55 FR No. 145, pp 30797-30884), and May 1, 1996 (61 FR No. 85, pp 19431-19464), both titled Corrective Action for Releases From Solid Waste Management Units at Hazardous Waste Management Facilities, as amended in the Federal Register dated October 7, 1999 (64, FR No. 194, pp 54604-54607).

The guidance encourages a facility-specific approach to corrective action. The Permittee may proceed with corrective action using a phase-by-phase approach or use alternative approaches, such as combining corrective action phases, grouping areas of contamination, prioritizing areas for remediation, or other facility-specific approaches. Any approach taken will be dependent upon site-specific conditions and remediation objectives. The corrective action approaches must be developed through work plans and reports that must be submitted to DEQ for approval.

II.B. Applicability

II.B.1. *General*

The Permittee must institute corrective action as necessary to protect human health and the environment for all releases of hazardous waste or constituents from any solid waste management unit (SWMU), area of concern (AOC), or from any other source of contamination at the facility, regardless of the time at which waste was placed in such unit. [MCA 75-10-406(7) and 40 CFR 264.101(a)]

II.B.2. *Off-Site*

The Permittee must implement corrective actions beyond the facility property boundary, where necessary to protect human health and the environment, unless the Permittee demonstrates to the satisfaction of DEQ that, despite the Permittee's best efforts, the Permittee was unable to obtain the necessary permission to undertake such actions. The Permittee is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis. [MCA 75-10-406(7) and 40 CFR 264.101(c)]

II.B.3. *Specifics*

The conditions of this Module apply to:

II.B.3.a. The SWMUs and AOCs identified in Attachment II.1a of this Module;

II.B.3.b. Newly discovered SWMUs and AOCs discovered during the course of ground water monitoring, field investigations, environmental audits, or by other means; and

II.B.3.c. Newly identified releases from previously identified SWMUs or AOCs discovered during the course of ground water monitoring, field investigations, environmental audits, or by other means.

II.B.4. *Description and Status of SWMUs and AOCs*
Attachment II.1a lists and describes the status of SWMUs and AOCs that have been identified by DEQ and the Permittee.

II.B.4.a. DEQ will update Attachment II.1a when changes to the status of SWMUs and/or AOCs occur or when new SWMUs and/or AOCs are identified. DEQ will send revisions to Attachment II.1a to the Permittee for inclusion in all copies of the permit.

II.B.4.b. For those SWMUs and AOCs where cleanup is deferred until the unit becomes inactive, at plant closure, or when accessible due to refinery activities as described in the Statement of Basis in Attachment II.1c, refinery activity means any activity that exposes suspected contaminated soils and groundwater for characterization, remedy design, and remedy selection.

II.B.5. *Reportable Spills and Releases*

II.B.5.a. Spills and releases reported to DEQ under the Comprehensive Environmental Cleanup and Responsibility Act (75-10-701, et seq., MCA); Hazardous Waste Act (75-10-401, et seq., MCA); Solid Waste Management Act (75-10-201, et seq., MCA); Underground Storage Tank Act (75-11-501, et seq., MCA); and the Water Quality Act (75-5-101, et seq., MCA) which are not remediated within a reasonable timeframe may be determined by DEQ to be a new SWMU or AOC under Condition II.E, or a release from an existing SWMU or AOC under Condition II.F.

II.B.5.b. DEQ will notify the Permittee of its determination in writing. If DEQ determines that additional investigation is needed, the Permittee shall be required to prepare an RFI Work Plan, as outlined in Condition II.E.3. or II.F.2.

II.B.6. *Compliance Schedule*
The Permittee shall follow the Compliance Schedule of Attachment II.6. [40 CFR 264.101(b)]

II.B.7. *Modifications*
Permit modifications to Module II include selection of any corrective measures as outlined in Conditions II.J.2. and II.L. and any subsequent significant changes to any selected corrective measures previously incorporated into this permit by modification.

II.C. **Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs)**
Attachment II.1a contains a list and the corrective action status of individual SWMUs and AOCs. Attachment II.1a must be updated by DEQ when changes to the status of SWMUs and/or AOCs occur. DEQ shall send updated copies of Attachment II.1a to the Permittee. SWMUs and/or AOCs may be added to Attachment II.1a without meeting permit modification requirements of Conditions I.K.2. or I.K.3.

II.C.1. *Status of Corrective Action at Permit Issuance*
On August 2, 1991, EPA issued CHS a corrective action permit under the Hazardous and Solid Waste Amendments (HSWA) of 1989 to RCRA. Corrective action requirements of the EPA permit were replaced by Montana-issued hazardous waste permit, MTHWP-02-02, and the current permit.

II.D. **Financial Assurance**
CHS shall meet the financial assurance requirements for facility-wide corrective action as set forth in Condition I.G. and this Module.

II.E. **New SWMUs and AOCs – Notification and Assessment Requirements**

II.E.1. *Notification*
The Permittee shall notify DEQ in writing within fifteen (15) calendar days of discovery of any new SWMU or AOC. The notification must include, at a minimum, the following:

II.E.1.a. The location of the SWMU or AOC;

II.E.1.b. The available information pertaining to the nature of the wastes, including hazardous constituents, at the SWMU or AOC;

II.E.1.c. The known extent and magnitude of the release; and

II.E.1.d. The media(s) affected.

II.E.2. *Assessment Report*
If further investigation of a newly identified SWMU or AOC is required by DEQ, the Permittee must prepare and submit to DEQ, within ninety (90) calendar days of DEQ request, a written assessment report. At a minimum, this assessment report must include the following information:

II.E.2.a. The location on a topographic map of appropriate scale as required under 40 CFR 270.14(b)(19);

II.E.2.b. Designation of the type and function of the SWMU or AOC;

II.E.2.c. General dimensions, capacities, and structural description (including any available plans/drawings);

II.E.2.d. Dates of operation;

II.E.2.e. Specification of all wastes (including any available data on hazardous constituents) that have been managed at the location; and

II.E.2.f. All available information pertaining to any release of hazardous waste or hazardous constituents (including ground water, surface water, and soil analytical results).

II.E.3. *Department Action*

II.E.3.a. Based on the results of the assessment report, DEQ will determine the need for further investigations of the SWMU or AOC. If DEQ determines that additional investigation is needed, the Permittee will be required to submit one of the following work plans or an equivalency demonstration report, within a timeframe specified by DEQ:

II.E.3.a.i. An RFI Work Plan as outlined Condition II.I.1.;

II.E.3.a.ii. An IM Work Plan as outlined in Condition II.J.1., or

II.E.3.a.iii. If contamination present in the SWMU(s) or AOC(s) is similar to units assessed in previous facility-wide corrective action activities, an equivalency demonstration report in accordance with Condition II.H.

II.E.3.b. If DEQ requires further investigation of a newly identified SWMU or AOC and the Permittee is currently implementing an RFI Work Plan, the newly identified SWMU or AOC may be included in that Work Plan. The Permittee shall prepare an addendum to the RFI Work Plan for investigation of the newly identified SWMU or AOC. The addendum must meet the requirements of Condition II.I.1.

II.F. **Existing SWMUs and AOCs – Notifications and Assessment Requirements**

II.F.1. *Notification*

Within fifteen (15) calendar days of discovery, the Permittee must notify DEQ in writing of any newly discovered release(s) of hazardous waste or hazardous constituents at previously identified units including SWMUs and AOCs identified in Condition II.C., discovered during the course of ground water monitoring, field investigations, environmental audits, or other means. The newly discovered releases may be from SWMUs and AOCs identified in Condition II.C. for which further investigation and/or corrective action was not previously required. The notification must include, at a minimum, the following:

II.F.1.a. The location of the SWMU or AOC;

II.F.1.b. The available information pertaining to the nature of the wastes, including hazardous constituents, at the SWMU or AOC;

II.F.1.c. The known extent and magnitude of the release; and

II.F.1.d. The media(s) affected.

II.F.2. *Department Action*

II.F.2.a. If DEQ determines that additional investigation is needed, the Permittee will be required to submit one of the following work plans or an equivalency demonstration report, within a timeframe specified by DEQ:

II.F.2.a.i. An RFI Work Plan as outlined Condition II.I.1.;

II.F.2.a.ii. An IM Work Plan as outlined in Condition II.J.1., or

II.F.2.a.iii. If contamination present in the SWMU(s) or AOC(s) is similar to units assessed in previous facility-wide corrective action activities, an equivalency demonstration report in accordance with Condition II.H.

II.F.2.b. If DEQ requires further investigation and the Permittee is currently implementing an RFI Work Plan, the newly identified release may be included in that Work Plan. The Permittee shall prepare an addendum to the RFI Work Plan for investigation of the newly identified SWMU or AOC. The addendum must meet the requirements of Condition II.I.1.

II.G. **New Detections in Analytical Results**

II.G.1. *Notification*

During activities undertaken as part of any future investigation, the Permittee shall notify DEQ within fifteen (15) calendar days after the Permittee's receipt or its representative's receipt of analytical results that detect any hazardous waste or hazardous constituent that were previously not detected. The new detections may be from either documented or unidentified sources.

II.G.2. *Department Action*

DEQ may require further investigation of the new detections reported in Condition II.G.1.

II.H. **Equivalency Demonstration**

II.H.1. *Equivalency Demonstration Report*

II.H.1.a. Submit, within a timeframe specified by DEQ, an equivalency demonstration report, if contamination present in the SWMU(s) or AOC(s) is similar to units assessed in previous facility-wide corrective action activities. The demonstration must include, as applicable,:

II.H.1.b. All information pertaining to the release or releases of hazardous waste or hazardous constituents, including analytical results, history of the release, and any interim corrective measures taken;

II.H.1.c. An evaluation of the information provided in Condition II.H.1.b., including data quality reviews, and nature and extent of contamination;

II.H.1.d. An evaluation of risk which follows the general methodology presented in the Baseline Risk Assessment Report for the CHS Laurel Refinery, dated April 3, 2006, using the most current risk parameters and screening levels in the risk evaluation;

II.H.1.e. An evaluation of potential corrective measures which is consistent with the Final Corrective Measures Study for the CHS Laurel Refinery, dated March 3, 2010; and

II.H.1.f. A proposed corrective measure.

II.H.2. *Department Action*

II.H.2.a. DEQ will approve or disapprove the equivalency demonstration report of Condition II.H.1. If the report is disapproved, DEQ will notify the Permittee in writing of the deficiencies and specify a due date for submission of a revised report.

II.H.2.b. Upon approval of the equivalency demonstration report, DEQ will notify the Permittee that:

II.H.2.b.i. No further action is required;

II.H.2.b.ii. Further investigation is required;

II.H.2.b.iii. Interim Measures must be implemented in accordance with Condition II.J.; or

II.H.2.b.iv. A notification that the SWMU(s) and/or AOC(s) may be incorporated into the selected remedy currently being implemented as set forth in Condition II.M.

II.H.2.b.iv.1. The notification will include requirements for inclusion into the current Corrective Measures Implementation Work Plan.

II.I. RCRA Facility Investigation (RFI)

II.I.1. *Work Plan(s)*

II.I.1.a. Applicability

As directed by DEQ under circumstances set forth in Conditions II.E. and II.F., the Permittee shall prepare and submit an RFI Work Plan(s). The Permittee shall submit the RFI Work Plan(s) within sixty (60) calendar days after notification by DEQ that further investigation is required, or in a timeframe specified by DEQ the notification.

II.I.1.b. Contents

The RFI Work Plan(s) should, at a minimum, address the elements as outlined in Attachment II.2 and must include:

II.I.1.b.i. Schedules and a cost estimate for implementation and completion of specific actions necessary to determine the nature and extent of releases;

II.I.1.b.ii. The potential pathways of contaminants releases to the air, land, surface water, and ground water; and

II.I.1.b.iii. The risks to human health and the environment associated with the releases.

II.I.1.c. Deviations

The Permittee shall provide sufficient justification and/or documentation to exclude particular units, media, or pathways associated with a unit (i.e. ground water, surface water, soil, subsurface gas, or air). Such deletions of a unit, media, or pathway from the RFI(s) are subject to the approval of DEQ. The Permittee should also provide sufficient written justification for any omission or deviation from the elements outlined in Attachment II.2. Such omissions or deviations are subject to the approval of DEQ. In addition, the RFI Work Plan(s) must include all investigations necessary to ensure compliance with 40 CFR 264.101.

II.I.1.d. Risk Assessment

II.I.1.d.i. *Contents*: The Permittee shall include in the RFI Work Plan(s) a baseline risk assessment work plan as required in Attachment II.2. The baseline risk assessment should include the elements outlined in Attachments II.2 and II.3.

II.I.1.d.ii. *Deviation*: The Permittee may provide written justification for changes in the submittal schedule and contents of the baseline risk assessment. The Permittee may deviate from the requirements of submitting a baseline risk assessment with the RFI Work Plan(s) if prior written approval is obtained from DEQ.

II.I.1.e. Department Action

The RFI Work Plan(s) must be approved in writing by DEQ prior to implementation. DEQ's letter approving the RFI Work Plan(s) will specify the start date of the RFI Work Plan(s) schedule.

II.I.1.e.i. If DEQ does not approve the RFI Work Plan(s), DEQ shall either:

II.I.1.e.i.1. Notify the Permittee in writing of the RFI Work Plan(s)'s deficiencies and specify a due date for submission of a revised RFI Work Plan(s); or

II.I.1.e.i.2. Revise the RFI Work Plan(s) and notify the Permittee of the revisions and the start date of the schedule within the approved RFI Work Plan(s).

II.I.2. *Implementation*
The Permittee shall implement the RFI in accordance with the approved Work Plan(s).

II.I.3. *Notification*
The Permittee shall notify DEQ of investigation activities such as drilling, boring, or sampling undertaken pursuant to the RFI Work Plan(s), no less than fourteen (14) calendar days prior to implementation. Notification shall be made by electronic mail to the Hazardous Waste Section Project Manager for the CHS facility.

II.I.4. *Progress Reports*
The Permittee shall provide DEQ with RFI progress reports. The reporting schedule for the RFI progress reports must be established in the RFI Work Plan(s); however, progress reports must be submitted at least quarterly. RFI progress reporting will commence upon Department approval of the RFI Work Plan(s). Subsequent changes to the frequency and scope of the RFI progress reports must be approved in writing by DEQ. The progress reports must contain at a minimum the following information:

II.I.4.a. A description of the portion of the RFI completed;

II.I.4.b. Summaries of findings;

II.I.4.c. Summaries of all deviations from the approved RFI Work Plan(s) during the reporting period;

II.I.4.d. Summaries of all problems or potential problems encountered during the reporting period;

II.I.4.e. Projected work for the next reporting period;

II.I.4.f. Copies of daily reports, inspection reports, laboratory/monitoring data, and other pertinent information; and

II.I.4.g. A short description of activities which have occurred at the OLF, if any, during the reporting period.

II.I.5. *Draft and Final Reports*

II.I.5.a. Schedule
The Permittee shall prepare and submit to DEQ a draft and final RFI Report(s) for the investigations conducted pursuant to the Work Plan(s).

II.I.5.a.i. The Draft RFI Report(s) must be submitted to DEQ for review in accordance with the schedule in the approved RFI Work Plan(s).

II.I.5.a.ii. The Final RFI Report(s) must be submitted within forty-five (45) calendar days after receipt of DEQ's comments on the Draft RFI Report(s), unless an alternative schedule is approved in writing by DEQ.

II.I.5.b. Contents

II.I.5.b.i. *General*: The RFI Report(s) must include an analysis and summary of all required investigations of those units included in the RFI Work Plan(s). The summary must describe the type and extent of contamination, including sources and migration pathways, and a description of actual or potential human or ecological receptors.

II.I.5.b.ii. *Risk Assessment*: The RFI Report(s) must include a baseline risk assessment for both environmental and human receptors unless DEQ has approved in writing a deviation. The human health baseline risk assessment must include, but is not limited to, a residential exposure scenario. The baseline risk assessment should address the elements outlined in Attachment II.3. The Permittee should provide written justification for any omissions or deviations from the elements outlined in Attachment II.3.

II.I.5.b.iii. *Background Information*: The RFI Report(s) must describe the extent of contamination (qualitative and quantitative) in relation to background levels. Background levels must be indicative of the area surrounding the facility and must not be impacted by facility operations.

II.I.5.b.iv. *Data Quality*: The Permittee shall ensure that the data generated during the investigation are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and/or the environment, and to support a Corrective Measures Study (CMS), if necessary.

II.I.5.c. Department Action

II.I.5.c.i. DEQ will review the Draft RFI Report(s) and approve the Draft RFI Report(s) and specify that the Final RFI Report(s) must be submitted pursuant to Condition II.I.5.a., or disapprove the Draft RFI Report(s). If DEQ disapproves the Draft RFI Report(s), DEQ will notify the Permittee in writing of the Draft RFI Report's deficiencies and specify a due date for submission of a revised Draft RFI Report(s).

II.I.5.c.ii. DEQ will review the Draft and/or Final RFI Report(s) and notify the Permittee that:

II.I.5.c.ii.1. Further investigative action is required,

II.I.5.c.ii.2. Interim Measures must be implemented as set forth in Condition II.J.,

II.I.5.c.ii.3. A CMS must be submitted as set forth in Condition II.K., or

II.I.5.c.ii.4. SWMU(s) and/or AOC(s) investigated in the RFI may be incorporated into the selected remedy currently being implemented as set forth in Condition II.M.

II.I.5.c.iii. DEQ will notify the Permittee if DEQ determines, upon review of the RFI Report(s), that no further action is required for SWMUs and AOCs described in the RFI Report(s).

II.I.6. *Ground Water Monitoring*
Ground water monitoring must continue as outlined in the RFI Work Plan(s) unless altered by implementation of a Department-approved Corrective Measures Implementation (CMI) Work Plan(s) pursuant to Condition II.M., or a Department approved revision is made to the RFI Work Plan(s) at the Permittee's or DEQ's request during the period between completion of the RFI Report(s) and the implementation of the CMI Work Plan(s).

II.J. **Interim Measures (IM)**

II.J.1. *Work Plan(s)*

II.J.1.a. Applicability
As directed by DEQ under circumstances set forth in Conditions II.E. and II.F., the Permittee shall prepare and submit an IM Work Plan(s) for any unit that poses an immediate or potential threat to human health or the environment. The IM Work Plan(s) must be submitted within thirty (30) calendar days of receipt of such notification. If DEQ determines that immediate action is required, DEQ or an authorized representative may verbally direct the Permittee to act prior to the Permittee's receipt of DEQ's written notification. Interim measures may be conducted concurrently with other investigations required under the terms of this permit.

II.J.1.b. Contents
The IM Work Plan(s) must ensure that the interim measures are designed to mitigate any immediate or potential threat(s) to human health or the environment. The IM Work Plan(s) should address, at a minimum, the elements listed in Attachment II.5. The Permittee must provide sufficient written justification for any omissions or deviations from the minimum requirements in Attachment II.5. Such omissions or deviations are subject to written approval of DEQ.

II.J.1.c. Department Action
The IM Work Plan(s) must be approved in writing by DEQ prior to implementation. DEQ shall specify the starting date of the IM Work Plan(s) schedule in its written approval.

II.J.1.c.i. If DEQ disapproves the IM Work Plan(s), DEQ shall either:

II.J.1.c.i.1. Notify the Permittee in writing of the IM Work Plan(s)'s deficiencies and specify a due date for submitting of a revised IM Work Plan(s); or

II.J.1.c.i.2. Revise the IM Work Plan(s) and notify the Permittee of the revisions and the start date of the schedule within the approved IM Work Plan(s).

II.J.2. *Public Participation*
DEQ may require a permit modification in accordance with Condition I.K. for the proposed IM to allow public participation on Draft IM Work Plan(s).

II.J.3. *Implementation*
The Permittee shall implement the interim measures in accordance with the approved IM Work Plan(s).

II.J.4. *Notification*
The Permittee shall notify DEQ of new investigation activities (such as drilling, boring, or sampling) or remedial activities undertaken pursuant to the IM Work Plan(s) no less than fourteen (14) calendar days prior to implementation. Notification must be made by electronic mail to the Hazardous Waste Section Project Manager for the CHS facility.

II.J.4.a. The Permittee shall notify DEQ as soon as possible of any planned changes, deletions or additions to the IM Work Plan(s). Notification must be made by electronic mail to the Hazardous Waste Section Project Manager for the CHS facility. Such changes, deletions, or additions are subject to Department approval.

II.J.5. *Progress Reports*
The Permittee shall provide DEQ with IM progress reports. The reporting schedule for the IM progress reports must be established in the IM Work Plan(s); however, progress reports must be submitted at least quarterly. Subsequent changes to the frequency and scope of the IM progress reports must be approved by DEQ. The IM progress reports must contain at a minimum the following information:

II.J.5.a. A description of interim measures implemented and/or completed;

II.J.5.b. Summaries of progress and/or results;

II.J.5.c. Summaries of deviations from the approved IM Work Plan(s), and problems encountered during the reporting period;

II.J.5.d. Projected work for the next reporting period; and

II.J.5.e. Copies of all daily reports, inspection reports, laboratory/monitoring data, and other pertinent information.

II.J.6. *Draft and Final Report(s)*

II.J.6.a. Schedule

The Permittee shall prepare and submit to DEQ a draft and final IM Report(s) after completion of interim measures.

II.J.6.a.i. The Draft IM Report(s) must be submitted to DEQ for review in accordance with the schedule in the approved IM Work Plan(s).

II.J.6.a.ii. The Final IM Report(s) must be submitted within forty-five (45) calendar days after receipt of DEQ's comments on the Draft IM Report(s), unless an alternative schedule is approved in writing by DEQ.

II.J.6.b. Contents

The IM reports must contain the following information:

II.J.6.b.i. A description of interim measures implemented;

II.J.6.b.ii. Summaries of results;

II.J.6.b.iii. Summaries of all problems encountered; and

II.J.6.b.iv. Summaries of accomplishments and/or effectiveness of interim measures.

II.K. Corrective Measures Study (CMS)

II.K.1. *Work Plan(s)*

II.K.1.a. Applicability

II.K.1.a.i. The Permittee shall prepare and submit to DEQ a draft CMS Work Plan(s) for units that require a CMS. The Work Plan(s) must be submitted after notification by DEQ that a CMS is required, within a timeframe specified by DEQ. The CMS Work Plan(s) must be developed to meet the requirements of Condition II.K.1.b.

II.K.1.a.ii. As necessary, units requiring interim measures may be addressed in a CMS Work Plan and Report.

II.K.1.b. Contents

II.K.1.b.i. The CMS Work Plan(s) should, at a minimum, address the elements in Attachment II.4. The CMS Work Plan(s) must include schedules of implementation and completion of specific actions necessary to complete a CMS.

II.K.1.b.ii. The Permittee shall provide justification and/or documentation for any unit deleted from the CMS Work Plan(s). Such deletions of a unit are subject to the written approval of DEQ. The CMS must be conducted in accordance with the approved CMS Work Plan(s).

II.K.1.b.iii. The Permittee should also provide sufficient written justification for any omissions or deviations from the minimum requirements of Attachment II.4. Such omissions or deviations are subject to the written approval of DEQ.

II.K.1.b.iv. The scope of the CMS Work Plan(s) must include all investigations necessary to ensure compliance with 40 CFR 264.101.

II.K.1.c. Department Action
The CMS Work Plan(s) must be approved in writing by DEQ prior to implementation. DEQ shall either approve or disapprove in writing the CMS Work Plan(s).

II.K.1.c.i. If DEQ disapproves the CMS Work Plan(s), DEQ shall either:

II.K.1.c.i.1. Notify the Permittee in writing of the CMS Work Plan(s)'s deficiencies and specify a due date for submitting of a revised CMS Work Plan(s); or

II.K.1.c.i.2. Revise the CMS Work Plan(s) and notify the Permittee of the revisions and the start date of the schedule within the approved CMS Work Plan(s).

II.K.2. *Implementation*
The Permittee shall implement the CMS according to the schedules specified in the CMS Work Plan(s).

II.K.3. *Notification*
The Permittee shall notify DEQ of investigation activities (such as drilling, boring, or sampling) or remedial activities undertaken pursuant to the CMS Work Plan(s), no less than fourteen (14) calendar days prior to implementation. Notification must be made by electronic mail to the Hazardous Waste Section Project Manager for the CHS facility.

II.K.4. *Draft and Final Report(s)*
II.K.4.a. Schedule
The Permittee shall prepare and submit to DEQ a draft and final CMS Report(s) for the study conducted pursuant to the approved CMS Work Plan(s).

II.K.4.a.i. The Draft CMS Report(s) must be submitted to DEQ in accordance with the schedule in the approved CMS Work Plan(s).

II.K.4.a.ii. The final CMS Report(s) must be submitted to DEQ within forty-five (45) calendar days after receipt of DEQ's comments on the draft CMS Report(s), unless an alternative schedule is approved by DEQ.

II.K.4.b. Contents
The CMS Report(s) must include an evaluation of each remedial alternative and present all information gathered under the approved CMS Work Plan(s),

including a summary of any bench scale or pilot test conducted. The CMS Final Report(s) must contain adequate information to enable DEQ to make a decision on remedy selection described under Condition II.L.

II.K.4.c. Department Action

II.K.4.c.i. DEQ will review the Draft CMS Report(s), approve the Draft CMS Report(s), and specify that the Final CMS Report(s) must be submitted pursuant to Condition II.K.4.a., or disapprove the Draft CMS Report(s). If DEQ does not approve the Draft CMS Report(s), DEQ shall notify the Permittee in writing of any deficiencies and specify a due date for submittal of a revised Draft CMS Report(s).

II.K.4.c.ii. DEQ may require the Permittee to further evaluate additional remedies or particular elements of one or more proposed remedies.

II.K.4.c.iii. The Permittee will be notified if DEQ determines, upon review of the CMS Report(s), that no further action is warranted for the unit(s) described in the CMS.

II.L. **Remedy Approval and Permit Modification**

II.L.1. *Approval*

DEQ shall select corrective action remedies for the site. DEQ may select a remedy from the Final CMS Report(s), reject any alternative in the Final CMS Report(s), or prescribe a different remedial alternative or remedy performance standard. DEQ will base its selection, at a minimum, on protection of human health and the environment, including site-specific human and ecological receptors, existing law and regulations, and guidance. The remedy and justification for selection of the remedy will be presented in a document called a Statement of Basis.

II.L.2. *Permit Modification*

After selection of a remedy, DEQ will initiate a permit modification to incorporate into the permit the remedy and the Statement of Basis in accordance with 40 CFR 270.41. The Permittee shall implement the requirements of Condition II.M. (Corrective Measures Implementation) when DEQ issues the permit modification incorporating the selected remedy.

II.L.3. *Remedy Approval at Permit Issuance*

DEQ has selected a facility-wide remedy for the CHS Laurel Refinery. The remedy is described in the 2014 Statement of Basis incorporated into this permit as Attachment II.1c. The current remedy status for the SWMUs and AOCs is incorporated into this permit as Attachment II.1a.

II.M. **Corrective Measures Implementation (CMI)**

II.M.1. *Work Plan(s)*

II.M.1.a. Applicability

The Permittee shall prepare and submit a Draft CMI Work Plan(s) following modification of the permit to incorporate the selected remedy. The Draft CMI Work Plan(s) must be submitted within ninety (90) calendar days after finalization of the permit modification.

II.M.1.b. Contents

The CMI Work Plan must at a minimum address the elements listed in Attachment II.5 and Condition II.M.6. (Institutional and Land Use Controls). The Permittee should provide sufficient written justification of any omissions or deviations from the minimum requirements in Attachment II.5.

II.M.1.b.i. An Institutional and Land Use Control Plan must be included in the CMI Work Plan. The Plan must include:

II.M.1.b.i.1. A description of the procedures used by CHS to ensure proper institutional and land use controls for SWMUs and AOCs listed in Attachment II.1a, while those SWMUs and AOCs are under the ownership of the CHS;

II.M.1.b.i.2. A plan for ensuring continuance of institutional and land use controls when ownership of SWMUs and AOCs listed in Attachment II.1a is transferred;

II.M.1.b.i.3. A plan for execution and maintenance of deed notices, deed restrictions, and survey plats required in Condition II.M.6.; and

II.M.1.b.i.4. A schedule for submittal of survey plats to local authorities required in Condition II.M.6.c.

II.M.1.c. Department Action

The CMI Work Plan(s) must be approved in writing by DEQ prior to implementation. The letter approving the CMI Work Plan(s) must specify the start date of the CMI Work Plan(s) schedule.

II.M.1.c.i. If DEQ does not approve the CMI Work Plan(s), DEQ shall either:

II.M.1.c.i.1. Notify the Permittee in writing of the CMI Work Plan(s)'s deficiencies and specify a due date for submitting of a revised CMI Work Plan(s); or

II.M.1.c.i.2. Revise the CMI Work Plan(s) and notify the Permittee of the revisions and the start date of the schedule within the approved CMI Work Plan(s).

II.M.2. *Implementation*

The Permittee shall implement the approved CMI Work Plan(s) in accordance with the schedule specified in the Work Plan(s).

II.M.3. *Notification*

II.M.3.a. The Permittee shall notify DEQ of investigation activities (such as drilling, boring, or sampling) or remedial activities undertaken pursuant to the CMI Work Plan(s), no less than fourteen (14) calendar days prior to implementation. Notification must be made by electronic mail to the Hazardous Waste Section Project Manager for the CHS facility.

II.M.3.b. The Permittee shall give verbal notice to DEQ as soon as possible of any planned changes, deletions or additions to the CMI Work Plan(s). Verbal notification shall be followed by formal written notification. Changes, deletions, or additions to the CMI Work Plan are subject to Department approval.

II.M.3.c. For significant changes, the Permittee shall submit an amended CMI Work Plan(s) to DEQ for approval. The amended CMI Work Plan(s) must include, but is not limited to, a description of changes to the selected remedy and justification of the change(s).

II.M.4. *Remedy Changes*

Changes to the selected remedy may be made upon written approval from DEQ. DEQ may determine an additional permit modification is necessary if proposed changes to the selected remedy are substantial enough to warrant public participation.

II.M.5. *Progress Reports*

II.M.5.a. The Permittee shall provide DEQ with progress reports on implementation of the CMI Work Plan(s). The reporting schedule for the CMI progress reports must be established in the CMI Work Plan(s); however, reports must be submitted at least quarterly. Subsequent changes to the frequency and scope of the CMI progress reports must be approved by DEQ.

II.M.5.b. All CMI progress reports must contain at a minimum the following information:

II.M.5.b.i. A description of corrective measure implemented and/or completed;

II.M.5.b.ii. Summaries of progress and/or results;

II.M.5.b.iii. Summaries of deviations from the approved CMI Work Plan(s), and problems encountered during the reporting period;

II.M.5.b.iv. Anticipated work for the next reporting period; and

II.M.5.b.v. Copies of all daily reports, inspection reports, laboratory/monitoring results, and other pertinent information.

II.M.6. *Institutional and Land Use Controls*
The following institutional and land use controls must be maintained with the appropriate State and local authorities.

II.M.6.a. Deed Notices

II.M.6.a.i. The Permittee shall place a notation on all instruments of conveyance such as deeds or contracts for deed for all SWMUs and AOCs. The notation must include the following:

II.M.6.a.i.1. Notice provisions to subsequent purchasers and lessees that the SWMU and/or AOC has been used to manage and dispose of hazardous waste and, as applicable, use of the land is restricted;

II.M.6.a.i.2. Notice that any State-required institutional or land use control or condition on the land must be maintained;

II.M.6.a.i.3. As applicable, notice that any State-required engineering controls must be maintained for the duration of required remediation;

II.M.6.a.i.4. Notice of any restrictions placed on the CHS facility pursuant to Conditions II.M.6.a. and II.M.6.b. Such notice must include a precise statement of DEQ's and Permittee's intentions with regard to the scope and duration of the restrictions. Where applicable, such notice must also include a statement that particular restrictions placed on the Facility "run with the land"; and

II.M.6.a.i.5. Notice, in precise and easily understandable language, specifying the activities and uses that will be allowed and the specific activities and uses that will be prohibited.

II.M.6.b. Deed Restrictions
The Permittee shall maintain restrictions on the deed that include the following:

II.M.6.b.i.1. A requirement for notification to be sent by the owner of the property to purchasers, lessees, and tenants disclosing the existence of residual chemicals of concern;

II.M.6.b.i.2. A requirement that the owner and successors and assigns give notice in all deeds, mortgages, leases, subleases, and rental agreements that, as applicable, there are residual chemicals of concern on the CHS facility;

II.M.6.b.i.3. A requirement for advance notice to DEQ of any sale, lease, or other conveyance of property;

II.M.6.b.i.4. A requirement for notice in the deed notifying prospective purchasers that the property has been used to manage and dispose of hazardous waste, and that, as applicable, its use is restricted (notice must specify the restricted use); and

II.M.6.b.i.5. Restrictions of the property to land uses selected as part of the corrective measure(s). Should the property be used for purposes other than the land uses selected as part of the corrective measure(s), the owner must ensure the property is reevaluated to determine whether additional remediation is needed to provide an adequate level of protection to human health and the environment and ensure that any necessary remediation takes place.

II.M.6.c. Survey Plat

II.M.6.c.i. In accordance with the CHS Institutional and Land Use Controls Plan required in Condition II.M.1.b.i., the Permittee shall submit to the local zoning authority or the authority with jurisdiction over local land use, to DEQ, and to the county planner or equivalent, a survey plat indicating the location and dimension of the SWMUs and AOCs with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat must be recorded with the local zoning authority or the authority with jurisdiction over local land use and must contain a note prominently displayed which states the owner's or operator's obligation, in accordance with Conditions II.M.6.a. and II.M.6.b. to restrict any future land use and continue any required remediation and/or post-completion care.

II.M.6.c.i.1. The survey plat must include the following language:

(a) **Effect of recording complying plat.** The recording of any plat made in compliance with the provisions of this chapter shall serve to establish the identity of all lands shown on and being a part of such plat. Where lands are conveyed by reference to a plat, the plat itself or any copy of the plat properly certified by the county clerk and recorder as being a true copy thereof shall be regarded as incorporated into the instrument of conveyance and shall be received in evidence in all courts of this state. 76-3-304 Montana Code Annotated.

II.M.6.c.i.2. The plat and restriction notice must be attached to all instruments of conveyance such as deeds or contracts for deeds.

II.M.6.d. Certification of Institutional and Land Use Controls

No later than thirty (30) days after filing the survey plat., the Permittee shall submit to DEQ a certification stating that he or she has recorded notations on all instruments of conveyance and has submitted a survey plat to the authority with jurisdiction over local land use that meet the requirements of Conditions II.M.6.a., II.M.6.b. and II.M.6.c.

II.M.6.d.i. The certification must include copies of the document in which the notations have been placed, and the survey plat.

II.M.6.e. Changes to Deed Notices, Deed Restrictions, and/or Survey Plat

Any changes to filed deed notices, deed restrictions, and/or survey plat must be

approved by DEQ prior to filing the changes with the appropriate State or local authorities. DEQ must be notified and given copies of the changed documents within thirty (30) days after any modification or changes have been submitted to the appropriate authorities.

II.M.6.f. Continuation of Institutional and Land Use Controls
Institutional and land use controls are considered to be part of the remedial action for the CHS facility; and, therefore, must be maintained through the duration of this permit, and subsequent permits or other enforcement mechanisms as allowed in 40 CFR 270.1(c)(7).

II.M.7. *Notice to Government Authority*
The Permittee shall provide notice to DEQ within ten (10) calendar days prior to completion of any land transaction.

II.M.8. *Five-Year Review*
In 2030, five years after issuance of this permit, CHS must evaluate the implementation and performance of the remedy in order to determine if the remedy is or will be protective of human health and the environment.

II.M.8.a. Applicability
CHS shall review data and other pertinent site-specific information, including sampling and monitoring plans, analytical results, operation and maintenance reports, and/or other documentation of corrective measures performance to determine the following:

II.M.8.a.i. Whether the remedy is functioning as intended as set forth in the Statement of Basis and Corrective Measures Work Plan;

II.M.8.a.ii. Whether the exposure assumptions, toxicity data, cleanup levels, and corrective measures objectives used at the time of the remedy selection are still valid; and

II.M.8.a.iii. Whether new information indicates the corrective measures will not achieve the corrective measures objectives, or is not protective of human health or the environment.

II.M.8.b. Report
CHS shall submit a report to DEQ which presents the findings and conclusions of the review, including identification of any issues, recommendations, follow-up actions, and a determination as to whether the corrective measures are protective. The report must contain the data and information necessary to support all findings and conclusions.

II.M.8.b.i. The report must be submitted by March 1, 2030, and five years following that date, until permit reissuance, termination, or another enforceable mechanism is

issued to CHS for the Laurel Refinery, unless another schedule is agreed upon in writing by DEQ.

II.M.8.c. Department Action

II.M.8.c.i. DEQ will review the five-year review report, and determine what actions, if any, must be taken. Upon approval, DEQ will:

II.M.8.c.i.1. Notify the Permittee by written letter of actions that must be taken to improve and/or enhance the current remedy and a schedule for implementation;

II.M.8.c.i.2. Notify the Permittee by written letter that no action is required; or

II.M.8.c.i.3. Change the remedy, as allowed in Condition II.M.4.

II.M.8.c.ii. If DEQ does not approve the report, DEQ shall either:

II.M.8.c.ii.1. Notify the Permittee in writing of deficiencies and specify a due date for submitting of a revised report; or

II.M.8.c.ii.2. Revise the report and notify the Permittee of the revisions and any actions that must be taken as set forth in Conditions II.M.8.c.i.1, II.M.8.c.i.2., and II.M.8.c.i.3.

II.N. Completion of Corrective Measures

II.N.1. *Applicability*

Conditions under this section (II.N.) apply to completion of facility-wide corrective measures, completion of corrective measures for a group of SWMUs/AOCs, or completion of corrective measures for a specific SWMU or AOC.

II.N.2. *Corrective Measures Completion Certification Report*

II.N.2.a. The Permittee shall prepare and submit a Corrective Measures Completion Certification Report to DEQ within forty-five (45) days after completion of corrective measures conducted under Condition II.M.

II.N.2.b. The Corrective Measures Completion Certification Report must at a minimum contain the following information:

II.N.2.b.i. A description of all corrective measures completed;

II.N.2.b.ii. Summaries of results and documentation of attainment of performance requirement;

II.N.2.b.iii. Summaries of all problems encountered;

II.N.2.b.iv. Summaries of accomplishments and/or effectiveness of corrective measures;

II.N.2.b.v. Copies of all instruments of conveyance with notices required by Conditions II.M.6.a., II.M.6.b., and II.M.6.c.; and

II.N.2.b.vi. Certification that corrective measures have been completed in accordance with the approved CMI Work Plan(s) of Condition II.M.1., and/or Interim Measures Work Plan(s) of Condition II.J.1., and institutional and land use controls have been implemented as per Condition II.M.6.

II.N.2.b.vi.1. The certification must be signed by the Permittee and by an independent, registered professional engineer(s) skilled in the appropriate technical discipline(s). Documentation supporting the independent professional engineer(s) certification must be furnished to DEQ upon request until Department approval of the Corrective Measures Completion Certification Report.

II.N.3. *Department Approval*
DEQ shall review the Corrective Measures Completion Certification Report and, if necessary, notify the Permittee in writing of any deficiencies and specify a due date for submitting of a revised report. DEQ shall approve the Corrective Measures Completion Certification Report when all deficiencies have been addressed to its satisfaction.

II.N.4. *Permit Modification*
After approval of the Corrective Measures Completion Certification Report, DEQ will initiate a modification incorporating the completion of the corrective measures into the permit. The modification will remove the unit(s) associated with the completed corrective measures from further permit action unless releases are discovered from those units as set forth in Condition II.F. The permit modification will be in accordance with 40 CFR 270.41.

II.O. **Modification of the Corrective Action Compliance Schedule**
If at any time DEQ determines that modification of the Compliance Schedule in Attachment II.6 is necessary, DEQ may initiate a modification to the schedule in accordance with the procedures contained in 40 CFR 270.41. The Permittee may also submit a request for modification in accordance with 40 CFR 270.42.

II.P. **Plan and Report Requirements**

II.P.1. All plans and schedules are subject to approval by DEQ prior to implementation. The Permittee shall revise and implement all submittals and schedules as specified by DEQ.

II.P.2. Work plans, reports, and other required documentation must be submitted in accordance with the approved schedule. Extensions of the due date for submittals may be granted by DEQ based on the Permittee's demonstration that sufficient justification for the extension exists.

II.P.3. The Permittee shall submit an amended RFI Work Plan(s) or IM Work Plan(s) to DEQ if the Permittee or Department determines that an Assessment Report required under Condition II.E.2., or the RFI or IM Work Plan(s) required under Condition II.I. or II.J, respectively, no longer satisfy requirements under this Permit or 40 CFR 264.101.

II.P.3.a. DEQ will notify the Permittee in writing of its determination.

II.P.3.b. The amended Work Plan(s) must be submitted to DEQ within ninety (90) calendar days of the Permittee's determination or DEQ's written notification.

II.P.4. All reports must be signed and certified in accordance with 40 CFR 270.11.

II.P.5. The Permittee shall provide one electronic copy and hard copy (if requested) of all work plans and reports to DEQ and one electronic copy of all work plans and reports to the Environmental Protection Agency (EPA), Region 8 – Denver Office.

II.P.5.a. Copies sent to DEQ should be addressed to the current Hazardous Waste Program Project Manager for the CHS Laurel Refinery.

II.P.5.b. Copies sent to EPA, Region 8 should be addressed to the Program Director, Resource Conservation and Recovery Program.

Attachment II.1
Solid Waste Management Unit (SWMU) and Area of Concern (AOC) Information

II.1a	SWMUs and AOCs List and Current Status
II.1b	SWMUs and AOCs Location Map
II.1.c	Statement of Basis: Final Determination for Remedy Selection

Attachment II.1a
Solid Waste Management Units and Areas of Concern
List and Current Status

Number	Name	Date Identified	IM/ISM Status	RFI Status	BLRA Status	Proposed CM			CMS Status	CMI Status
						No Action	IC	Action		
SWMUs										
1	Leaded Tank Bottoms Trench	8/29/1994	NA	C	C	----	X	----	C	C
2	Pitch/Asphalt Landfill									
2a	Pitch Waste Area	8/29/1994	NA	C	C	----	X	----	C	C
2b	Asphalt Waste Area	8/29/1994	NA	C	C	----	X	ER, EC	C	C
3	Asphalt/Lime/Catalyst Landfill									
3a	Calcium Fluoride Disposal Area 1	8/29/1994	NA	C	C	----	X	ER, EC	C	C
3b	Disturbed Area	8/29/1994	NA	C	C	X	----	----	NR	
3c	Hot Process Lime Softener Waste Area	8/29/1994	NA	C	C	----	X	ER, EC	C	C
3d	Calcium Fluoride Disposal Area 2	8/29/1994	NA	C	C	----	X	ER	C	P
3e	Miscellaneous Waste Area	8/29/1994	NA	C	C	----	X	ER, EC	C	C
3f	FCC Catalyst Waste Area	8/29/1994	NA	C	C	----	X	ER, EC	C	C
3g	Spent Lime Sludge Trenches	8/29/1994	NA	C	C	----	X	ER	C	P
3h	Asphaltic Material and Spent Lime Sludge Area	8/29/1994	NA	C	C	----	X	ER	C	P
4	Scrap Landfill	8/29/1994	NA	C	C	----	X	ER, EC	C	IP [1]
5	Asphaltic Material Disposal Area									
5a	Asphaltic Material Disposal Area	8/29/1994	NA	C	C	----	X	----	C	P
5b	Asphaltic Barrel Disposal Area	8/29/1994	NA	C	C	----	X	----	C	P
6	Cooling Tower Sludge Pit	8/29/1994	NA	C	C	----	X	----	C	P
7 (A, B, C)	Drum Storage/Disposal Areas	8/29/1994	NA	C	C	X	----	----	C	P
8	Clarifier and Spent Lime Sludge Disposal Area	8/29/1994	NA	C	C	----	X	ER, EC	C	C
9	South Asphaltic Area									
9a	South Asphaltic Area (A)	8/29/1994	NA	C	C	----	X	----	C	P
9b	South Asphaltic Area (B)	8/29/1994	NA	C	C	----	X	----	C	P

Number	Name	Date Identified	IM/ISM Status	RFI Status	BLRA Status	Proposed CM			CMS Status	CMI Status
						No Action	IC	Action		
9c	South Asphaltic Area (C)	8/29/1994	NA	C	C	----	X	----	C	P
9d	South Asphaltic Area (D)	8/29/1994	NA	C	C	----	----	----	NR	
10	Tank Draw Study Group - South Tank Farm									
10a	Tank Draw near Tank 110	8/29/1994	NA	C	C	X	----	----	C	NR
10b	Tank Draw near Tank 112	8/29/1994	NA	C	C	----	----	----	NR	
10c	Tank Draw near Tank 109	8/29/1994	NA	C	C	----	X	----	C	P
10d	Tank Draw near Tank 108	8/29/1994	NA	C	C	X	----	----	C	P
10e	Tank Draw near Tank 101	8/29/1994	NA	C	C	----	X	----	C	P
10f	Tank Draw near Tank 102	8/29/1994	NA	C	C	X	----	----	C	P
10g	Tank Draw near Tank 96	8/29/1994	NA	C	C	----	X	----	C	P
10	Tank Draw Study Group - Central Tank Farm									
10h	Tank Draw near Tank 56	8/29/1994	NA	C	C	----	----	----	NR	
10i	Tank Draw near Tank 7	8/29/1994	NA	C	C	X	----	----	C	P
10j	Tank Draw near Tank 69 [2]	8/29/1994	NA	C	C	----	X	ER, EC	C	P
10k	Tank Draw near Tank 103	8/29/1994	NA	C	C	----	----	----	NR	
10l	Tank Draw near Tank 88	8/29/1994	NA	C	C	----	----	----	NR	
10m	Tank Draw near Tank 66 [2]	8/29/1994	NA	C	C	----	X	----	C	P
10	Tank Draw Study Group - East Tank Farm									
10n	Tank Draw near Tank 113	8/29/1994	NA	C	C	----	X	----	C	P
10o	Tank Draw near Tank 100	8/29/1994	NA	C	C	----	----	----	NR	
10p	Tank Draw near Tank 95	8/29/1994	NA	C	C	----	----	----	NR	
11	Laydown Area	8/29/1994	NA	C	C	----	X	ER	C	C
12	South Liquid Waste Pits Area									
12a	South Liquid Waste Pits (A)	8/29/1994	NA	C	C	----	X	ER	C	C
12b	South Liquid Waste Pits (B)	8/29/1994	NA	C	C	----	X	----	C	P
12c	South Liquid Waste Pits (C)	8/29/1994	NA	C	C	----	X	ER	C	C
12d	South Liquid Waste Pits (D)	8/29/1994	NA	C	C	----	----	----	NR	

Number	Name	Date Identified	IM/ISM Status	RFI Status	BLRA Status	Proposed CM			CMS Status	CMI Status
						No Action	IC	Action		
12e	South Liquid Waste Pits (E)	8/29/1994	NA	C	C	----	X	ER, EC	C	P
12f	South Liquid Waste Pits (F)	8/29/1994	NA	C	C	----	----	----	NR	
12g	South Liquid Waste Pits (G)	8/29/1994	NA	C	C	X	----	----	C	P
13	Old API Separator Unit	8/29/1994	NA	C	C	X	----	----	C	P
14	Caustic Material Pit	8/29/1994	NA	C	C	----	X	----	C	P
15	Old Lagoon Area	8/29/1994	NA	C	C	X	----	----	C	P
16	HF Neutralization Pits Area									
16a	HF Neutralization Pits (A)	8/29/1994	NA	C	C	----	X	----	C	P
16b	HF Neutralization Pits (B)	8/29/1994	NA	C	C	X	----	----	C	P
16c	HF Neutralization Pits (C)	8/29/1994	NA	C	C	----	X	----	C	P
17	Old Wastewater Plant									
17a	Pilkenroad Tilted Plate Separator	8/29/1994	NA	C	C	----	X	----	C	P
17b	Sludge Pit	8/29/1994	NA	C	C	----	X	----	C	P
17c	API Separator	8/29/1994	NA	C	C	----	X	----	C	P
18	Wastewater Impoundment Area									
18a	Wastewater Impoundment Area (A)	8/29/1994	NA	C	C	X	----	----	C	P
18b	Wastewater Impoundment Area (B)	8/29/1994	NA	C	C	----	X	----	C	P
19	Buried Scrap Disposal Area	8/29/1994	NA	C	C	X	----	----	C	P
20	"Smokeless" Incinerator Site	8/29/1994	NA	C	C	X	----	----	C	P
21	Asphaltic Burn Pit Area									
21a	Burn Pit	8/29/1994	NA	C	C	----	X	----	C	P
21b	Burn Pit Disposal Area	8/29/1994	NA	C	C	----	X	ER, EC	C	P
22	Wastewater Treatment Pond System									
22a	Wastewater Retention Pond System	8/29/1994	NA	C	C	----	X	ER, EC	C	P
22b	Treatment Pond Sludge Disposal Area	8/29/1994	NA	C	C	----	X	ER	C	P
23	Former New Landfarm	4/19/2006	NA	C	C	X	----	----	C	NR
24	BioPond Landfarm	2/14/2005	NA	C	C	----	X	EC	C	C

Number	Name	Date Identified	IM/ISM Status	RFI Status	BLRA Status	Proposed CM			CMS Status	CMI Status
						No Action	IC	Action		
25	Old Landfarm (formerly SWMU 36)	9/12/2014	NA	C	C	----	X	----	C	C
26	Old Landfarm Trench	2013	NA	IP	P	P	P	P	P	P
27	Tank 102 SE Containment Area	10/25/2018	NA	IP	P	P	P	P	P	P
28	Asphaltic Material Trenches 1	5/11/2020	NA	IP	P	P	P	P	P	P
29	Historical Bitumul Processing Area	12/2/2024	NA	IP	P	P	P	P	P	P
AOCs										
1	Clarks Fork Ditch									
1a	Clarks Fork Ditch (groundwater)	8/2/1991	C	C	C	----	----	IP	C	IP
1b	Clarks Fork Ditch (soils)	8/29/1994	NA	C	C	----	----	----	NR	
2	Cycle Oil Loading Rack	8/29/1994	NA	C	C	----	----	----	NR	
3	Hot Oil Belt Heating Unit	8/29/1994	NA	C	C	----	X	----	C	P
4	Tank Car Loading Rack	8/29/1994	NA	C	C	----	X	----	C	P
5	Covered Drain Ditch	8/29/1994	NA	C	C	X	----	----	NR	
6	Refinery Sewer System	8/29/1994	NA	C	C	----	----	SSU	C	P
7	Oil on Groundwater									
7a	Oil on Groundwater (groundwater)	8/2/1991	C	C	C	----	----	IP	C	IP
7b	Oil on Groundwater (soils)	8/29/1994	NA	C	C	----	----	----	NR	
8	Product Piping (USTs) Study Group									
8a	Product Piping (UST Piping)	8/29/1994	NA	C	C	----	----	----	NR	
8b	Product Piping (UST Piping)	8/29/1994	NA	C	C	----	X	----	C	P
8c	Product Piping (UST Piping)	8/29/1994	NA	C	C	----	----	----	NR	
8d	Product Piping (UST Piping)	8/29/1994	NA	C	C	----	----	----	NR	
8e	Product Piping (UST Piping)	8/29/1994	NA	C	C	----	----	----	NR	
8f	Product Piping (UST Piping)	8/29/1994	NA	C	C	----	----	----	NR	
9	UST Study Group									
9a	UST (Regulated) near Tank 25	8/29/1994	NA	C	C	----	X	----	C	P

Number	Name	Date Identified	IM/ISM Status	RFI Status	BLRA Status	Proposed CM			CMS Status	CMI Status
						No Action	IC	Action		
9b	UST (Regulated) near Tank 74	8/29/1994	NA	C	C	----	X	----	C	P
9c	UST (Regulated) near Tank 75	8/29/1994	NA	C	C	----	X	----	C	P
9d	UST (Regulated) near Tank 74	8/29/1994	NA	C	C	----	X	----	C	P
9e	UST (Regulated) near Tank Truck Unloading Rack	8/29/1994	NA	C	C	----	X	----	C	P
9f	UST (Regulated) near Tank 39	8/29/1994	NA	C	C	----	----	----	NR	
9g	UST (Regulated) near Tank 56	8/29/1994	NA	C	C	----	----	----	NR	
9h	UST (Regulated) near Tank 62	8/29/1994	NA	C	C	----	X	----	C	P
9i	UST (Regulated) near Tank 67 [2]	8/29/1994	NA	C	C	----	X	----	C	P
9j	UST (Regulated) near Tank 78	8/29/1994	NA	C	C	X	----	----	C	P
9k	UST (Regulated) near Tank 81 [2]	8/29/1994	NA	C	C	----	X	----	C	P
9l	UST (Regulated) near Tank 84 [2]	8/29/1994	NA	C	C	X	----	----	C	P
9m	UST (Regulated) near Tank 86	8/29/1994	NA	C	C	----	----	----	NR	
9n	UST (Regulated) near Former Tank 93	8/29/1994	NA	C	C	X	----	----	C	P
10	Former Refinery Bulk Terminal Area	4/4/1996	NA	C	C	----	X	EC	C	P
11	Tank 52 Area	6/26/2003	NA	C	C	----	X	----	C	P
12	Tank 64 Area	10/29/2004	NA	C	C	X	----	----	C	P
13	Tank 100 Area	2/25/2005	NA	C	C	----	X	EC	C	P
14	Tank 82 Area	12/25/2005	NA	C	C	----	X	----	C	P
15	Tank 118 Area	2/18/2006	NA	C	C	----	X	----	C	P
16	Tank 93 Area	4/18/2007	NA	C	C	----	X	----	C	P
17	South Tank Farm (groundwater)	10/26/2012	C	C	C	----	----	IP	C	IP
18	Tank 73 Area	1/14/2009	NA	C	C	----	X	ER, EC	C	P
19	Gas Blender Sample Loop and Tank 96 (soils)	10/26/2012	NA	C	C	----	X	ER, EC	C	P
20	Tank 77 Area	5/1/2013	NA	IP	P	P	P	P	P	P
21	Tank 41 Area	2/1/2016	NA	IP	P	P	P	P	P	P
22	Former Tank 76 Area	11/15/2016	NA	IP	P	P	P	P	P	P
23	Tank 102 Pump Base Area	8/3/2018	NA	C	C	----	X	EC	C	P

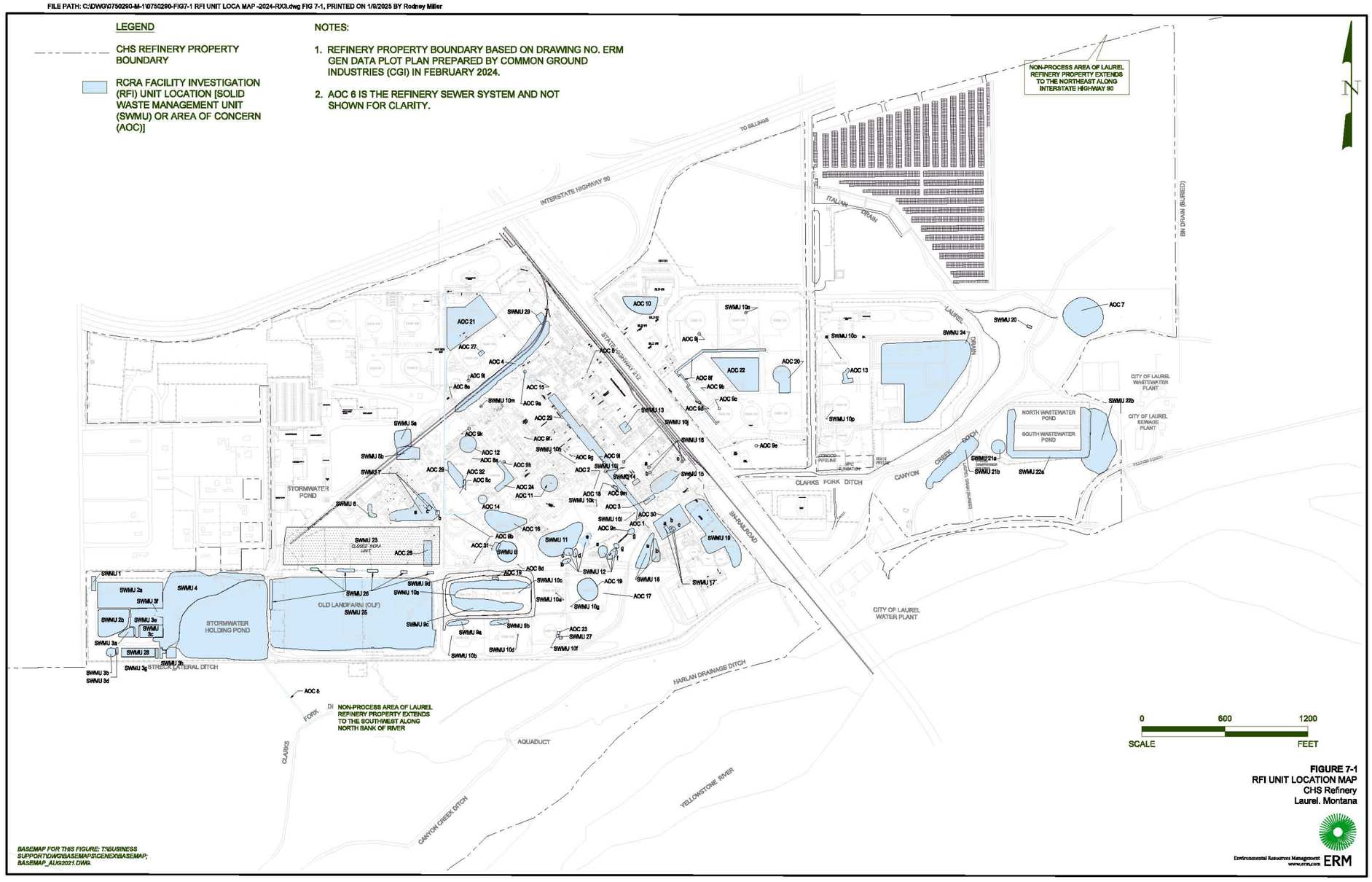
Number	Name	Date Identified	IM/ISM Status	RFI Status	BLRA Status	Proposed CM			CMS Status	CMI Status
						No Action	IC	Action		
24	Tank 62 Area	11/9/2018	NA	IP	P	P	P	P	P	P
26	Exchanger Bundle Pad Area	4/29/2020	NA	IP	P	P	P	P	P	P
27	Tank 126 Pump Area	8/26/2024	NA	IP	P	P	P	P	P	P
28	Tank 147 Area	3/22/2024	NA	IP	C	----	X	EC	C	P
29	North-South Sleeper Pipe Rack Area	9/4/2024	NA	IP	P	P	P	P	P	P
30	Old API Area	9/4/2024	NA	IP	P	P	P	P	P	P
31	Tank 136 Gasoline Area	9/4/2024	NA	IP	P	P	P	P	P	P
32	Tank 120 Area	9/4/2024	NA	IP	P	P	P	P	P	P
33	Zone D Oily Water Sewer Line Area	4/7/2025	NA	IP	P	P	P	P	P	P
34	Tank 25 Frac Tank Area	4/9/2025	NA	IP	P	P	P	P	P	P
OTHER										
Groundwater	Refinery LNAPL and Dissolved Phase Plumes	8/29/1994	C	C	C	----	----	IP	C	IP
Groundwater	MDOH Drain	8/2/1991	C	NR	NR	----	----	C	NR	C
Groundwater	Transportation Terminal Area	8/2/1991	C	C	C	----	----	IP	C	IP
Groundwater	Southeast Area	6/16/2000	C	C	C	----	----	IP	C	IP
Surface Water	Italian Drain	8/29/1994	NA	C	P	P	P	P	P	P

Legend:

IM/ISM: Interim Measures/Interim Stabilization Measures
RFI: RCRA Facility Investigation
BLRA: Baseline Risk Assessment
CM: Corrective Measures
IC: Institutional Control
CMS: Corrective Measure Study
CMI: Corrective Measures Implementation
C: Completed
IP: In Progress
NA: Not Applicable
NR: Not Required
P: Pending
ER: Excavation and removal/ex-situ treatment
EC: Engineered Control (i.e., capping)
SSU: Sewer Survey and Upgrades

[1] In 2021, DEQ approved remedy change to partial excavation, engineered cover installation, and implementation of institutional controls with the inclusion of a visual barrier to alert personnel to the presence of asbestos containing material in the subsurface. The partial excavation has been completed between 2015 and 2019 in SWMU 4, and installation of the cover and institutional controls remain.
[2] The tank referenced in the unit description has been removed.

Attachment II.1b
Solid Waste Management Units and Areas of Concern
Location Map



Montana Department of
ENVIRONMENTAL QUALITY

FINAL DETERMINATION FOR REMEDY SELECTION

Introduction

The Department of Environmental Quality (DEQ) has made a final determination on remedy selection for the CHS Laurel Refinery. DEQ has selected the proposed remedy described in the Statement of Basis, dated July 9, 2014.

Public Participation Activities

The public was provided 45 days to review and comment on DEQ's proposed remedy selection as described in the Statement of Basis. The comment period extended from July 14 to August 27, 2014. No comments on the Statement of Basis were submitted to DEQ.

Selected Remedy

DEQ has determined that the remedy proposed in the Statement of Basis will meet cleanup objectives at the CHS Laurel Refinery. DEQ's decision is based on review of the Corrective Measures Study, extensive knowledge of the contamination present in environmental media and the remedial activities that have been conducted to date at the facility, and public input. The selected remedy combines remediation of contaminated soil and groundwater, institutional controls, and deferral of remedial action for areas of contamination currently inaccessible due to refinery infrastructure and operations. Remedies for contaminated soil are excavation combined with ex-situ treatment or disposal, and engineered controls. Remedies for contaminated groundwater include air sparging, oil skimming, groundwater recovery and treatment, and monitored natural attenuation. Implementation of land use controls and business safety practices are expected to prevent potential exposures of contaminants to current and future on-and off-site workers, and to current and future off-site residents.

The selected remedy is expected to provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through contaminant source reduction, engineering controls, and institutional controls. The selected remedy is expected to be reliable and effective over the long-term by reducing hazards posed by volatile and semi-volatile organic compounds and metals in contaminated soils and groundwater.

The administrative mechanism for implementation of the remedy will be the CHS Laurel Refinery hazardous waste permit and subsequent renewals, or other enforceable mechanisms which require implementation of facility-wide corrective action under the Montana Hazardous Waste Act.

Montana Department of
ENVIRONMENTAL QUALITY

STATEMENT OF BASIS

PROPOSED REMEDY SELECTION for SOIL AND GROUNDWATER

CHS Laurel Refinery
803 Highway 212 S.
Laurel, Montana 59044-0909
EPA ID Number MTD006238083

July 9, 2014

Public Comment Period: July 14 to August 27, 2014 (45 days)

Send Comments To:

U.S. Mail
Becky Holmes
DEQ Permitting and Compliance Division,
Waste and Underground Tank Management Bureau
P.O. Box 200901
Helena, MT, 59620-0901

Email
DEQhazwaste@mt.gov
Subject Line – CHS Laurel Public Comment

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EXECUTIVE SUMMARY

The Montana Department of Environmental Quality (DEQ) has prepared this Statement of Basis to describe DEQ's recommended remedies for groundwater and soil contamination at the CHS Inc. (CHS) Laurel Refinery in Laurel, Montana. The Laurel Refinery is located at 803 Highway 212 S., Laurel, Montana (Figure 1). This Statement of Basis discusses the corrective actions which have been conducted to date, media-specific cleanup objectives, corrective measures alternatives evaluated, and the final corrective measures DEQ is proposing to ensure human health and the environment are protected at the Laurel Refinery.

The purpose of the corrective action process at the Laurel Refinery is to investigate releases or potential releases of hazardous waste or constituents to environmental media and assess potential risk of exposure to those hazardous constituents. Appropriate corrective action measures are then developed and implemented based on information gathered from the investigation and from the assessment of risk.

The Laurel Refinery has been in operation since the 1930's. The facility currently produces approximately 59,600 barrels per day of refined petroleum hydrocarbon products. A Montana hazardous waste permit has been issued to the facility for closure and post-closure of two land treatment units, and for facility-wide investigation and remediation of contaminated environmental media. Requirements of the permit, along with other relevant regulations and guidance, provided the basis for corrective action activities at the facility.

Releases of hazardous waste and hazardous constituents to environmental media have been found at the facility. Results of the remedial investigations indicate that volatile organic compounds, polycyclic aromatic hydrocarbons, and metals are the main constituents of concern. A human health and ecological risk assessment was conducted by CHS to evaluate potential health risks to humans or other ecological receptors if they were to be exposed to these constituents in soil, sediment, surface water, and/or groundwater. CHS then conducted a corrective measures study to evaluate corrective measure alternatives for cleanup of the releases. CHS submitted phased RCRA Facility Investigation Reports in 1997 and 2006; human health and ecological risk assessments in 2006, and a Corrective Measures Study Report in 2010.

CHS has implemented interim corrective measures to address contaminated groundwater within the refinery to prevent off-site migration. The interim measures include oil skimming, groundwater recovery and treatment, air sparging, chemical oxidation, and monitored natural attenuation.

DEQ is recommending a combination of corrective measures for the Laurel Refinery which includes remediation of contaminated soil and groundwater, institutional controls, and deferral of remedial action for areas of contamination currently inaccessible due to refinery infrastructure and operations. Excavation combined with ex-situ treatment or disposal, and engineered controls are proposed remedies for contaminated soil. Proposed remedies for contaminated groundwater include air sparging, oil skimming, groundwater recovery and treatment, and monitored natural attenuation. Implementation of land use controls and business safety practices are proposed to prevent potential exposures of contaminants to current and future on-and off-site workers, and to

current and future off-site residents.

DEQ is soliciting comment on the recommended corrective measures. The public comment period extends from July 14 to August 27, 2014. Instructions for submitting comments are in Section 9.

The Statement of Basis summarizes information that can be found in greater detail in reports developed for the Phase I and Phase II RCRA Facility Investigation, human health and ecological risk assessments, and the Corrective Measure Study. These reports are part of DEQ's public records. DEQ encourages the public to review these documents in order to gain a more comprehensive understanding of the Laurel Refinery and the corrective action activities that have been conducted there. These reports are available for review during the public comment period at the location provided in Section 9.

DEQ is issuing this Statement of Basis as a part of its public participation obligations under the Montana Hazardous Waste Act (MHWA) and the Laurel Refinery permit, MTHWP-02-02.

1.0 FACILITY AND REGULATORY BACKGROUND

Facility Description

The CHS Laurel Refinery is located at 803 Highway 212 S., Laurel, Montana (Figures 1). Refinery operations are conducted on approximately100 of 350 acres owned by CHS, all of which are currently zoned for heavy industrial use (Figure 2). The remaining acreage consists of administrative offices and green space. Adjacent property is residential, light industrial, and agricultural. The Yellowstone River borders a majority of the southern portion of the refinery property.

The refinery has been in operation since the 1930s. The original owner, Independent Refining Company, operated the refinery until Farmers Union Central Exchange, Inc. (CENEX, Inc.) purchased it in the 1940s. In 1998, CENEX Inc. merged with Harvest States Grain to form Cenex Harvest States Cooperatives and subsequently changed its name to CHS Inc.

Petroleum production has varied throughout the history of the Laurel Refinery. Currently, the refinery produces approximately 59,600 barrels per day of refined petroleum hydrocarbon products, including propane, gasoline, burner fuel, diesel fuel, asphalt, propane de-asphalted pitch, and road oil.

Regulatory Background

The Resource Conservation and Recovery Act (RCRA) is a federal law which governs proper management and disposal of hazardous waste, including requirements for issuance of permits to facilities for specific on-site treatment, storage, or disposal of hazardous waste. In addition to waste management, RCRA requires cleanup of hazardous waste and hazardous constituents in environmental media at permitted hazardous waste facilities. Any off-site contamination originating from the facility must also be addressed.

The Montana Hazardous Waste Act (MHWA) is the Montana equivalent of RCRA. DEQ is the

implementing state agency for MHWA.

A hazardous waste permit was initially issued to CHS for the Laurel Refinery in 1991, and reissued in 2002. The permit includes requirements for implementing facility-wide investigation and cleanup, and for closure and post-closure maintenance of two inactive land treatment units, named the New Landfarm and the Old Landfarm. CHS closed the New Landfarm in 2006 to cleanup standards which do not require post-closure care. The Old Landfarm was designated by DEQ as a Corrective Action Management Unit (CAMU) in the 2002 permit. The designation allows CHS use the CAMU to land treat remediation wastes that are generated during site-wide cleanup.

Hazardous waste permits are effective for ten years and may be reissued at the end of that time period. Concurrent with the remedy selection described in this Statement of Basis, DEQ is reissuing the Laurel Refinery hazardous waste permit. Final remedies selected by DEQ will be included in the reissued permit.

Site Geology and Hydrology

The refinery is underlain by alluvial terrace deposits from the Yellowstone River, which in turn are underlain by impermeable Colorado Shale bedrock. The upper surface of the bedrock is highly irregular and is present locally at approximately 14 to 21 feet below ground surface. An unconfined aquifer in the alluvial deposits above the bedrock flows generally southeast towards the Yellowstone River. Groundwater usage in the area is limited to residential wells upgradient and cross-gradient to the refinery.

2.0 SUMMARY OF SITE INVESTIGATION

In the facility-wide corrective action process, the owner/operator of a hazardous waste permitted facility must identify and characterize the nature and extent of all contamination present on-site and any contamination off-site that originated from the facility/ They also must evaluate potential risks of that contamination to human and ecological receptors. If characterization and assessment of risk indicate cleanup is necessary, remediation technologies and engineering and/or institutional controls are evaluated to determine the best approach to cleaning up the facility. A final cleanup remedy is chosen by DEQ and is then implemented by the permitted facility owner/operator.

Corrective action was initiated in 1989 at the Laurel Refinery when EPA conducted a facility assessment to identify areas of actual and potential releases. Thirty-eight areas, shown in Figure 5, were identified during that assessment. The areas are divided into solid waste management units (SWMUs) and areas of concern (AOCs). A SWMU is any unit used at any time to manage solid or hazardous waste, regardless of whether the unit was intended for that purpose. An AOC is any area where a release of a hazardous waste or hazardous constituent has occurred or potentially occurred. Contaminants in groundwater were also identified within the refinery and at the refinery boundaries.

In response to the potential for off-site migration of contaminated groundwater, CHS implemented several interim measures to prevent off-site migration of dissolved-phase

hydrocarbons in groundwater and to reduce the volume of light non-aqueous phase liquid (LNAPL) within the refinery proper. These interim measures were initiated in 1991 and have continued to present day. They include oil skimming and groundwater recovery, air sparging, and chemical oxidation. Monitored natural attenuation is also used to ensure dissolved-phase hydrocarbons in the groundwater are degrading.

CHS conducted two phases of field investigations between 1996 and 2004 to characterize soil, groundwater, and surface water conditions. Results of the field investigations are included in the following reports:

- Phase I Soil and Waste Investigation Report (ERM, 1997a), and
- Summary of Phase II RCRA Facility Investigation Results, Section 2 of the Baseline Risk Assessment Report (ERM, 2006)

These investigations included extensive sampling and analysis of soil, sediment, surface water, and groundwater. A system of groundwater monitoring wells was installed to support a groundwater monitoring program for both the field investigations and the interim measures. Results of groundwater monitoring for the interim measures were also used in the field investigations.

3.0 NATURE AND EXTENT OF CONTAMINATION

A brief summary of contamination found at the facility is presented below. Table 1 lists preliminary Constituents of Concern (COCs) identified during the field investigations that might be of concern to human and ecological receptors.

Soil and Sediment

Surface and subsurface soil samples were collected from each SWMU and AOC and analyzed to identify contaminants, concentration levels of contaminants, and the lateral and vertical extent of contamination. Concentrations of COCs were found above screening levels in both surface and subsurface soils. Sediment samples were collected in irrigation ditches located within and along the perimeter of the refinery, and along the Yellowstone River. Sediment samples with concentrations of nickel above ecological target levels were identified in one irrigation ditch. Contaminant levels in sediments along the Yellowstone River were below analytical detection limits.

Groundwater

COCs have been detected in groundwater at the site at concentrations above Montana water quality standards as presented in DEQ Circular-7 (DEQ, 2012). Data collected since 1991 indicates two phases of groundwater contamination are present: a dissolved phase plume and a light non-aqueous phase liquid (LNAPL) plume.

Five separate dissolved phase plumes are present at the refinery. COCs in the dissolved phase plumes include volatile organic compounds (benzene, toluene, ethylbenzene, and xylenes) and vinyl chloride. Concentrations vary within each dissolved phase plume and, due to interim corrective measures, have decreased over time. The dissolved-phase plume is shown in Figure 3.

The main LNAPL plume is restricted to the interior of the refinery. A smaller LNAPL plume is located beneath the inactive land treatment unit. Thickness of LNAPL ranges from 0.01 to 3.65 feet in the refinery interior. Thickness of LNAPL in the land treatment unit area ranges from a sheen to 0.01 feet. LNAPL thickness in each plume has decreased over time due to corrective measures taken by CHS. The refinery LNAPL plume is shown in Figure 4.

Surface Water
Surface water was sampled in the on-site portions of the Laurel Drain and the Italian Drain. Analytical results from the Italian Drain samples indicated selenium concentrations were above ecological target levels.

4.0 SUMMARY OF CONTAMINANT RISK

Risk assessments are used to characterize current and future potential risks to human and ecological receptors from exposure to chemical contaminants present in the environment. Results of the risk assessment contribute to the overall characterization of a contaminated site and assist in the development of appropriate cleanup actions. Risk is evaluated based on consideration of current and reasonably expected future uses of the facility and maximum beneficial use of groundwater.

CHS conducted risk assessments for both human health and ecological receptors. Results of the risk assessments are documented in the *Baseline Risk Assessment Report, CHS Inc., Laurel, Montana Refinery* (ERM, 2006).

Human Health Risk Assessment
CHS utilized an exposure area concept to evaluate potential risk to people from exposure to COCs in affected soil. Exposure areas were primarily determined by proximity of SWMUs and AOCs in the same geographical location, and the potential for people to reasonably spend time in or near those SWMUs and AOCs. Evaluation of groundwater was separated into on- and off-site exposure. CHS used a cumulative Hazard Index of 1.0 as a target level for non-carcinogenic COCs. Cumulative risk for carcinogenic COCs was evaluated using a target level of 1×10^{-5}.[1]

[1] Non-carcinogenic risk is characterized as being acceptable (no health hazard) or not acceptable (potential for a health hazard). Non-cancer effects are evaluated by comparing the estimated amount of exposure to a constituent of concern (dose) with a reference dose. This comparison is called the Hazard Quotient. Hazard quotients for all constituents of concern and exposure pathways are summed together to determine the Hazard Index. A hazard index of less than one indicates no potential for a health hazard. A hazard index greater than one indicates there is potential for a health hazard. The potential for hazard based on the summation of the hazard quotients for all COCs is conservative with the assumption that all COCs affect the same target organ.

Carcinogenic risks are defined as the incremental probability of an individual to develop cancer over a lifetime, as a result of exposure to the potential carcinogen. The carcinogenic risk determined in the risk assessment is a cancer caused by exposure to the impacted environmental media and would be above and beyond any general cancer risk in the population. EPA guidance suggested range for individual excess lifetime cancer risk is 1 in 1,000,000 (1 in one million or 1×10^{-6} to 1 in 100,000 (1 in one hundred thousand or 1×10^{-4}). DEQ uses a range of 1×10^{-6} to 1×10^{-5} for lifetime cancer risk.

Receptors: Based on current and future use of the facility and surrounding areas, the following receptors were chosen for evaluation of potential risk:

- Current and future on-site industrial workers,
- Current and future on-site construction workers,
- Current and future on-site trespassers,
- Current and future off-site residents, and
- Current and future off-site recreationalists.

Exposure Pathways: An exposure pathway refers to the way in which a person may come into contact with a contaminant. The following exposure pathways were used in the risk assessment:

- Direct contact to surface and sub-surface soil, sediment, surface water and groundwater,
- Inhalation of volatile emissions from subsurface soil and shallow groundwater,
- Vapor intrusion from contaminated soil into building indoor air,
- Surface runoff to surface water and sediment,
- Leaching of constituents from soil into groundwater, and
- Groundwater discharge to surface water and sediment.

Constituents of Concern: COCs, listed as *Preliminary Constituents of Concern* in the first column of Table 1, were evaluated in the human health and ecological risk assessments. Through the risk evaluation, a list of COCs which exceeded target carcinogenic and non-carcinogenic risk levels was developed. These final COCs, listed in Table 1, will be used as the basis for cleanup.

<u>Conclusions of the Human Health Risk Assessment</u>
Surface Soil (0 – 2 feet below ground surface): For on-site industrial workers, construction workers, and trespassers, COC concentration levels in multiple exposure areas exceed a cumulate cancer risk of 1×10^{-5}. Non-cancer risks do not exceed a Hazard Index of 1.0.

Subsurface Soil (2 – 5 feet below ground surface): For construction workers, COC concentration levels in subsurface soil did not exceed the target levels for cumulative cancer risk (1×10^{-5}) or a Hazard Index of 1.0.

Soil Leaching Potential: Concentrations of multiple COCs in soil at the Laurel Refinery are greater than soil screening levels for protection of groundwater; suggesting that COCs in soil could leach to groundwater in concentrations that would pose a risk to human health. However, an evaluation of groundwater data indicated there is no correlation between the COC concentrations found in soil to concentrations found in groundwater. CHS included data and an evaluation of the potential for the soil-to-groundwater leaching pathway in the Laurel Refinery Corrective Measures Study (ERM, 2010).

Indoor Air: The potential for indoor worker exposures to vapor intrusion into buildings was evaluated based on comparison of personnel air monitoring data with OSHA permissible exposure limits (PELs) and hypothetical risk evaluations using the Johnson and Ettinger Model. The modeling results indicate inhalation of indoor vapors may pose a potential risk to human

health in office buildings located near areas where maximum concentrations of sufficiently volatile and toxic COCs were reported. However, CHS collected personnel air measurement data and determined that COCs were below OSHA PELs. Therefore, unacceptable risk from actual exposure is not apparent at the facility.

Groundwater: The human health risk evaluation suggests COCs are present above cumulative cancer risk and non-cancer hazard quotient target levels for direct contact exposures (ingestion, dermal, and inhalation) for future potable groundwater use on-and off-site. Exposure scenarios evaluated for groundwater to ambient air and vapor intrusion into buildings indicate risks are less than target levels.

Sediment: The human health risk evaluation indicated risks are not expected for potential exposures to sediment in on-site ditches and ponds or off-site in the Yellowstone River.

Surface Water: The human health risk evaluation indicated risks are not expected for potential exposures to surface water in on-site ditches and ponds or off-site in the Yellowstone River.

Ecological Risk Assessment

An ecological risk assessment is a qualitative and/or quantitative appraisal of actual or potential impacts of contaminants on plants and wildlife. CHS conducted a Preliminary Ecological Risk Assessment (PERA) in 1997 (ERM, 1997b). The data and information collected in the PERA was used to conduct a Screening Level Ecological Risk Assessment (SLERA). A screening level approach was determined to be an adequate and conservative evaluation to determine risk to ecological receptors at the refinery.

Areas of the refinery were grouped into three ecological zones, based on existing refinery infrastructure and operations. Zone 2 encompasses the refinery production area and does not provide suitable habitat for ecological receptors due to the presence of pavement and process equipment. Zones 1 and 3 are located west and east of Zone 2, respectively, and were identified by CHS as areas of potential ecological concern.

<u>Conclusions of the Ecological Risk Assessment</u>

Surface Soil (0 – 0.5 feet below ground surface): The ecological risk evaluation indicated that the highest potential risk is to omnivorous birds on the western and eastern portions of the refinery. Risk evaluation results indicated no potential risk to terrestrial plants and soil invertebrates.

Subsurface Soil (0.5 – 5 feet below ground surface): Risk evaluation results indicated that subsurface soil is not a significant exposure route for ecological receptors. Therefore, soil was not evaluated in the ecological risk assessment.

Groundwater: As with subsurface soil, risk evaluation results indicated groundwater is not a significant exposure route for ecological receptors and, therefore, groundwater was not evaluated in the ecological risk assessment.

Surface Water: Risk evaluation results indicated selenium concentrations in surface water from the Italian Drain in Zone 3 exceed the chronic surface water standards (Circular DEQ-7) for aquatic life. The risk evaluation indicated surface water poses no risk to birds or mammals.

Sediment: Nickel concentrations exceeded sediment community level benchmarks for community-level receptors (benthic invertebrates) in the Gravel Pit Pond in Zone 1. The gravel pit has been filled with clean material as a part of refinery construction activities, removing the sediment exposure pathway. Arsenic concentrations exceed benchmarks in Zone 3; however, concentrations are below DEQ's published generic background level (DEQ, 2012). The risk evaluation also indicated sediment posed no risk to birds or mammals. Therefore, no corrective measures will be required for sediment in Zones 1 and 3.

5.0 CLEANUP LEVELS

Based on results of the human health and ecological risk assessments, concentrations of COCs in surface soil in multiple SWMUs and AOCs, groundwater, and surface water in the Italian Drain are above risk-based target levels. The COCs which exceed cleanup levels for human and ecological receptors are listed in Table 1. Remediation of these areas will be required to reduce COC concentrations to the cleanup levels described below.

Surface Soil
Cleanup levels were developed for surface soil – 0 to 2 feet below ground surface for human health protection and 0 to 0.5 feet below ground surface for ecological receptors. If both human health and ecological receptors are at risk for a given COC, then the more conservative cleanup level will be used.

Human Health
Cleanup levels for protection of human health will be based on an industrial worker scenario and a cancer exposure pathway. To ensure a cumulative cancer risk of 1×10^{-5} is not exceeded, target cleanup goals for individual carcinogenic constituents will be based on an acceptable cancer risk of 1×10^{-6} for organic constituents and background concentrations for inorganic compounds.

The most current industrial risk-based values published in *EPA Regional Screening Levels for Superfund* will be used as cleanup target levels for organic compounds. Cleanup target levels for inorganic compounds will be background concentrations as determined by field investigation activities, or as published in *Background Concentrations of Inorganic Constituents in Montana Surface Soils* (DEQ, September 2013).

Non-carcinogenic constituents will not be included in the cleanup goals because risk for non-carcinogenic COCs is below the risk limit of a Hazard Quotient or Hazard Index of 1.0.

Ecological
CHS calculated Protective Concentration Levels (PCLs) for surface soil (ERM, 2010). The PCLs will be used as cleanup levels for ecological receptors.

Protection of Groundwater (Soil Leaching Potential)
As noted above, COC concentrations in soil are greater than soil screening levels for protection of groundwater; suggesting it is possible that COCs in soil could leach to groundwater. However, current groundwater data indicates there is not a correlation between COC concentrations in soil and in groundwater. As part of the proposed remedy, evaluation of groundwater sampling and analytical results will be used to monitor whether COCs in soil are leaching to groundwater.

Groundwater
Cleanup levels for groundwater will be the most current water quality standards found in Circular DEQ-7, Montana Numeric Water Quality Standards. If Montana water quality standards do not exist for specific COCs, the most current value in the following hierarchy will be used: Safe Drinking Water Act Maximum Contaminant Levels (MCLs); EPA Regional Screening Levels (RSLs) for Tap Water; and site-specific risk-based concentrations.

Sediment
As noted in the conclusions for the human health and ecological risk assessments, no corrective measures are required for sediment.

Surface Water (Italian Drain)
Contamination in surface water is limited to the Italian Drain. The driver for cleanup is ecological risk; therefore, cleanup levels will be the surface water standard from Circular DEQ-7 chronic aquatic life standard.

6.0 CORRECTIVE ACTION OBJECTIVES

Corrective action objectives form the basis for evaluating potential remedial technologies and actions. They are based on an evaluation of information presented in the Phases I and II RCRA Field Investigation Reports, human health and ecological risk assessments, the Corrective Measures Study, as well as the cleanup levels described in Section 5.0.

Objectives for Surface Soil
<u>Human Receptors</u>

- Prevent unacceptable exposures to human receptors from contaminated surface soil.
  - Prevent direct contact, ingestion, and inhalation of surface soil COCs, using industrial risk-based target levels.
- Prevent residential use of the facility property in areas where the excess lifetime risk from exposure to a carcinogenic constituent exceeds 1×10^{-5} or the Hazard Quotient/ Hazard Index exceeds 1.0.

<u>Ecological Receptors</u>

- Prevent unacceptable exposures to ecological receptors from contaminated soil.

Groundwater Protection

- Prevent leaching of contaminants in soil to groundwater at concentrations which would cause exceedances of Circular DEQ-7, Montana Numeric Water Quality Standards (DEQ, 2012); or if Montana water quality standards do not exist for specific COCs, the following hierarchy: Safe Drinking Water Act Maximum Contaminant Levels (MCLs); EPA Regional Screening Levels (RSLs) for Tap Water (EPA, 2013); and site-specific risk-based concentrations.

Objectives for Groundwater

- Reduce the amount of LNAPL in the aquifer to the extent practicable using available technologies;
- Prevent unacceptable exposures to human health and the environment from both LNAPL and dissolved-phase contaminants in groundwater.
  - Prevent direct contact with groundwater; and
  - Prevent direct contact, ingestion, and inhalation of groundwater COCs.

- Reduce groundwater contamination to levels that meet Circular DEQ-7, Montana Numeric Water Quality Standards (DEQ, 2012); or if Montana water quality standards do not exist for specific COCs, the following hierarchy: Safe Drinking Water Act Maximum Contaminant Levels (MCLs); EPA Regional Screening Levels (RSLs) for Tap Water (EPA, 2013); and site-specific risk-based concentrations.

Objectives for Surface Water

Ecological Receptors

- Prevent unacceptable exposures to ecological receptors from contaminated surface water.

7.0 SUMMARY OF CLEANUP OPTIONS

CHS evaluated multiple cleanup options for soil and groundwater in a Corrective Measures Study (CMS). CHS then recommended a combination of options they believed would meet the stated objectives for site-wide cleanup. The evaluation and recommended corrective measures were included in a CMS report (ERM, 2010). The CMS report documents the process for developing and evaluating corrective measures alternatives that would address contamination identified at the facility.

Identification and Evaluation of Corrective Measures Alternatives

CHS compiled a list of potentially applicable technologies based on a preliminary screening of a larger list of possible technologies, using the numeric screening matrix in the Federal Remediation Technologies Roundtable (FRTR); *Table 3-2: Treatment Technologies Screening Matrix*. Low scoring technologies, and technologies unsuitable to site geology or those presenting a high safety risk were dropped from consideration. The retained technologies and administrative approaches used in the evaluation of corrective measures alternatives are listed in Table 2.

The retained technologies were then carried forward into the evaluation of corrective measures alternatives. CHS developed a series of corrective measures alternatives which were technologies and administrative approaches, or combinations of technologies and administrative approaches, designed to meet cleanup objectives. These alternatives were ranked using technical, human health, environmental, and institutional criteria. Cost of implementation was considered as well. The evaluation criteria are required by permit conditions and described in Appendix D of the CHS hazardous waste permit issued in 2002.

A detailed evaluation of the alternatives was conducted in two stages. Each alternative was first scored against the technical evaluation criteria of reliability, implementability, and safety. The scores of each alternative were then compared to each other. Alternatives with the highest technical scores were further evaluated against the human health, environmental, and institutional criterion. From the results of this evaluation process, corrective measures were developed for groundwater and for each SWMU and AOC. CHS then recommended these corrective measures to DEQ as the preferred cleanup options for the Laurel Refinery.

8.0 THE PROPOSED REMEDIES

DEQ selects corrective measures at permitted hazardous waste facilities in Montana. DEQ has concluded, based on the review of the Corrective Measures Study, as well as an extensive knowledge of the remedial activities that have been conducted and the contamination present at the facility, that the corrective measures recommended by CHS will meet the cleanup objectives for the Laurel Refinery. DEQ, therefore, proposes the following corrective measures for soil, surface water and groundwater. Maps of the recommended corrective measures for soil and groundwater are shown in Figures 5 and 6, respectively.

Proposed Remedies for Soil

No Action

No further action is proposed for areas where concentrations of constituents of concern (COCs) in the soil do not pose a risk to human or ecological health. In areas where no action is proposed, sampling results indicate that concentrations of COCs are below residential risk levels for soil and below risk action levels for ecological receptors.

Institutional Controls

Institutional controls are proposed both as a sole remedy and in combination with other proposed corrective measures. Institutional controls are proposed as the sole remedy for areas where concentrations of COCs are above residential risk-based values, and below industrial risk values. CHS would be required to restrict land use by establishing institutional controls which limit site zoning to long-term industrial use of the property, thus preventing use of the area for residential or recreational purposes. Institutional controls would include deed restrictions on SWMUs and AOCs, limiting use to commercial or industrial only, and access control in the form of gates, fencing, and security during the operating life of the refinery.

Deferred

Deferred would postpone corrective measures in areas where refinery practices prevent implementation of a remedy. These areas are currently being used for waste management, are beneath refinery structures such as tanks or process units, or are otherwise inaccessible. Corrective measures would be evaluated and implemented as necessary when deferred areas become inactive, accessible, or at plant closure. When contaminated soil is accessible, CHS would be required to conduct an investigation and any necessary cleanup in accordance with requirements in the CHS hazardous waste permit. If contamination in a deferred area becomes an immediate threat to human health or the environment, the deferred status would be removed and CHS would be required to take immediate action to remove the threat.

Excavation and Removal with Institutional Controls

Excavation and removal of soil for ex-situ treatment or disposal is proposed for accessible surface soil contamination. Excavated soil would be placed on the CAMU, undergo further treatment, or be shipped off-site for disposal. Institutional controls would be combined with the excavation alternative to address any remaining contamination which is not accessible.

Engineering Controls (Capping) with Institutional Controls

Engineering controls with institutional controls is proposed for areas where infrastructure and refinery operations limit access. Engineering controls would include soil cover, capping with pavement or infrastructures such as tanks, and solidification/stabilization of soil. Engineering controls would limit human and ecological exposure to COCs and reduce infiltration and subsequent leaching of COCs to groundwater. Institutional controls are proposed in tandem with this alternative to ensure the engineering controls are maintained and inspected regularly, as well as ensuring current and future land use is limited to commercial or industrial purposes.

Because engineering controls do not reduce or remove hazardous constituents in soil, this remedy is proposed as a corrective measure until the land use changes. If land use changes in a way that causes exposure to hazardous constituents above acceptable risk levels, CHS will be required to evaluate and implement additional corrective measures.

Excavation and Removal with Institutional Controls and Engineering Controls

Excavation and removal with institutional and engineering controls is proposed for areas where infrastructure and refinery operations allow partial access for excavation of contaminated soil. Because engineering controls do not reduce or remove COCs in soil, this remedy is proposed as a corrective measure until the land use changes. If land use changes in a way that causes exposure to COCs above acceptable risk levels, CHS will be required to evaluate and implement additional corrective measures.

Proposed Remedy for Surface Water

Deferred

Surface water sampling results from the Italian Drain have shown selenium exceeds the chronic surface water standards for ecological receptors. Additional assessment is necessary to confirm the initial sample results. Corrective measures will be deferred until further evaluation is completed. DEQ will require that a schedule for the evaluation be included in the Corrective Measures Implementation Work Plan. Should the evaluation indicate remediation is required,

CHS will follow procedures outlined in the hazardous waste permit for developing and implementing corrective measures.

Proposed Remedies for Groundwater

The proposed remedy for groundwater contamination is the continuation of current interim measures (Figure 6). DEQ is proposing technologies used for the interim measures and bases its decision on their demonstrated long-term effectiveness in reducing LNAPL volume and COC concentrations in the dissolved phase plume. Please note the area named *RCRA LTU* in Figure 6 is the groundwater monitoring program for the closed land treatment unit and is not included in the facility groundwater remedy described in this Statement of Basis.

Air Sparging

Air sparging is proposed to remediate dissolved-phase contaminants in the groundwater at AOC-7 and the Southeast Area.

Pump and Treat

A groundwater treatment and LNAPL removal system is proposed to address dissolved-phase COCs in groundwater at AOC-1, AOC-17, and for the refinery LNAPL plume. Groundwater containing dissolved-phase COCs would be pumped from the ground and treated in the refinery wastewater treatment system. Belt skimmers would be used to remove LNAPL. In addition, a bail-down program would continue to be implemented annually where accumulated LNAPL in wells is removed by pumping or installation of a hydrophobic sock.

Monitored Natural Attenuation

Studies by CHS indicate that natural attenuation processes are reducing contaminant levels in the dissolved-phase plumes (ERM, 1998a). Monitored natural attenuation is proposed for the dissolved-phase plume at the Transportation Terminal Area. CHS would be required to monitor groundwater wells along the flow path of the plume. Monitoring parameters, such as pH, specific conductivity, dissolved oxygen and oxidation reduction potential, and concentrations of COCs would be used to evaluate degradation of organic COCs.

Groundwater Monitoring

Site-wide groundwater monitoring is proposed for evaluating and monitoring areas where COCs in soil have the potential to leach to groundwater.

9.0 OPPORTUNITY FOR PUBLIC COMMENT

DEQ is seeking comment from the public on the proposed corrective measures described in this Statement of Basis. Public input is an important contribution to the remedy selection process. The final remedies selected may be different from the one that has been proposed by DEQ, depending on the information received through the public participation process. DEQ will make a final determination on the remedies after all public comments have been considered. The CHS hazardous waste permit will be the administrative mechanism for implementing corrective measures at the Laurel Refinery.

DEQ is also proposing to re-issue a hazardous waste permit to CHS for closure and post-closure care of a regulated unit, and continued implementation of facility-wide cleanup. DEQ is required under the Montana Environmental Policy Act to conduct environmental assessments on the proposed corrective measures selection and the draft permit. Comments on the draft permit and the environmental assessments will be accepted during the same comment period as for DEQ's proposed remedy selection. Information on where to find copies of the draft permit and environmental assessments can be found below.

Comment Period
The comment period extends from **July 14 to August 27, 2014**.

Document Location
The Statement of Basis, supporting project documents, draft permit, and environmental assessments for the Statement of Basis and the draft permit are available for review at the DEQ office in Helena and the Laurel Public Library. The supporting project documents include the human health and ecological risk assessment reports, and the Corrective Measures Study. All documents and correspondence related to facility cleanup at the Laurel Refinery are located in DEQ's public record and may be reviewed at the DEQ Helena office.

The Statement of Basis, draft permit, and environmental assessment are available on DEQ's website: http://deq.mt.gov/pubcom.mcpx and http://deq.mt.gov/ea/WasteMgt.mcpx.

Location Information	*Review Hours*
Laurel Public Library 720 West 3rd Street PO Box 68 Laurel, MT 59044 (406)682-4961	Monday through Thursday 9 A.M. to 7:30 P.M. Saturday 9 A.M. to 3 P.M. *Closed Friday and Sunday*
Montana Department of Environmental Quality Permitting and Compliance Division Waste and Underground Tank Management Bureau Metcalf Building 1520 E. 6th Ave. Helena, Montana (406) 444-5300	Monday through Friday 8:00 am – 5:00 pm Website: Statement of Basis and Draft Permit http://deq.mt.gov/pubcom.mcpx Draft Environmental Assessment http://deq.mt.gov/ea/WasteMgt.mcpx

Written Comments
The public has until close of business on August 27, 2014 to submit written comments. Comments should include all reasonably available references, factual grounds for comments, and supporting material. Please submit written comments to the following address or email:

U.S. Mail
Becky Holmes
DEQ Permitting and Compliance Division
Waste and Underground Tank Management Bureau
P.O. Box 200901
Helena, MT, 59620-0901

Email
DEQhazwaste@mt.gov
Subject Line – CHS Laurel Public Comment

A public hearing will be held if DEQ determines, based upon requests, there is a significant degree of public interest in the proposed permit reissuance and/or remedy selection. Requests for a public meeting may be submitted in writing to DEQ prior to the end of the comment period.

Procedures for Reaching a Final Decision on Remedy Selection
After reviewing all comments, DEQ will prepare a Response to Comments document. The Response to Comments will explain any changes to the proposed remedy and respond to all significant comments.

DEQ will then make a final decision on the remedy selection. After the final decision is made, notice will be given to CHS and each person who submitted written comments or requested a notice of the final decision. The final remedy decision becomes effective thirty (30) days after the service of notice of the decision, unless a later date is specified or a public hearing is requested under 40 CFR 124.11, as incorporated by ARM 17.53.1201. If no comments are received, the final remedy becomes effective immediately upon notice of DEQ's final decision.

For More Information
Please contact Becky Holmes at the address listed above, by phone 406-444-2876, or email rholmes@mt.gov.

References

DEQ, 2012. *Circular DEQ-7, Montana Numeric Water Quality Standards, October 2012*.

EPA, 2014. *Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites, EPA May 2014.*

ERM, 1997a. *RCRA Facility Investigation: Phase I Soil and Waste Investigation at Solid Waste Management Units and Areas of Concern, May 30, 1997*.

ERM, 1997b. *RCRA Facility Investigation: Phase I Preliminary Ecological Risk Assessment. ERM-Southwest, July 31, 1997*.

ERM, 1998. *An Intrinsic Remediation Demonstration Report – Transportation Terminal Interim Measures Area, June 3, 1998.*

ERM, 1998. *Summary of ISM LNAPL Plume Investigation; LNAPL Interim Stabilization Measures, November 17, 1998*.

ERM, 2006. *Baseline Risk Assessment Report, CHS Inc., Laurel, Montana Refinery, April 3, 2006.*

ERM, 2010. *Final Corrective Measures Study, CHS Refinery, Laurel Montana, March 3, 2010*.

Table 1
Summary of Constituents of Concern for the Laurel Refinery

Table 1a – Human Health			
Preliminary COCs	**Final COCs for Cleanup**		
	Groundwater		Surface Soil
	On-site	Off-site	
Organic Compounds			
Benzene	X	X	
Ethylbenzene			
Vinyl Chloride	X	X	
Xylenes, total			
1,2-Dichloroethylene (cis)			
1,4-Dichlorobenzene			
1-Methylnaphthalene			
2-Methylnapthalene			
Benz(a)anthracene			X
Benzo(b)flouranthene			X
Benzo(a)pyrene			X
Bis(2-ethylhexyl)phthalate			
Chrysene			
7,12-Dimethylbenz(a)anthracene			X
Dibenz(a,h)anthracene			X
Indeno(1,2,3-cd)pyrene			
Naphthalene			
Trichloroethylene	X		
Inorganic Compounds			
Antimony			
Arsenic	X	X	X
Chromium, total			
Lead			
Manganese	X		
Mercury			
Vanadium			

Notes:
COC – Constituents of Concern

Table 1b – Ecological		
Preliminary COC	**Final COCs for Cleanup**	
	Surface Water	Surface Soil
Organic Compounds		
Benzene		
Bis(2-ethylhexyl)phthalate		X[b]
Dibenzofuran		
Dibutyl phthalate		
di-n-Octyl phthalate		
Ethylbenzene		
Fluoranthene		
Polycyclic aromatic hydrocarbons (PAHs)[a]		X[b]
Toluene		
Xylenes		
Inorganic Compounds		
Antimony		
Arsenic		
Barium		X[c]
Cadmium		
Chromium, Total		X[c]
Cyanide		X[b,c]
Lead		
Mercury		
Nickel		
Selenium	X[c]	X[c]
Silver		
Vanadium		X[b]
Zinc		

Notes:
COC – Constituent of Concern

[a] In the ecological risk assessment, polycyclic aromatic hydrocarbons (PAHs) were evaluated as one constituent due to limited toxicity information for individual PAHs.

[b] COC is found in ecological Zone 1 (east of the refinery operations area)

[c] COC is found in ecological Zone 3 (west of the refinery operations area)

Table 2
Applicable Technologies and Administrative Approaches Evaluated in the Corrective Measures Study

Soil
In Situ Biological Treatment
• Phytoremediation
In Situ Physical/Chemical Treatment
• Soil Flushing
Engineering Controls
• Capping
• Cap Enhancement/Alternatives
• Solidification/Stabilization
Other
•Excavation and Treatment or Disposal
- Land treatment of excavated material on the refinery CAMU is considered part of the Excavation and Removal alternative.
•Evaluate and Upgrade (specifically for the refinery wastewater sewer system)
Groundwater, Surface Water, and Leachate Media
In Situ Biological Treatment
• Enhanced Bioremediation
• Monitored Natural Attenuation
• Phytoremediation
In Situ Physical/Chemical Treatment
• Air Sparging
• Bioslurping
• Chemical Oxidation
• Dual Phase Extraction
• In-Well Air Stripping
• Passive/Reactive Treatment Walls
Ex Situ Physical Treatment of Pumped Fluids
• Pump & Treat
Containment
• Physical Barriers
• Deep Well Injection
Administrative Controls
• Institutional and Land Use Controls
• Deferred
• No Action (COC concentration levels pose no risk to human or ecological receptors)

Figure 1
Site Location Map

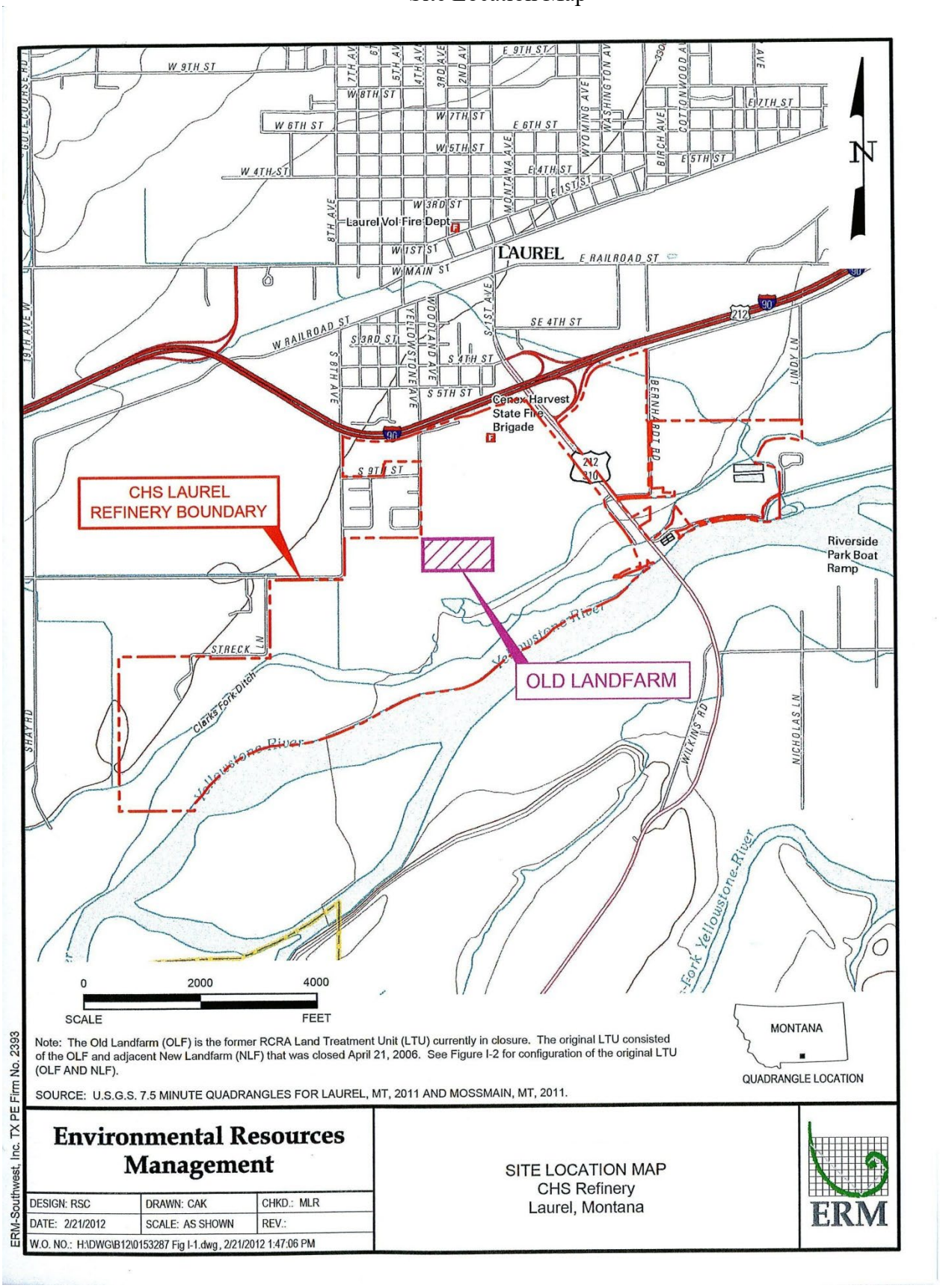


Figure 2
CHS Laurel Refinery Site Map

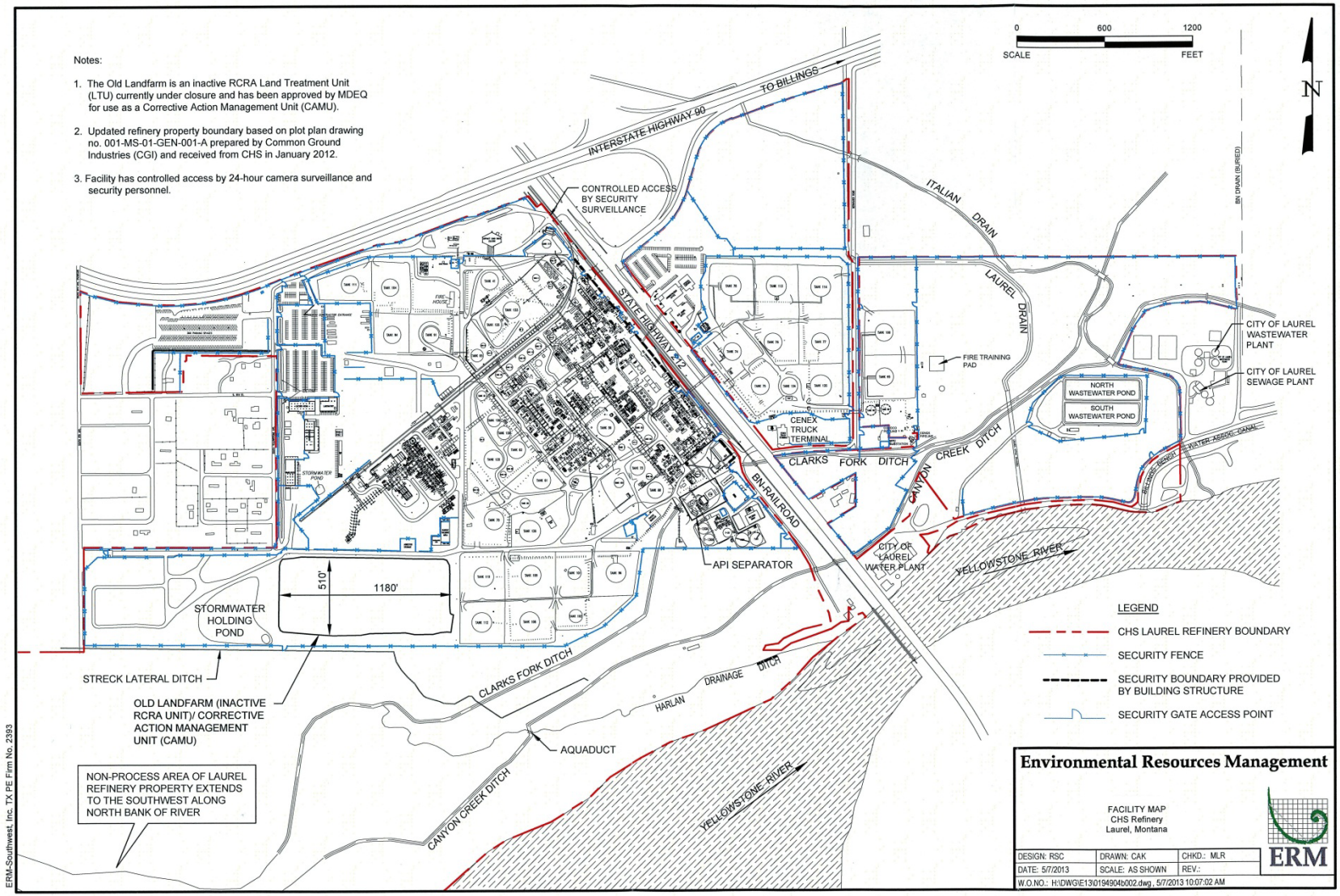
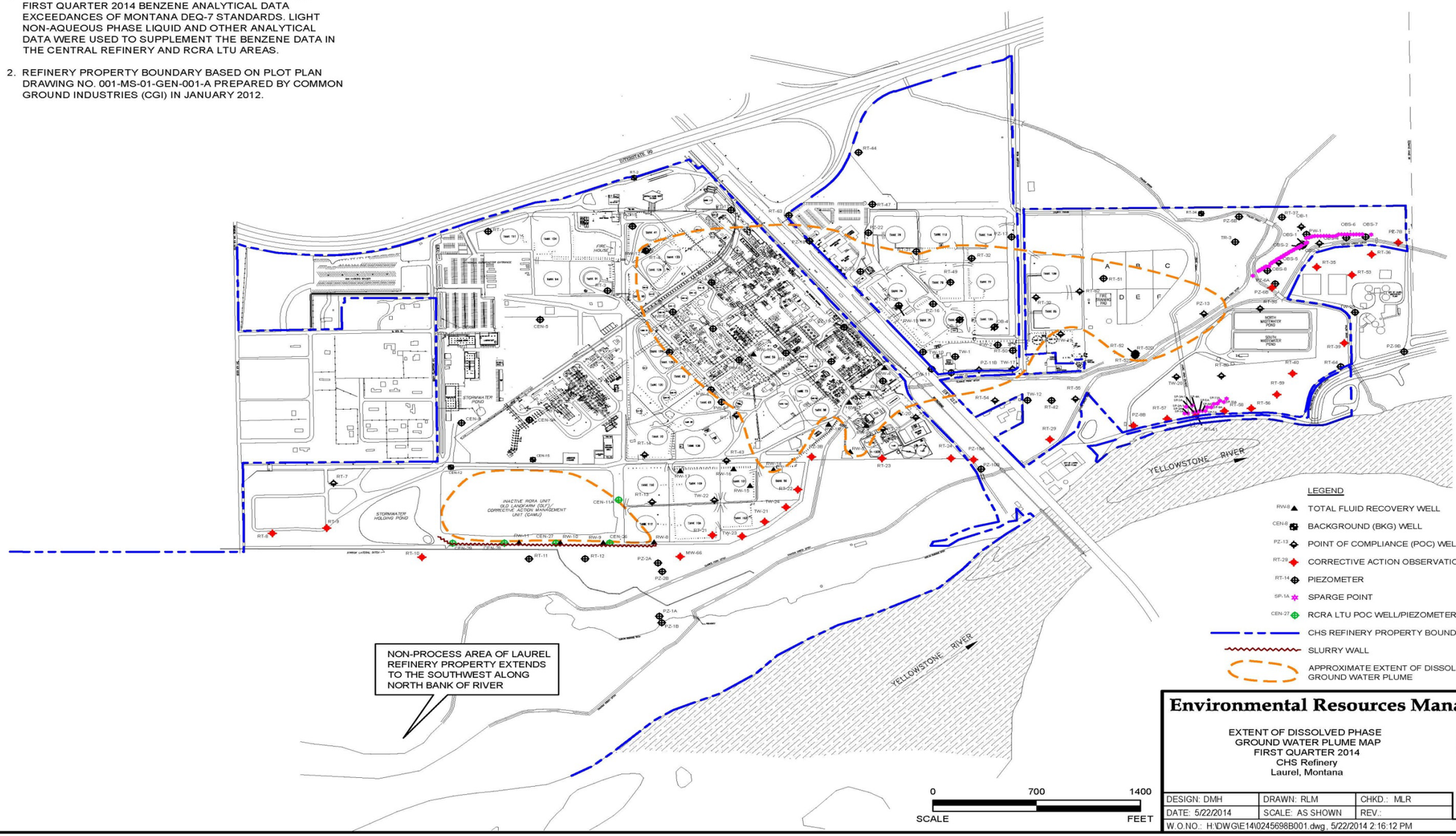


Figure 3
Dissolved-Phase Groundwater Plume

NOTES:

1. THE DISSOLVED GROUND WATER PLUME IS BASED ON FIRST QUARTER 2014 BENZENE ANALYTICAL DATA EXCEEDANCES OF MONTANA DEQ-7 STANDARDS. LIGHT NON-AQUEOUS PHASE LIQUID AND OTHER ANALYTICAL DATA WERE USED TO SUPPLEMENT THE BENZENE DATA IN THE CENTRAL REFINERY AND RCRA LTU AREAS.

2. REFINERY PROPERTY BOUNDARY BASED ON PLOT PLAN DRAWING NO. 001-MS-01-GEN-001-A PREPARED BY COMMON GROUND INDUSTRIES (CGI) IN JANUARY 2012.



Environmental Resources Management

EXTENT OF DISSOLVED PHASE
GROUND WATER PLUME MAP
FIRST QUARTER 2014
CHS Refinery
Laurel, Montana

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DATE: 5/22/2014	SCALE: AS SHOWN	REV.:
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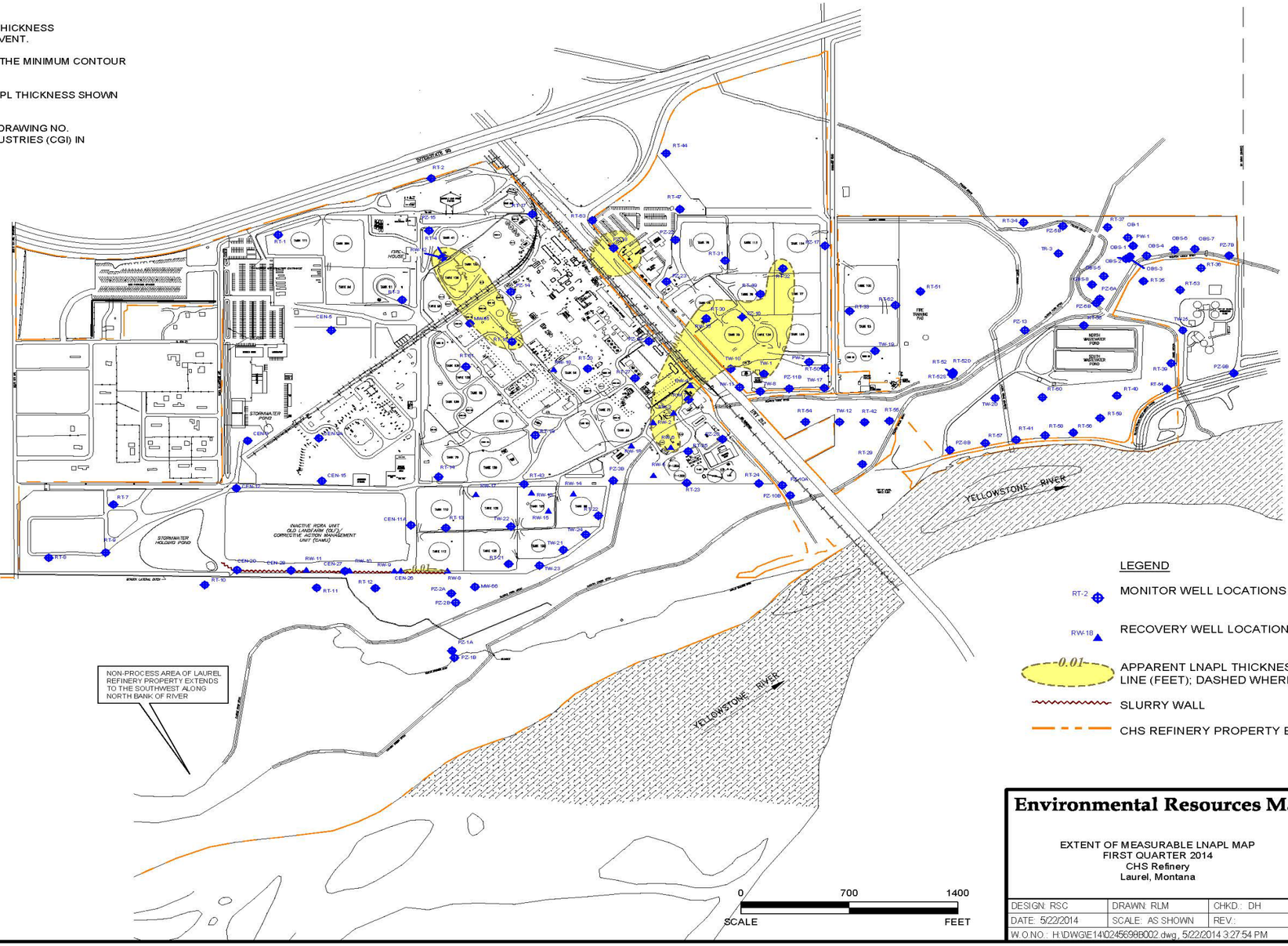
ERM

ERM-Southwest, Inc. TX PE Firm No. 2393

Figure 4
LNAPL Groundwater Plume

NOTES:

1. APPARENT LIGHT NON-AQUEOUS PHASE LIQUID (LNAPL) THICKNESS MEASUREMENTS ARE FROM MARCH 5-6, 2014 GAUGING EVENT.
2. THE LNAPL THICKNESS CONTOUR INTERVAL IS 0.5 FEET. THE MINIMUM CONTOUR IS 0.01 FEET.
3. PZ-18 - RECOVERY SYSTEM IN PLACE. INFERRED 0.01 LNAPL THICKNESS SHOWN AS A DASHED LINE.
4. REFINERY PROPERTY BOUNDARY BASED ON PLOT PLAN DRAWING NO. 001-MS-GEN-001-A PREPARED BY COMMON GROUND INDUSTRIES (CGI) IN JANUARY 2012.



Environmental Resources Management

EXTENT OF MEASURABLE LNAPL MAP
FIRST QUARTER 2014
CHS Refinery
Laurel, Montana

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ERM-Southwest, Inc. TX PE Firm No. 2393

Figure 5
Proposed Corrective Measures for Soil

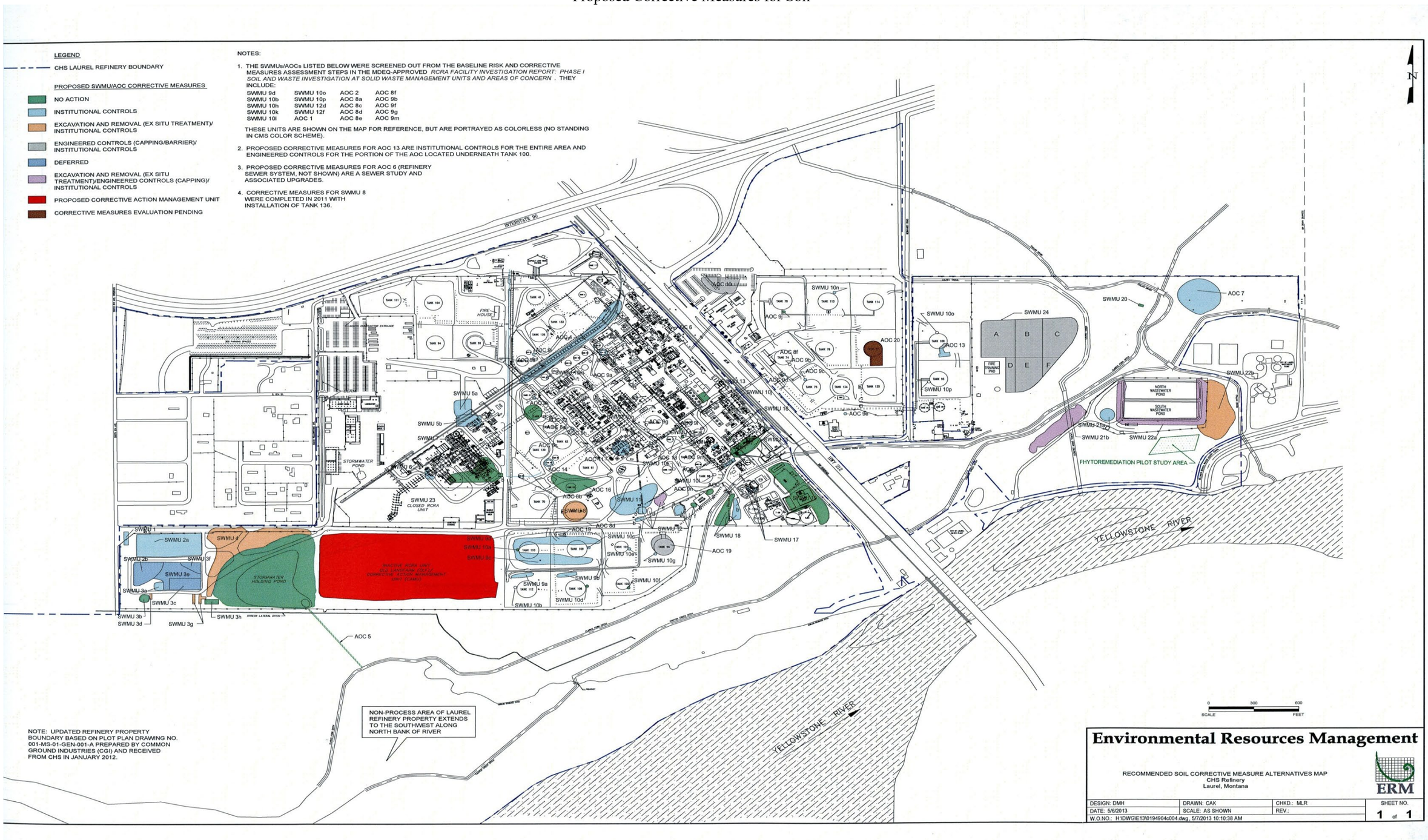
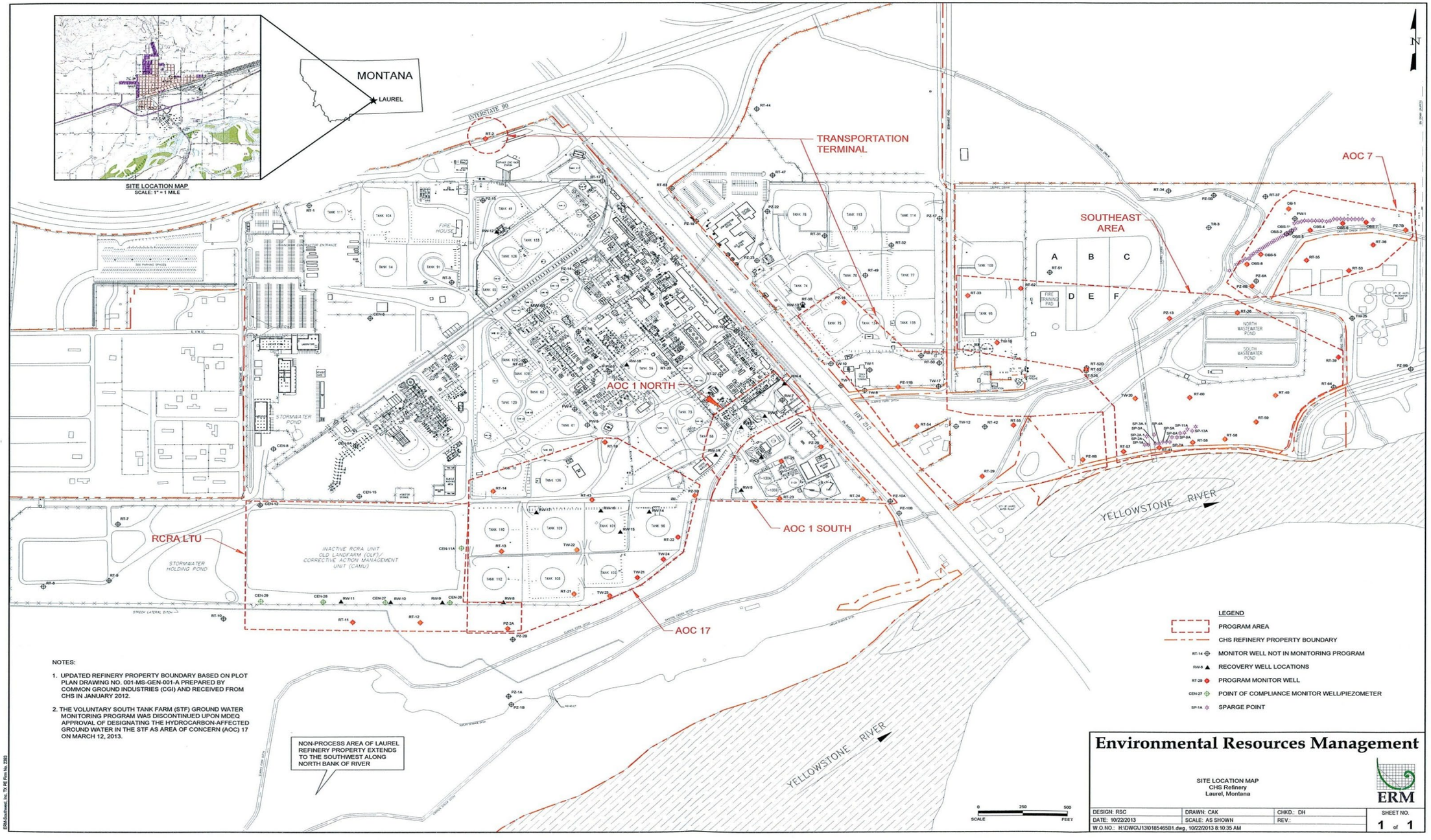


Figure 6
Proposed Corrective Measures for Groundwater



Attachment II.2
RCRA Facility Investigation (RFI)
Scope of Work

Table of Contents

RCRA Facility Investigation
Scope of Work

1.0. **Purpose**

The RCRA Facility Investigation (RFI) characterizes contamination at the facility and evaluates potential risks of that contamination to human health and the environment. Components of the characterization include describing the environmental setting; defining contamination sources (source characterization), determining the degree, and extent of any release of hazardous constituents (contamination characterization); identifying actual or potential receptors; and determining associated risks to human health and the environment. The RFI Work Plan must be developed based on Condition II.I. and should include the framework provided in this Attachment.

Respondent should establish preliminary facility-specific objectives for corrective action. Objectives should be based on public health and environmental criteria, information expected to be gathered during the RFI, EPA guidance, and the requirements of any applicable federal and state statutes.

The RFI investigations should result in data of adequate technical content and quality to support the development and evaluation of the corrective measures alternative(s) during the Corrective Measures Study, or to determine no further action is necessary.

2.0. **Components**

2.1. *Environmental Setting*

Information to supplement and/or verify existing information on the environmental setting at the facility should be collected. The following should be characterized as they relate to identified sources, pathways and areas of releases of hazardous constituents from the solid waste management units (SWMUs) and areas of concern (AOCs).

2.1.1. Hydrogeology

The hydrogeologic conditions at the facility should be evaluated. This evaluation should provide the following information:

2.1.1.1. A description of the regional and facility specific geologic and hydrogeologic characteristics affecting groundwater flow beneath the facility, including:

- Regional and facility specific stratigraphy; description of strata including strike and dip, identification of stratigraphic contacts;
- Structural geology; description of local and regional structural features (e.g., folding, faulting, tilting, jointing, etc.);
- Depositional history;
- Regional and facility specific groundwater flow patterns;
- Identification, characterization, and quantification of recharge and discharge areas;
- Characterization of seasonal and temporal variations in the groundwater flow regime; and

- A map drawn at an appropriate scale to show the location of SWMUs and AOCs in Attachment II.1a.

2.1.1.2. An analysis of any topographic features that might influence the groundwater flow system.

2.1.1.3. Based on field data, tests, and cores, a representative and accurate classification and description of all hydrogeologic units which may be part of the migration pathways at the facility (i.e., the aquifers and any intervening saturated and unsaturated units), including:
- Hydraulic conductivity and porosity (total and effective);
- Lithology, grain size, sorting, degree of cementation;
- An interpretation of hydraulic interconnections between saturated zones; and
- The attenuation capacity and mechanisms of the natural earth materials (e.g., ion exchange capacity, organic carbon content, mineral content, etc.).

2.1.1.4. Based on field studies and cores, structural geology and hydrogeological cross sections showing the extent (depth, thickness, and lateral extent) of hydrogeologic units which may be part of the migration pathways identifying:
- Sand and gravel deposits in unconsolidated deposits;
- Zones of fracturing or channeling in consolidated or unconsolidated deposits;
- Zones of higher permeability or lower permeability that might direct and restrict the flow of contaminants;
- The uppermost aquifer: geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs; and
- Water bearing zones above the first confining layer that may serve as a pathway for contaminant migration including perched zones of saturation.

2.1.1.5. Based on data obtained from groundwater monitoring wells and piezometers installed upgradient and downgradient from the potential contaminant sources, a representative description of water level or fluid pressure monitoring including:
- Water level contour and/or potentiometric maps;
- Hydrologic cross sections showing vertical gradients and thickness of immiscibles and/or other known contaminants;
- The flow system, including the vertical and horizontal components of flow; and
- Any temporal changes in hydraulic gradients, for example, due to seasonal influences.

2.1.1.6. A description of manmade influences that may affect the hydrogeology of the site, including Interim Measure units or structures, identifying:
- Active and inactive local water supply and production wells with an approximate schedule of pumping; and
- Manmade hydraulic structures (pipelines, french drains, ditches, unlined ponds, septic tanks, NPDES outfalls, retention areas, etc.).

2.1.1.7. A description of the local geology and potential contaminant migration pathways. These should be determined by an appropriate number of borings and boring spacing. Borings should be located so that reasonably accurate cross-sections can be constructed.

2.1.2. Soils

Soil and rock units above the water table in the vicinity of contaminant release(s) should be characterized. Such characterization must include, but not be limited to, the following activities and information, as appropriate:

- SCS soil classification;
- Surface soil distribution;
- Soil profile, including ASTM classification of soils;
- Transects of soil stratigraphy;
- Hydraulic conductivity (saturated and unsaturated);
- Relative permeability;
- Bulk density;
- Porosity;
- Soil sorption capacity;
- Cation exchange capacity (CEC);
- Soil organic content;
- Soil pH;
- Particle size distribution;
- Depth of water table;
- Moisture content;
- Effect of stratification on unsaturated flow;
- Infiltration;
- Evapo-transpiration;
- Storage capacity;
- Vertical flow rate;
- Mineral content; and
- Redox potential (Eh).

2.1.3. Surface Water and Sediment

Surface water bodies in the vicinity of the facility should be characterized. Such characterization should include, but not be limited to, the following activities and information:

2.1.3.1. Description of the temporal and permanent surface water bodies including:

- For impoundments: location, elevation, surface area, depth, volume, freeboard, and construction and purpose;
- For streams, ditches, and channels: location, elevation, flow, velocity, depth, width, seasonal fluctuations, flooding tendencies (i.e., 100-year event), discharge point(s), and general contents;
- For lakes and estuaries: location, elevation, surface area, inflow, outflow, depth, temperature stratification, and volume;

- Drainage patterns; and
- Evapo-transpiration rate.

2.1.3.2. Description of the chemistry of the natural surface water and sediments. This includes determining the pH, total dissolved solids, total suspended solids, biochemical oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients, chemical oxygen demand, total organic carbon, specific contaminant concentrations, etc.

2.1.3.3. Description of sediment characteristics including:
- Deposition area;
- Thickness profile; and
- Physical and chemical parameters (e.g., grain size, density, organic carbon content, ion exchange capacity, pH, etc.)

2.1.4. Air

Information characterizing the climate in the vicinity of the facility should be provided in the RFI Report. Such information should include, but not be limited to:

2.1.4.1. A description of the following parameters:
- Annual and monthly rainfall averages;
- Monthly temperature averages and extremes;
- Wind speed and direction;
- Relative humidity/dew point;
- Atmospheric pressure;
- Evaporation data;
- Development of inversions; and
- Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence.

2.1.4.2. A description of topographic and man-made features which affect air flow and emission patterns, including:
- Ridges, hills or mountain areas;
- Canyons or valleys;
- Surface water bodies (e.g. rivers, lakes, bays, etc.);
- Wind breaks and forests; and
- Buildings.

2.2. *Source Characterization*

To the degree possible without undue safety risks, analytical data should be collected to completely characterize the wastes and the areas where wastes have been placed, collected, or removed. The characterization should include type, quantity, physical form, disposition (containment or nature of deposits), and facility characteristics affecting release (e.g., facility security, and engineering barriers). Procedures used in making the following determinations should be documented. The source characterization should include quantification of the following specific characteristics, at each source area:

2.2.1. Unit/Disposal Area Characteristics

- Location of unit/disposal area;
- Type of unit/disposal area;
- Design features;
- Operating practices (past and present);
- Period of operation;
- Age of unit/disposal area;
- General physical conditions; and
- Method used to close the unit/disposal area.

2.2.2. Waste Characteristics

2.2.2.1. Type of wastes placed in the unit;

- Hazardous classification (e.g., flammable, reactive, corrosive, oxidizing or reducing agent);
- Quantity; and
- Chemical composition.

2.2.2.2. Physical and chemical characteristics such as:

- Physical form (solid, liquid, gas);
- Physical description (e.g., powder, oily sludge);
- Temperature;
- pH;
- General chemical class (e.g., acid, base, solvent);
- Molecular weight;
- Density;
- Boiling point;
- Viscosity;
- Solubility in water;
- Cohesiveness of the waste;
- Vapor pressure; and
- Flashpoint.

2.2.3. Migration and Dispersal Characteristics of the Waste

Procedures used in making the following determinations should be documented.

- Sorption capacity;
- Biodegradability, bioconcentration, biotransformation;
- Photodegradation rates;
- Hydrolysis rates; and
- Chemical transformations.

2.3. *Characterization of Releases of Hazardous Constituents*

Analytical data should be collected on groundwater, soils, surface water, sediment, subsurface gas, and air contamination in the vicinity of the facility in accordance with the Sampling and Analysis Plan. These data should be sufficient to define the extent, origin, direction, and rate of movement of contamination. Data should include time and location of sampling, media sampled, concentrations found, conditions during

sampling, and the identity of the individuals performing the sampling and analysis. The following types of contamination at the facility should be addressed:

2.3.1. Groundwater Contamination

A groundwater investigation to characterize any plumes of contamination at the facility should be conducted. Procedures used in making all determinations (e.g., well design, well construction, geophysics, modeling, etc.) should be documented. The groundwater investigation should provide at a minimum the following information:

- A description of the horizontal and vertical extent of any plume(s) of hazardous constituents originating from or within the facility;
- The horizontal and vertical direction of contaminant movement;
- The velocity of contaminant movement;
- The horizontal and vertical concentration profiles of hazardous constituents in the plume(s);
- An evaluation of factors influencing the plume movement;
- An extrapolation of future contaminant movement; and
- All available monitoring data including sampling locations.

2.3.2. Soil Contamination

An investigation to characterize the contamination of the soil and rock units above the saturated zone in the vicinity of any contaminant release should be conducted. Procedures used in making the following determinations should be documented. The investigation should include the following information:

- A description of the vertical and horizontal extent of contamination;
- A description of appropriate contaminant and soil chemical properties within the contaminant source area and plume. This should include contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation and other factors that might affect contaminant migration and transformation;
- Specific contaminant concentrations;
- The velocity and direction of contaminant movement; and
- An extrapolation of future contaminant movement.

2.3.3. Surface Water and Sediment Contamination

A surface water investigation to characterize contamination in surface water bodies resulting from releases of hazardous constituents at the facility should be conducted. The investigation should include, at a minimum, the following information:

- A description of the horizontal and vertical extent of any plume(s) originating from the facility, and the extent of contamination in underlying sediments;
- The horizontal and vertical direction of contaminant movement;
- Contaminant velocity;
- An evaluation of the physical, biological and chemical factors influencing contaminant movement;
- An extrapolation of future contaminant movement; and
- A description of the chemistry of the contaminated surface waters and

sediments. This includes determining the pH, total dissolved solids, and contaminant concentrations, at a minimum. Analytical methods used to obtain the data should be specified.

2.3.4. Air Contamination

An investigation to characterize particulate and gaseous releases of hazardous constituents into the atmosphere should be conducted. Procedures used in making the following determinations should be documented. This investigation should provide the following information, if appropriate:

- A description of the horizontal and vertical direction and velocity of contaminant movement;
- The rate and amount of the releases; and
- The chemical and physical composition of the contaminant(s) released, including horizontal and vertical concentration profiles.

2.3.5. Subsurface Gas Contamination

An investigation to characterize subsurface gases emitted from buried hazardous wastes and constituents in the subsurface should be conducted. The investigation should include, but not be limited to, the following information:

- Horizontal and vertical concentration profiles of the subsurface gases being emitted;
- The chemical composition of the gases being emitted; and
- The rate, amount and density of the gases being emitted.

2.4. *Potential Receptors*

Data describing the human populations and environmental systems that are susceptible to contaminant exposure from the facility should be collected. Chemical analysis of biological samples and/or data on observable effects in ecosystems should also be obtained as appropriate. The following characteristics should be identified:

2.4.1. Current local uses and planned future uses of groundwater:

- Type of use (e.g., drinking water source: municipal or residential, agricultural, domestic/non-potable, and industrial);
- Location of groundwater users, to include withdrawal and discharge wells, within one mile of the affected area; and
- The aquifer or hydrogeologic unit used and/or affected by the current and planned future local uses.

2.4.2. Current local uses and planned future uses of surface waters directly affected by the facility:

- Domestic and municipal (e.g., potable and lawn/gardening watering);
- Recreational (e.g. swimming, fishing);
- Agricultural;
- Industrial; and
- Environmental (e.g., fish and wildlife propagation).

2.4.3. Human use of or access to the facility and adjacent lands, including but not limited to:

- Recreation;
- Hunting;
- Residential;
- Commercial;
- Relationship between population locations and prevailing wind direction; and
- The potential impact on human health including demography, groundwater and surface water use and land use.

2.4.4. A general description of the biota in surface water bodies on, adjacent to, or affected by, the facility.

2.4.5. A general description of the ecology within the area adjacent to the facility.

2.4.6. A general demographic profile of the people who use or have access to the facility and adjacent land, including, but not limited to; age, sex, and sensitive subgroups.

2.4.7. A description of any known or documented endangered or threatened species near the facility.

2.5. *Investigation Analysis*

An analysis and summary of all facility investigations and their results should be prepared. This task should be adequate to ensure that the investigation data are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and/or the environment, and to support a Corrective Measures Study. The Investigation Analysis should include:

2.5.1. Data Analysis

All facility investigation data should be analyzed and evaluated. A summary should be developed detailing the type and extent of contamination at the facility, including sources and migration pathways. The summary should describe the extent of contamination (qualitative/quantitative) in relation to background levels indicative for the area.

2.5.2. Baseline Risk Assessment

A baseline risk assessment should be developed, incorporating the elements listed in the "Outline for Baseline Risk Assessment" contained in Attachment II.3.

2.6. *Laboratory and Bench-Scale Studies*

Laboratory and/or bench scale studies should be conducted, if necessary, to determine the applicability of a corrective measure technology or technologies to facility conditions. Respondent should analyze the technologies, based on literature review, vendor contracts, and past experience to determine the testing requirements.

If such studies are to be implemented, a testing plan should be developed identifying

the type(s) and goal(s) of the study(ies), the level of effort needed, and the procedures to be used for data management and interpretation.

Upon completion of the testing, testing results should be evaluated to assess the technology or technologies with respect to site-specific questions identified in the test plan. A report summarizing the testing program and its results, both positive and negative should be prepared for submission to DEQ.

3.0. Description of Current Conditions

The Current Conditions Report provides background information pertinent to the facility. The Current Conditions Report may be submitted with the RFI Work Plan or in a separate document. The data gathered during any previous investigations or inspections and other relevant data should be included, along with a discussion of the quality of the data.

3.1. *Nature and Extent of Contamination*

Respondent's report should describe the existing information on the nature and extent of contamination with regard to the units and areas of concern which are the subject of the RFI Work Plan.

3.1.1. Respondent's report should summarize all possible source areas of contamination. For each area, Respondent should identify the following, to the extent that information is available:

- Location of unit/area (which must be depicted on a facility map);
- Quantities of solid and hazardous wastes;
- Hazardous waste or constituents, to the extent known; and
- Identification of areas where additional information is necessary.

3.1.2. The Current Conditions Report should provide an assessment and description of the existing degree and extent of contamination. The assessment should include:

- Available monitoring data and qualitative information on locations and levels of contamination at the facility;
- All potential migration pathways including information on geology, pedology, hydrogeology, physiography, hydrology, water quality, meteorology, and air quality; and
- The potential impact(s) on human health and the environment, including demography, groundwater and surface water use, and land use.

4.0. RFI Work Plan

The RFI work plan must meet the requirements of this permit and should include elements outlined in this Attachment. The work plan should also include preliminary interim and final objectives for the facility and for the RFI. Other pertinent EPA guidance may be used in work plan development.

4.1. *Project Management Plan*

The Project Management Plan should include a discussion of the technical approach,

schedules, budget, and personnel. The Project Management Plan should also include a description of qualifications of personnel performing or directing the RFI, including contractor personnel. This plan should also document the overall management approach to the RCRA Facility Investigation. Objectives for the RFI should be developed

4.2. *Sampling and Analysis and Quality Assurance Plans (SAP/QAP)*

All sampling and analysis should be conducted in accordance with the SAP/QAP. All sampling locations should be documented in a log and identified on a detailed site map.

The SAP/QAP should document all monitoring procedures including, but not limited to, the sampling and analytical procedures to be performed during the investigation to characterize the environmental setting, source, and releases of hazardous constituents, so as to ensure that all information and data are valid and properly documented. The sampling strategy and procedures should be in accordance with the *Characterization of Hazardous Waste Sites, a Methods Manual: Volume II, Available Sampling Methods*, EPA-600/4-84-076; *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), (third edition, 1986 and most recent updates); or other EPA approved methods. In accordance with Module II, Respondent should include in the RFI work plan justifications for deviations from these references.

The SAP/QAP should include the following:

4.2.1. Data Collection Strategy

4.2.1.1. A description of the intended uses for the data and the necessary level of precision and accuracy for these uses;

4.2.1.2. A description of the methods and procedures to be used to assess the precision, accuracy and completeness of the data;

4.2.1.3. A description of the rationale used to assure that the data accurately and precisely represent characteristics of a population, parameter variations at a sampling point, a process condition or an environmental condition. Examples of factors which should be considered and addressed include:

- Environmental conditions at the time of sampling;
- Number of sampling points;
- Representativeness of selected media; and
- Representativeness of selected analytical parameters.

4.2.1.4. A description of the measures to be taken to assure that the following data sets are comparable:

- RFI data generated by Respondent;
- RFI data generated by an outside laboratory or consultant versus data generated by Respondent; and
- Data generated by separate consultants or laboratories.

4.2.1.5. Details relating to the schedule and information to be provided in quality assurance reports, including:

- Periodic assessment of measurement data accuracy, precision, and completeness;
- Results of performance audits;
- Results of system audits;
- Significant quality assurance problems and recommended solutions; and
- Resolutions of previously stated problems.

4.2.2. Sampling Strategy

The sampling strategy should incorporate the following:

- Selecting appropriate sampling locations, depths etc.;
- Providing a statistically significant number of sampling sites;
- Obtaining all necessary ancillary data;
- Determining conditions under which sampling should be conducted;
- Determining which media are to be sampled (e.g., groundwater, air, soil, sediment, subsurface gas);
- Determining which parameters are to be measured and where and documenting the rationale for parameter selection;
- Selecting the frequency of sampling and length of sampling period;
- Selecting the types of samples (e.g., composites vs. grabs) and number of samples to be collected; and
- Preventing contamination of the sampling equipment and cross contamination between sampling points.

4.2.3. Sampling Procedures

4.2.3.1. Documenting sampling operations and procedures, including:

- Procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters, preservatives, and absorbing reagents);
- Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;
- Specific sample preservation methods;
- Calibration of field instruments;
- Collection of replicate samples;
- Submission of field-based blanks, where appropriate;
- Potential interferences present at the facility;
- Construction materials and techniques associated with monitoring wells and piezometers;
- Field equipment listing and sampling containers;
- Sampling order; and
- Decontamination procedures.

4.2.3.2. Selecting appropriate sample containers;

4.2.3.3. Sample preservation; and

4.2.3.4. Chain-of-custody, including:
- Standardized field tracking reporting forms to establish sample custody in the field prior to shipment; and
- Pre-prepared sample labels containing all information necessary for sample tracking.

4.2.4. Field Measurements

4.2.4.1. Determining which parameters are to be measured and where;

4.2.4.2. Selecting the frequency of field measurements and duration of field measurement period;

4.2.4.3. Providing a statistically significant number of field measurements;

4.2.4.4. Determining conditions under which field measurements should be conducted;

4.2.4.5. Determining which media are to be addressed by appropriate field measurements (e.g., groundwater, air, soil, sediment, etc.);

4.2.4.6. Documenting field measurement operations and procedures, including:
- Procedures and forms for recording raw data and the exact location, time, and facility-specific considerations associated with the data acquisition;
- Calibration of field instruments;
- Collection of replicate measurements;
- Submission of field-based blanks, where appropriate;
- Potential interferences present at the facility;
- Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;
- Field equipment listing;
- Order in which field measurements will be made; and
- Decontamination procedures.

4.2.5. Sample Analysis

Sample analyses should be conducted in accordance with the most recent edition of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) (third edition, 1986 and most recent updates); *Standard Methods for the Examination of Water and Wastewater*, (twenty-first edition, 2005); or an equivalent method approved by DEQ. The sample analysis section of the Sampling and Analysis Plan should specify the following:

4.2.5.1. Chain-of-custody procedures, including:
- Identification of the responsible party at the laboratory who is authorized to sign for incoming field samples, obtain documents of shipment, and verify the data entered onto the sample custody records;

- Use of a laboratory sample custody log consisting of serially numbered standard lab-tracking report sheets; and
- Specification of laboratory sample custody procedures for sample handling, storage, and dispersement for analysis.

4.2.5.2. Sample storage, procedures, and storage times;

4.2.5.3. Sample preparation methods;

4.2.5.4. Analytical procedures, including:
- Scope and application of the procedure;
- Sample matrix;
- Potential interferences;
- Precision and accuracy of the methodology; and
- Method detection limits.

4.2.5.5. Calibration procedures and frequency;

4.2.5.6. Data reduction, validation and reporting;

4.2.5.7. Internal quality control checks, laboratory performance and systems audits and frequency, including:
- Method blank(s);
- Laboratory control sample(s);
- Calibration check sample(s);
- Replicate sample(s);
- Matrix-spiked sample(s);
- "Blind" quality control sample(s);
- Control charts;
- Surrogate samples;
- Zero and span gases; and
- Reagent quality control checks.

4.2.5.8. Preventive maintenance procedures and schedules;

4.2.5.9. Corrective action (for laboratory problems); and

4.2.5.10. Turnaround time.

4.2.6. <u>Groundwater Investigations</u>

4.2.6.1. Monitoring system design
- Downgradient wells should be located to satisfy regulatory requirements for release detection and no migration of hazardous constituents beyond the site boundary. The horizontal placement of these wells should be such that they intercept potential pathways for contaminant migration. Wells should be monitored at each depth necessary to ensure immediate detection of a release.

- Upgradient or background wells should be installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of uncontaminated water that has not been affected by leakage from a SWMU or AOC. A sufficient number of wells should be installed to allow for stratified comparisons of water quality and to account for spatial variability in groundwater quality.

4.2.6.2. Monitoring well drilling methods

- Drilling should be performed in a manner that minimizes the disturbance and maintains the natural properties of the subsurface materials;
- Contamination and/or cross-contamination of groundwater and aquifer materials should be avoided;
- The drilling method should allow for the collection of representative samples of rock, unconsolidated materials, and soil;
- The drilling method should allow the owner/operator to determine when the appropriate location for the screened interval has been encountered;
- The drilling method should allow sufficient annular space around the well casing and screen to place the filter pack and annular sealants; and
- The drilling method should allow for the collection of representative groundwater samples. Drilling muds should be used only when minimal impact to the surrounding formation and groundwater can be ensured.

4.2.6.3. Monitoring well design and construction

- The most suitable material for a particular well at a particular site will depend on the characteristics of the site hydrogeology. The following factors should be taken into consideration: depth to the water-bearing zone, geochemistry of the soil and rock over the entire interval in which the well is to be cased, and the chemistry of the groundwater at the site. In addition, the screens and casing of all groundwater wells should be: 1) inert in the water being tested and 2) chemically resistant to any contaminants that are present in the aquifer(s) being monitored.
- The appropriate length of well screens varies from site to site; however, Respondent should provide justification for any screen which cuts across hydraulically separated geologic units. Well screens must be factory slotted or the equivalent. Field slotting is not permitted under any conditions.
- All wells should have a bottom sump to allow sediments that may enter the well to settle without silting in the well and preventing proper flow of fluids.
- The annular space between the borehole wall and the screen or slotted casing should be filled to minimize passage of formation materials into the well.
- A filter pack should be used when the natural formation is: 1) poorly sorted; 2) a uniform fine sand, silt, or clay; 3) very thin-bedded; 4) poorly cemented sandstone; or 5) highly fractured or characterized by relatively large solution channels. Filter pack material should be chemically inert and may not be constructed from fabric.

4.2.6.4. Annular sealant

- The well annulus must be properly sealed. Sealant materials should be chemically compatible with the highest anticipated concentration of chemical constituents that may be expected in the groundwater.
- When the screened interval is within the saturated zone, a minimum of two feet of sealing material should be placed immediately over the protective sand layer overlying the filter pack.
- The precise volume of filter pack material and sealant required should be calculated before placement; the actual volumes used should be determined during well construction. Any discrepancies between the calculated volumes and the actual volumes should be detailed and documented.

4.2.6.5. Surface completion

- A monitoring well surface seal should be installed on top of the annular sealant and extend vertically up the well annulus between the well casing and the borehole to the land surface.
- A protective casing should be installed around the well casing to prevent damage or unauthorized entry.
- A suitable cap should be placed on the well to prevent tampering or the entry of any foreign materials. A lock should be installed on the cap to provide security. Lubricants may not be applied to the lock.

4.2.6.6. Documentation of well design

Respondent should keep a record of the following information for each well:

- A well construction log;
- Date of construction;
- Drilling method and drilling fluid used;
- Well location (± 0.5 ft);
- Bore hole and well casing diameter;
- Well depth (± 0.1 ft);
- Drilling and lithologic logs;
- Casing materials;
- Screen materials and design;
- Casing and screen joint types;
- Screen slot size/length;
- Filter pack material/size, grain analysis;
- Filter pack volume calculations;
- Filter pack placement method;
- Sealant materials (% bentonite);
- Sealant placement method;
- Sealant volume (lbs/gallon of cement);
- Surface seal design/construction;
- Well development procedure;
- Type of protective well cap;
- Ground surface elevation (± 0.01 ft);
- Surveyor's pin elevation (± 0.01 ft) on concrete apron;

- Top of monitoring well casing elevation (± 0.01 ft);
- Top of protective steel casing elevation (± 0.01 ft); and
- Detailed drawing of well (include dimensions).

4.2.7. Water Level Elevation Determination

The following procedures should be followed when determining water level elevations:

- Field measurements should include depth to standing water and total depth of the well to the bottom of the intake screen.
- Prior to measurement, water levels in piezometers and wells should be allowed to stabilize for a minimum of 24 hours after well construction and development or well purging.
- Water level measurements from boreholes, piezometers, or monitoring wells used to define the water table or a single potentiometric surface should be collected within less than 24 hours.

4.2.8. Well Purging

The following procedures should be followed when purging wells:

- The purging method should ensure that all stagnant water is replaced by fresh formation water upon completion of the procedure.
- If the purged water is contaminated or if its chemistry is unknown, the water should be stored in appropriate containers until analytical results are available, at which time proper arrangements for disposal or treatment should be made.
- When purging a medium- to high-yielding well, the well should not be pumped dry if recharge causes the formation water to cascade vigorously down the sides of the screen.
- When purging a low yielding well, under no circumstances should the well be allowed to recover fully before sampling is started.

4.2.9. Sample Collection

- Monitoring well sampling should always progress from the well expected to be least contaminated to the well expected to be most contaminated. Samples to be analyzed for the most volatile constituents should be collected and containerized first.
- Equipment that minimizes agitation and reduces or eliminates contact with the atmosphere during sample transfer should be used.
- The following equipment or materials are not acceptable: neoprene fittings, PVC bailers, tygon tubing, silicon rubber bladders, neoprene impellers, polyethylene, and viton.

4.2.10. Bailers

The following precautions should be taken when using bailers:

- Bailers used in sampling groundwater from monitoring wells should be constructed of either fluorocarbon resin or stainless steel. Disposable single-use inert polyethylene bailers may also be used. The cable used to raise and lower the bailer should also be an inert material or coated with an inert material.

- Bailers should never be dropped into a well and should be removed in a manner that causes as little agitation as possible.

4.2.11. Sample Preservation

- Chemical preservatives should be added to the samples in the field.
- A temperature history of the samples should be maintained. Upon receipt of a shipment, the laboratory should record the temperatures on the chain-of-custody record;
- The laboratory should record the date/time sampled, the date/time received, the date/time extracted, and the date/time analyzed for all samples received.
- Samples should not be filtered in the field or transferred from one sample container to another unless approved by DEQ.
- No headspace should exist in the containers of samples containing volatile organics.

4.2.12. Borehole Location and Sampling Strategy

- Borings should be located so that reasonably accurate cross-sections can be constructed.
- Borehole samples should be collected with a shelby tube, split barrel sampler, rock corer, or other appropriate device and should be described in the field by a professional experienced in geology. Concise drilling logs and field records should be kept.
- Samples should be collected from all borings at intervals equal to 10% of the total depth of the borehole and should be collected wherever contamination is suspected.
- Borings in which permanent wells are not installed and wells being abandoned should be sealed with material at least an order of magnitude less permeable than the surrounding soil.

4.3. *Data Management Plan*

A Data Management Plan should be developed to document and track the RFI data and results. This plan should identify and set up data documentation materials and procedures, project file requirements, and progress reporting procedures and documents. The plan should also describe the format for presenting the raw data and conclusions of the investigation.

4.3.1. Data Record

The data record should include the following:

- Unique sample or field measurement code;
- Sampling or field measurement location and sample or measurement type;
- Sampling or field measurement raw data;
- Laboratory analysis ID number;
- Property or component measures; and
- Result of analysis (e.g. concentration).

4.3.2. Tabular Displays

The following data should be presented in tabular displays:

- Unsorted (raw) data;
- Results for each medium, or for each constituent monitored;
- Data reduction for statistical analysis, as appropriate;
- Sorting of data by potential stratification factors (e.g., location, soil layer, topography); and
- Summary data.

4.3.3. Graphical Displays

The following data should be included in the Data Management Plan and may be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transits, three dimensional graphs, etc.):

- Sampling location and sampling grid;
- Boundaries of sampling locations and areas where more data are required;
- Geographical extent of contamination;
- Contamination levels, averages and maxima;
- Sampling locations and levels of contamination at each;
- Changes in concentration in relation to distances from the source, time, depth or other parameters; and
- Features affecting inter-media or intramedia transport and potential receptors.

4.4. *Health and Safety Plan*

4.4.1. Respondent should prepare a Health and Safety Plan which includes the following:

- A facility description including the locations of roads, water supply, electricity, and telephone service;
- The known hazards and an evaluation of the risks associated with those hazards;
- Key personnel and alternates responsible for site safety, response operations, and the protection of public health;
- A description of the work area;
- Levels of protection to be worn by personnel;
- Procedures to control site access;
- Decontamination procedures for personnel and equipment;
- Site emergency procedures;
- Emergency medical care for injuries and toxicological problems;
- Requirements for an environmental surveillance program;
- Routine and special training required for responders; and
- Procedures for protecting workers from weather-related problems.

4.4.2. The Health and Safety Plan should be consistent with:

- NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);
- EPA Order 1440.1 - Respiratory Protection;
- EPA Order 1440.3 - Health and Safety Requirements for Employees Engaged in Field Activities;
- Facility Contingency Plan;

- EPA Standard Operating Safety Guide (1984);
- OSHA regulations, particularly in 29 CFR 1910 and 1926;
- State and local regulations; and
- Other EPA guidance as provided.

** Note – DEQ will not approve or disapprove Respondent's Health and Safety Plan.

4.5. *Community Relations Plan*

A plan for the dissemination of information to the public, regarding investigation activities and results, should be prepared.

Attachment II.3
Scope of Work
Baseline Risk Assessment

1.0. **Introduction**
- Statement of the problem
- Site-specific objectives of the risk assessment
- Risk Assessment Report Organization

1.1. *Site Background*
- Site description
- Map of site
- Site History
- Current land use
- Regulatory Background
- Significant site reference points
- Description of SWMUs, AOCs, and other units considered in the risk assessment
- General sampling locations and media sampled
- Description of any interim corrective or stabilization measures

1.2. *Scope of Risk Assessment*
- Complexity of assessment
- Synopsis of study design

2.0. **Site Characterization**

2.1. *Summary of the Remedial Investigation Results*
- Soil/sediment/waste Investigation
- Surface Water Investigation
- Ground Water Investigation

3.0. **Data Usability**

3.1. *Site-Specific Data Collection Considerations*
- Identification of potential human exposure
- Identification of potential environmental exposure
- Groundwater, soils, and air modeling parameters
- Sampling locations and media sampled
- Sampling methods for each medium
- QA/QC methods for sample collection and analysis

3.2. *Study Areas for Which Media-Specific Samples Were Collected*
- Collection strategies for sampling in each area studied
- Evaluation of data collected
- Comparison of chemical concentrations with background samples
- Uncertainties in data

4.0. **Human Health Baseline Risk Assessment**

4.1. *Selection/Description of Chemicals of Potential Concern*

- Summary of applicable Data Usability in Section 2.0
- Comparison of maximum soil, groundwater, surface water, and sediment concentrations to screening and background levels
- Comparison of detection limits to screening or background levels
- Potential daughter products
- Final selection of human health COPCs

4.2. *Identify Receptors of Concern/Potentially Exposed Populations*

- Typical on- and off-site receptor types
- Relative locations and descriptions of populations with respect to site
- Current land uses adjacent to site
- Populations of concern which might be or are being affected by site contaminants

4.3. *Characterization of Exposure Setting*

- Climate
- Vegetation
- Soil types
- Surface water hydrology
- Ground water hydrology

4.3.1. Identification of Exposure Pathways

- Contaminant sources- primary and secondary
- Media receiving contamination on- and off-site
- Fate and transport of contaminants in media
- Exposure points and exposure routes
- Integration of sources, releases, fate and transport mechanisms, exposure points, and exposure routes into complete exposure pathways
- Summary of exposure pathways to be quantified
- Current and potential future receptors
- Conceptual site model

4.4. *Risk Analysis*

4.4.1. Exposure Assessment

4.4.1.1. Quantification of Exposure

- Exposure Point Concentrations
- Chemical intake estimates for individual exposure pathways

4.4.1.2. Summary of Exposure Assessment

4.4.2. Toxicity Assessment

4.4.2.1. Toxicity Information for Non-carcinogenic Effects

- Appropriate exposure periods for toxicity values
- Latest Reference Dose (RfD) for all chemicals
- Reference Concentration (RfC) for all chemicals
- One- and ten-day health advisories for shorter term oral exposures

- Overall database and the critical study on which the toxicity value is based
- Effects that may appear at doses higher than those required to elicit critical effect
- Consideration of absorption efficiency

4.4.2.2. Toxicity Information for Carcinogenic Effects
- Exposure averaged over lifetime
- Latest slope factors for all carcinogens
- Weight-of-evidence classification for all carcinogens
- Concentrations above which the dose-response curve is no longer linear

4.4.2.3. Chemicals for Which No EPA Toxicity Values Are Available
- Qualitative evaluation
- Documentation/justification of any new toxicity values

4.4.2.4. Uncertainties Related To Toxicity Information
- Quality of individual studies
- Completeness of overall database
- Uncertainty Factors
- Modifying Factors

4.4.2.5. Summary of Toxicity Information

4.5. *Risk Characterization*

4.5.1. Current Land-Use Conditions
- Carcinogenic risk of individual substances
- Chronic hazard quotient calculation for individual substances
- Subchronic hazard quotient calculation for individual substances
- Shorter-term hazard quotient calculation for individual substances
- Carcinogenic risk for multiple substances
- Chronic hazard index for multiple substances
- Subchronic hazard index for multiple substances
- Shorter-term hazard index calculation for multiple substances
- Segregation of hazard indices
- Justification for combining risks across pathways
- Non-carcinogenic hazard index (multiple pathways)
- Carcinogenic risk (multiple pathways)

4.5.2. Future Land-Use Conditions
- Carcinogenic risk of individual substances
- Chronic hazard quotient calculation for individual substances
- Subchronic hazard quotient calculation for individual substances
- Shorter-term hazard quotient calculation for individual substances
- Carcinogenic risk for multiple substances
- Chronic hazard index for multiple substances
- Subchronic hazard index for multiple substances
- Shorter-term hazard index calculation for multiple substances

- Segregation of hazard indices
- Justification for combining risks across pathways
- Non-carcinogenic hazard index (multiple pathways)
- Carcinogenic risk (multiple pathways)

4.5.3. Uncertainties
- Site-specific uncertainty factors
- Definition of physical setting
- Model applicability and assumptions
- Parameter values for fate/transport and exposure calculations
- Summary of toxicity assessment uncertainty
- Identification of potential health effects
- Derivation of toxicity value
- Potential for synergistic or antagonistic interactions
- Uncertainty in evaluating less-than-lifetime exposures

4.5.4. Summary Discussion and Tabulation of Risk Characterization
- Key site-related contaminants and exposure pathways
- Types of health risks of concern
- Level of confidence in the quantitative information used to estimate risk
- Presentation of qualitative information on toxicity
- Confidence in the key exposure estimates for key exposure pathways
- Magnitude of the carcinogenic and non-carcinogenic risk estimates
- Major factors driving risk
- Major factors contributing to uncertainty
- Exposure human population characteristics
- Comparison with site-specific health studies

4.6. *Human Health Risk Assessment References*

5.0. **Ecological Risk Assessment**

5.1. *Problem Formulation*

5.1.1. Selection of Ecological COPCs (Screening Level ERA)
- Summary of Applicable Data Usability in Section 2.0
- Comparison of maximum soil, groundwater, surface water and sediment concentrations to screening or background levels
- Comparison of detection limits to screening levels
- Inclusion of bioaccumulative chemicals
- Final selection of ecological COPCs

5.2. *Ecological Setting*
- Climate
- Vegetation
- Soil types
- Surface water hydrology
- Ground water hydrology
- Detailed habitat descriptions

- List of species observed or expected to occur
- Discussion of special status species

5.2.1. Conceptual Site Model
- Environmental setting
- Ecological COPCs
- Contaminant sources
- Media receiving contamination on-and off-site
- Fate and transport of contaminants in media
- Potential exposure pathways
- Current and potential future receptors
- Conceptual model diagrams

5.2.2. Assessment Endpoints
- Description of management goals
- Identification of assessment endpoints linked to management goals

5.2.3. Analysis Plan
- Risk hypotheses or questions
- Identification of measures (including measures of effect, measures of exposure, and measures of ecosystem and receptor characteristics)
- Brief description of site-specific biota surveys or toxicity tests that were conducted (complete study reports should be included as attachments)
- Selection of representative receptors (for wildlife, typically one avian and one mammalian species from each of the feeding guilds that are expected to be most highly exposed)
- Specify data quality objectives
- Outline weight-of-evidence framework

5.2.4. Risk Analysis

5.2.4.1. Exposure Assessment
- Exposure concentrations
- Exposure parameters
- Methods for estimating tissue concentrations (measured or modeled)
- Uptake factors (if applicable)
- Ingested dose, hazard quotient, and other relevant equations

5.2.4.2. Effects Assessment
- Toxicity reference values (TRVs) for abiotic media to protect community-level receptors such as plants, terrestrial invertebrates, benthic invertebrates and aquatic life
- Dose-based TRVs for wildlife
- Critical body residue TRVs (if applicable)
- Dietary TRVs for fish and/or wildlife (if applicable)

5.2.5. Risk Characterization
- Description of hazard quotient calculation methods

- Discussion of risks for each line of evidence
- Spatial analysis of risks for receptor with limited mobility (e.g. plants, invertebrates)
- Background comparison for inorganic compounds
- Weight-of-evidence analysis

5.2.6. Uncertainty Analysis

- Discussion of qualitative magnitude and direction of each uncertainty (uncertainty tendency to underestimate or overestimate risks)
- Conceptual model
- Exposure model applicability and assumptions
- Exposure concentrations
- Exposure parameters
- Toxicity values
- Potential for synergistic or antagonistic interactions

5.2.7. Ecological Risk Assessment Conclusions

5.3. *Ecological Risk Assessment References*

6.0. **Summary**

7.0. **Conclusions**

Attachment II.4
Corrective Measures Study (CMS)
Scope of Work

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Corrective Measures Study (CMS)
Scope of Work

1.0. **Purpose**

The CMS is used to help determine which corrective measure is most appropriate for the facility. Sections 1.0 and 3.0 discuss the evaluation process for developing and recommending corrective measures alternatives. Section 4.0 and Section 5.0 outline contents of the CMS Work Plan and Report.

2.0. **Evaluation of the Corrective Measure Alternatives**

2.1. *Corrective Action Objectives*

Corrective action objectives for the facility should be established. These objectives should be based on public health and environmental criteria, information gathered during the RFI, EPA guidance, and the requirements of any applicable federal and state statutes. The objectives should include the facility-specific purpose for the corrective action, identifying actual and/or potential exposure pathways to be addressed. Objectives established during the RFI should be used in developing objectives for the CMS.

2.2. *Screening of Corrective Measures Technologies*

The CMS should include a preliminary assessment of technologies which may be applicable at the facility. Corrective measures technologies should be screened to eliminate those that may prove infeasible to implement, rely on technologies unlikely to perform satisfactorily or reliably, or do not achieve the corrective measure objectives within a reasonable time period. The screening process should focus on elimination of technologies which have severe limitations for a given set of waste and site-specific conditions. The screening step may also eliminate technologies based on inherent technology limitations. Reasons for excluding any technology should be documented. Site, waste, and technology characteristics used to screen inapplicable technologies are described in more detail below:

2.2.1. Site Characteristics

Site data should be reviewed to identify conditions that may limit or promote the use of certain technologies. Technologies that are clearly precluded by site characteristics may be eliminated from further consideration.

2.2.2. Waste Characteristics

A review of waste characteristics, including remediation waste, should be conducted. Identification of waste characteristics that limit the effectiveness or feasibility of technologies is an important part of the screening process. Waste characteristics particularly affect the feasibility of in-situ methods, direct treatment methods, and land disposal (on/off-site). Technologies clearly limited by site waste characteristics may be eliminated from consideration.

2.2.3. Technology Limitations

During the screening process, the level of technology development, performance

record, and inherent construction, operation, and maintenance problems should be identified for each technology considered. Technologies that are unreliable, perform poorly, or not fully demonstrated may be eliminated.

2.3. *Evaluation and Development of the Corrective Measure Alternatives*

Corrective measure alternatives should be developed based on the corrective action objectives and an analysis of the corrective measure technologies that pass the initial screening process. The corrective action alternatives developed in the CMS should represent a workable number of options that adequately address all site problems and corrective action objectives. Each alternative may consist of an individual technology or a combination of technologies. Technology descriptions and information used to support Respondent's evaluation of the alternative corrective measures should be included in the CMS Report. Reasons for excluding any technology should also be documented. The evaluation of alternatives should be based on technical, environmental, human health and institutional concerns. A cost estimate should be developed for each corrective measure alternative.

2.3.1. Technical/Environmental/Human Health/Institutional

Respondent should evaluate each alternative from a technical, environmental, human health and institutional standpoint, following the guidelines presented below.

2.3.1.1. Technical

Each corrective measure alternative should be evaluated based on performance, reliability, implementability and safety.

2.3.1.1.1. Performance should be evaluated based on the effectiveness and useful life of the corrective measure:

- Effectiveness should be evaluated in terms of the ability to perform intended functions, such as containment, diversion, removal, destruction, or treatment. The effectiveness of each corrective measure should be determined either through design specifications or by performance evaluation. Any specific waste or site characteristics which could potentially impede effectiveness should be considered. The evaluation should also consider the effectiveness of combinations of technologies.

- Useful life is defined as the length of time the level of desired effectiveness can be maintained. Most corrective measure technologies, with the exception of destruction, deteriorate with time. Often, deterioration can be slowed through proper system operation and maintenance, but the technology eventually may require replacement. Each corrective measure should be evaluated in terms of the projected service lives of its component technologies. Resource availability in the future life of each technology, as well as appropriateness of each technology, should be considered in estimating the useful life of the project.

2.3.1.1.2. The reliability of each corrective measure should be evaluated based on its operation and maintenance requirements and its demonstrated reliability:

- Operation and maintenance requirements include the frequency and complexity of necessary operation and maintenance. Technologies requiring frequent or complex operation and maintenance activities should be regarded as less reliable than technologies requiring little or straightforward operation and maintenance. The availability of labor and materials to meet these requirements should also be considered.

- Demonstrated and expected reliability is a way of measuring the risk and effect of failure. Respondent should evaluate whether the technologies have been used effectively under analogous conditions, whether the combination of technologies have been used together effectively, whether failure of any one technology has an immediate impact on receptors, and whether the corrective measure has the flexibility to deal with uncontrollable changes at the site.

2.3.1.1.3. The implementability of each corrective measure should be evaluated, including the relative ease of installation (constructability) and the time required to achieve a given level of response:

- Constructability is determined by conditions both internal and external to the facility and includes such items as location of underground utilities, depth to water table, heterogeneity of subsurface materials, and location of the facility (i.e., remote location vs. a congested urban area). Respondent should evaluate what measures can be taken to facilitate construction under these conditions. External factors which affect implementation include the need for special permits or agreements, equipment availability, and the location of suitable off-site treatment or disposal facilities.

- Components of time should be addressed: 1) the time it takes to implement a corrective measure and 2) the time it takes to see beneficial results. Beneficial results are defined as the reduction of contaminants to some acceptable, pre-established level.

- Respondent should evaluate each corrective measure alternative with regard to safety. This evaluation should include threats to the safety of nearby communities and environments as well as those to workers during implementation. Factors to consider are fire, explosion, and exposure to hazardous substances.

2.3.1.2. Environmental

An environmental assessment should be performed for each alternative. The environmental assessment should focus on the facility conditions and pathways of contamination actually addressed by each alternative. The environmental assessment for each alternative should include, at a minimum, an evaluation of the short- and

long-term beneficial and adverse effects of the response alternative, any adverse effects on environmentally sensitive areas, and an analysis of measures to mitigate adverse effects.

2.3.1.3. Human Health

Each alternative should be assessed in terms of the extent to which it mitigates short- and long-term potential exposure to any residual contamination and protects human health both during and after implementation of the corrective measure. The assessment should describe the concentrations and characteristics of the contaminants on-site, potential exposure routes, and the potentially affected population. Each alternative should be evaluated to determine the level of exposure to contaminants and the reduction over time. For management of mitigation measures, the relative reduction of impact should be determined by comparing residual levels of each alternative with existing criteria, standards, or guidelines acceptable to DEQ.

2.3.1.4. Institutional Needs and Controls

The relevant institutional needs for each alternative should be assessed. Specifically, those needs include the effects of federal, state and local environmental and public health standards, regulations, guidance, advisories, ordinances, or community relations on the design, operation, and timing of each alternative.

2.3.2. Cost Estimate

An estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative) should be developed. The cost estimate should include both capital, and operation and maintenance costs.

2.3.2.1. Capital Costs

Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs.

2.3.2.1.1. Direct capital costs include:

- Construction costs: Costs of materials, labor (including fringe benefits and worker's compensation), and equipment required to install the corrective measure;

- Equipment costs: Costs of treatment, containment, disposal and/or service equipment necessary to implement the action. These materials remain until the corrective action is complete;

- Land and site-development costs: Expenses associated with purchase of land and development of existing property; and

- Buildings and services costs: Costs of process and non-process buildings, utility connections, purchased services, and disposal costs.

2.3.2.1.2. Indirect capital costs include:

- Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives;
- Legal fees and license or Order costs: Administrative and technical costs necessary to obtain licenses and permits for installation and operation;
- Start-up and shakedown costs: Costs incurred during corrective measure start-up; and
- Contingency allowances: Funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strike, and inadequate facility characterization.

2.3.2.2. Operation and Maintenance Costs

Operation and maintenance costs are post-construction costs necessary to ensure continued effectiveness of a corrective measure. Respondent should consider the following operation and maintenance cost components:

- Operating labor costs: Wages, salaries, training, overhead, and fringe benefits associated with the labor needed for post-construction operations;
- Maintenance materials and labor cost: Costs for labor, parts, and other resources required for routine maintenance of facilities and equipment;
- Auxiliary materials and energy: Costs of such items as chemicals and electricity for treatment plant operations, water and sewer service, and fuel;
- Purchased service: Sampling costs, laboratory fees, and professional fees for which the need can be predicted;
- Disposal and treatment costs: Costs of transporting, treating, and disposing of waste materials, such as treatment plant residues, generated during operations;
- Administrative costs: Costs associated with administration of corrective measure operation and maintenance not included under other categories;
- Insurance, taxes, and licensing costs: Costs of such items as liability and sudden accident insurance; real estate taxes on purchased land or right-of-way; licensing fees for certain technologies; and hazardous waste regulatory fees and reporting costs;
- Maintenance reserve and contingency funds: Annual payments into escrow funds to cover (1) costs of anticipated replacement or rebuilding of equipment and (2) any large unanticipated operation and maintenance costs; and

- Other costs: items that do not fit any of the above categories.

2.3.3. Use of the Corrective Action Management Unit (CAMU)
As a part of any corrective measures alternative, the Permittee may propose designation of one or more remediation units under the provisions of 40 CFR 264, Subpart S. These units would include CAMUs, temporary units, and/or staging piles. Final designation of subpart S units is made by DEQ.

2.3.3.1. DEQ has designated the OLF as a Corrective Action Management Unit (CAMU). The CAMU may only be used to manage remediation wastes for implementation of corrective action at the facility under 40 CFR 264.101 and MCA 75-10-415 and 416. Management of remediation wastes is restricted to the footprint of the OLF.

3.0. **Recommending Corrective Measure(s)**
Once the evaluation process is complete, Respondent should justify and recommend a corrective measure alternative using technical, human health, and environmental criteria. This recommendation should include summary tables which allow the alternative or alternatives to be understood easily. Tradeoffs among health risks, environmental effects, and other pertinent factors should be highlighted.

3.1. *Technical Criteria*

3.1.1. Performance - corrective measure(s) which are most effective at performing their intended functions and maintaining the performance over extended periods of time are preferred;

3.1.2. Reliability - corrective measure(s) which do not require frequent or complex operation and maintenance activities and that have proven effective with wastes, and under facility conditions similar to those anticipated are preferred;

3.1.3. Implementability - corrective measure(s) which can be constructed and operated to reduce levels of contamination to attain or exceed applicable standards in the shortest period of time are preferred; and

3.1.4. Safety - corrective measure(s) which pose the least threat to the safety of nearby residents, environments and workers during implementation are preferred.

3.2. *Human Health Criteria*
The corrective measure(s) must comply with existing EPA and State of Montana criteria, standards, and/or guidelines for the protection of human health. Corrective measures providing the minimum level of exposure to contaminants and the maximum reduction in exposure with time are preferred.

3.3. *Environmental Criteria*
The corrective measure(s) posing the least adverse impact (or greatest improvement) on the environment over the shortest period of time are preferred.

4.0. **CMS Work Plan**

The CMS Work Plan must meet the requirements of Module II and should include the elements outlined in this Attachment. Other pertinent EPA guidance may be used in work plan development. The work plan should present facility-specific objectives for remediation and the methods Respondent will use to develop and evaluate appropriate corrective measure alternatives. The work plan should also present criteria to be used in determining which alternative best meets the objectives.

4.1. *Contents of the CMS Work Plan*

The CMS Work Plan should include:

- Corrective action objectives for the facility;
- Specific problems or areas to be addressed;
- A description of the general approach to investigating and evaluating potential remedies;
- A description of the specific remedies and/or technologies to be studied;
- A description of how each potential corrective measure(s) and/or technology will be evaluated, including identification of data gaps, implementation of pilot tests or bench studies, etc.; and
- A schedule for completion for all tasks included in the CMS Work Plan.

5.0. **CMS Report**

A Corrective Measures Study Report should be prepared which presents the results of the Corrective Measures Study and includes a recommendation for a corrective measures alternative.

5.1. *Report Content*

The Report should, at a minimum, include:

5.1.1. Site Description

A description of the facility, including a site topographic map. The description should include the current situation at the facility and the known nature and extent of the contamination as documented by the RFI Report, as well as any previous response activities and/or interim measures that have or are being implemented;

5.1.2. RFI Summary

A summary of the RFI and its impact on the selected corrective measure(s), including the following information:

- Field studies (ground water, surface water, soil, air);
- Summary of human health and ecological risk assessments, if performed; and
- Laboratory studies (bench scale, pilot scale).

5.1.3. Corrective Measures Alternatives

The discussion of the corrective measures alternative should include the following:

- Description of the corrective measure(s), the results of the evaluation, and rationale for selection. Each corrective measure evaluated should be described, including those that did not pass the initial screening;
- Performance expectations, including media cleanup levels, points of compliance and remediation timeframes;
- Preliminary design criteria and rationale;
- General operation and maintenance requirements; and
- Long-term monitoring requirements.

5.1.4. Design and Implementation Precautions:

- Special technical problems;
- Additional engineering data required;
- Permits and regulatory requirements;
- Access, easements, right-of-way, and other institutional controls;
- Health and safety requirements; and
- Community relations activities.

5.1.5. Cost Estimates:

- Capital cost estimate;
- Operation and maintenance cost estimate.

5.1.6. Schedules

- Project schedule (design, construction, and operation).

Attachment II.5
Scope of Work
Interim Measures (IM) and Corrective Measures Implementation (CMI) Outline

1.0 **Engineer Design**
- Treatment Systems
- Containment Systems
- Cover Systems
- Monitoring Networks
- Security

2.0 **Operation And Maintenance**
- Treatment Systems
- Containment Systems
- Cover Systems
- Monitoring Networks

3.0 **Monitoring And Performance Monitoring**
- Location
- Frequency
- Sampling and Analysis

4.0 **Waste Management**
- On-Site Management
- Sampling and Analysis
- Disposition

5.0 **Institutional And Land Use Controls**
- Requirements in Condition II.M
- Institutional and Land Use Control Plan
- Implementation schedule

6.0 **Health And Safety Plan**
- Same Requirements As Section 4.4 of Attachment II.2

7.0 **Schedule**
- Construction
- Operation
- Monitoring/Performance Monitoring
- Closure/Completion

8.0 **Remediation Goals**
- Description of Media Goals
- Time Frames for Achieving Goals

9.0 **Reporting**

- Types of Reports
- Reporting

10.0 **Public Participation**

- Major Changes to the Selected Corrective Measure(s)
- At Completion of Corrective Measure(s)

11.0 **Demonstration Of Financial Assurance And Cost Estimates**

- Cost Estimate for Corrective Measures Implementation
- Cost Estimate for Maintenance of Corrective Measures after Implementation

Attachment II.6
Compliance Schedule

Activity & Permit Condition(S)	Due Date
Compliance Reporting	
1. Notification of compliance or noncompliance with compliance schedules (Condition I.J.13.e.)	Within 14 calendar days of due date
2. Twenty-four hour reporting (Condition I.J.13.f.)	Oral notification within 24 hours; written notification within 5 calendar days
3. Other non-compliance (Condition I.J.13.h.)	Include in the next Progress Report
Newly Identified SWMUs/AOCs, and Newly Discovered Releases at Previously Identified SWMUs and AOCs	
4. Notification of newly identified SWMUs/AOCs or hazardous constituents (Conditions II.E.1. and II.F.1.)	Within 15 calendar days of discovery
5. Submittal of SWMU/AOC Assessment Report (Condition II.E.2.)	Within 90 calendar days of notification per Condition II.E.1. (see Item 4)
6. Notification of newly discovered releases at existing SWMUs and AOCs (Condition II.F.1.)	Within 15 calendar days of discovery
RCRA Facility Investigation	
7. Submittal of RFI Work Plan(s) for SWMUs and AOCs and Description of Current Conditions Report (Condition II.I.1.a. and Attachment II.2)	Within 60 days of notification by DEQ to proceed, or within a timeframe specified by DEQ.
8. Notification of RFI activities (Condition II.I.3.)	No less than 14 calendar days prior to start of activities.
9. Submittal of RFI Progress Reports (Condition II.I.4.)	In accordance with the approved RFI Work Plan
10. Submittal of Draft RFI Report (Condition II.I.5.a.i.)	In accordance with the approved RFI Work Plan
11. Submittal of Final RFI Report (Condition II.I.5.a.ii.)	Within 45 calendar days after receipt of DEQ comments on RFI Report
Interim Measures	
12. Submittal of IM Work Plan (Condition II.J.1.a.)	Within 30 calendar days of notification by DEQ to proceed under Conditions II.E. or II.F.
13. Notification of IM activities (Condition II.J.4)	No less than 14 calendar days prior to start of activities.
14. Submittal of IM Progress Reports (Condition II.J.5.)	In accordance with the approved IM Work Plan
15. Submittal of Draft IM Report (Condition II.J.6.a.i.)	In accordance with the approved IM Work Plan

Activity & Permit Condition(S)	Due Date
16. Submittal of IM Final Report (Condition II.J.6.a.ii.)	Within 45 calendar days after receipt of DEQ comments on IM Report

Activity & Permit Condition(S)	Due Date
Corrective Measures Study	
17. Submittal of CMS Work Plan (Condition II.K.1.a.i.)	Within the timeframe specified by DEQ.
18. Notification of CMS activities (Condition II.K.3.)	No less than 14 calendar days prior to start of activities.
19. Submittal of Draft CMS Report (Condition II.K.4.a.i.)	In accordance with the approved CMS Work Plan
20. Submittal of Final CMS Report (Condition II.K.4.a.ii.)	Within 45 calendar days after receipt of DEQ comments on draft CMS Report
Corrective Measures Implementation	
21. Submittal of CMI Work Plan (Condition II.M.1.a.)	Within 90 days of following permit modification to incorporate the remedy.
22. Notification of CMI activities (Condition II.M.3.)	No less than 14 calendar days prior to start of activities.
23. Implementation of Institutional and Land Use Controls (Condition II.M.1.b.i.)	In accordance with the CHS Institutional and Land Use Controls Plan
24. Submittal of CMI Progress Reports (Condition II.M.5.)	In accordance with the approved CMI Work Plan
25. Submittal of Five-Year Review Report (Condition II.M.8.)	By March 1, 2030 and five years following that date, until permit reissuance, termination, or another enforceable mechanism is issued.
26. Submittal of Corrective Measures Completion Certification Report (Condition II.N.2)	Within 45 calendar days of completion of Corrective Measures
27. Institutional and Land Use Controls – Survey Plat (Condition II.M.6.c.i.)	In accordance with the CHS Institutional and Land Use Controls Plan
28. Documentation/Certification of Survey Plat filing to Department (Condition II.M.6.d.)	Within 30 calendar days of submitting a survey plat to the local zoning authority or authority with jurisdiction over local land use, and county planner.

MODULE III
GROUNDWATER MONITORING FOR THE OLD LANDFARM

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Attachments

MODULE III
GROUNDWATER MONITORING FOR THE OLD LANDFARM

III.A. **Applicability**

III.A.1. The requirements of this Module pertain to the regulated unit identified in Condition I.C.2.

III.A.1.a. At the time of permit issuance, the regulated unit is in corrective action monitoring, in accordance with the requirements under Condition III.H.

III.A.2. Permit modification provisions under Condition I.K. must be followed for modifications to groundwater monitoring requirements, including specific monitoring well placement.

III.A.3. As required in 40 CFR 264.90(c) and 270.14(c), the regulations under 40 CFR 264, Subpart F and the conditions in Module III apply during the active life of the regulated unit, including the closure period, and the compliance and post-closure periods.

III.B. **Groundwater Monitoring Network**

The monitoring wells described in this condition comprise the compliance monitoring network in conjunction with the corrective action monitoring program for the regulated unit. The network is shown in Attachment III.1.

III.B.1. *Point of Compliance Wells*

Wells CEN- 26, CEN-27, CEN-28 and CEN-29 and CEN-11A define the point of compliance (POC) monitoring wells.

III.B.2. *Background Wells*

Wells CEN-12 and CEN-15 define the upgradient/background monitoring wells.

III.B.2.a. Groundwater quality data submitted as background data must be based on samples from a well that is:

III.B.2.a.i. Upgradient at all times from any hazardous waste management area;

III.B.2.a.ii. Not threatened by possible contamination;

III.B.2.a.iii. Can provide a representative sample of background water quality for the aquifer monitored by the existing network; and

III.B.2.a.iv. Approved by DEQ.

III.B.3. *Assessment Wells*

Wells RT-11, RT-12, PZ-2A, and MW-66 must be used as assessment wells to monitor potential downgradient migration of hazardous constituents from the

regulated unit.

III.B.3.a. Well MW-66 serves as an assessment well for the LTU, and as a monitoring well within the facility-wide corrective action program for groundwater in Module II.

III.B.3.a.i. After installation, MW-66 must be sampled on a quarterly basis. If, after one year, PHC concentrations are below permit concentration limits listed in Attachment III.2, Table 2, the Permittee may sample the new assessment well on the schedule set forth in Attachment III.2, Table 1 for all assessment wells.

III.B.4. *LNAPL Recovery Wells*
Wells RW-8, RW-9, RW-10, RW-11, and CEN-26 must be used as recovery wells for the retrieval of Light Non-Aqueous Phase Liquid (LNAPL) at the downgradient edge of the regulated unit.

III.B.4.a. Other monitoring and/or recovery wells may be used as recovery wells for LNAPL, as necessary.

III.B.4.b. DEQ must be given written notification when additional wells in the monitoring network are used for LNAPL recovery.

III.C. **Required Programs**

III.C.1. *Monitoring and Response Program Requirements*
The Permittee shall conduct a monitoring and response program as follows for all units subject to these provisions:

III.C.1.a. Whenever one or more hazardous constituents under 40 CFR 264.93 are detected at or above the permit concentration limits at the compliance point(s) defined in Condition III.B.1. and III.B.3., the Permittee shall institute a compliance monitoring program, as defined in 40 CFR 264.99 and Condition III.G.;

III.C.1.b. Whenever the groundwater protection standard under 40 CFR 264.92 and Condition III.D. is exceeded, the Permittee shall institute a corrective action program under 40 CFR 264.100 and Condition III.H.;

III.C.1.c. Whenever hazardous constituents under 40 CFR 264.93 exceed permit concentration limits under Condition III.D. in groundwater between the compliance point(s) defined in Condition III.B.1., III.B.3., and the downgradient facility property boundary, the Permittee shall institute a corrective action program under 40 CFR 264.100 and Condition III.H.; or

III.C.1.d. In all other cases, the Permittee shall institute and maintain a detection monitoring program under 40 CFR 264.98 and Condition III.F.

III.C.2. *Response Program at Permit Issuance*
At the time of permit issuance, DEQ has determined that monitoring evidence

indicates groundwater contamination from the regulated unit. The Permittee is required to maintain a corrective action program as set forth in 40 CFR 264.100 and Condition III.H.

III.D. **Groundwater Protection Standard**

DEQ shall establish groundwater protection standards for each hazardous constituent that has entered groundwater at the time evidence indicates that hazardous constituents have entered groundwater beneath a regulated unit. DEQ shall also determine the hazardous constituents, as defined in 40 CFR 264.93, to which the groundwater protection standard applies; the concentration limits as defined in 40 CFR 264.94; the point(s) of compliance under 40 CFR 264.95; and the compliance period under 40 CFR 264.96.

III.D.1. *Groundwater Protection Standard for the Regulated Unit*

The groundwater protection standard, as established by DEQ, is comprised of Hazardous Constituents, Permit Concentration Limits, and the Point of Compliance, described as follows:

III.D.1.a. Principal Hazardous Constituents (PHC)

PHCs listed in Attachment III.2, Table 2, and any additional hazardous constituents detected in groundwater after this permit is issued.

III.D.1.b. Permit Concentration Limits (PCL)

Permit concentration limits (PCL) for the hazardous constituents listed in Attachment III.2, Table 2.

III.D.1.b.i. Point of Compliance Wells

If, in any sampling event, analysis shows concentrations of any PHC higher than its PCL listed in Attachment III.2, Table 2 for Point of Compliance Wells, the concentration limit will be exceeded.

III.D.1.b.ii. Assessment Wells

If, in any sampling event, analysis shows concentrations of any PHC higher than its PHC concentrations listed in Attachment III.2, Table 2 for Assessment Wells, the concentration limit will be exceeded.

III.D.1.c. Point of Compliance

The compliance monitoring network as defined in Condition III.B.

III.D.2. *Other Requirements and Standards*

III.D.2.a. If a PHC listed in Attachment III.2, Table 2 is identified and the difference between the permit concentration limit listed in Attachment III.2, Table 2 and the background value of that constituent is not statistically significant, the background value of the constituent will be used as the concentration limit.

III.D.2.b. If analysis shows detection of an analyte not included in the PHC list in Attachment III.2, Table 2, DEQ may add the analyte to the PHC list for future sampling events and/or require re-sampling for the detected analyte. An analyte is detected when its concentration is at or above the MDL (for an inorganic analyte) or EQL (for an organic analyte).

III.D.2.c. The Permittee may request a modification to eliminate any compound from the list of PHCs in Attachment 2, Table 2, if the Permittee can demonstrate through sampling that elimination of a specific PHC is warranted.

III.E. **General Monitoring Requirements**

III.E.1. *General*

The Permittee shall comply with the following general requirements for groundwater monitoring.

III.E.1.a. The groundwater monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that represent both the quality of background water that has not been affected by leakage from a regulated unit and the quality of groundwater passing the point of compliance.

III.E.1.b. The groundwater monitoring programs must include consistent sampling and analysis procedures defined in 40 CFR 264.97(d) and Condition III.E.5.

III.E.1.c. The Permittee shall measure groundwater surface elevation as specified in Condition III.E.5.d.

III.E.1.d. The Permittee shall determine whether permit concentration limits have been exceeded pursuant to Condition III.G.4.b.

III.E.2. *Requirements for Well Maintenance, New Wells and Well Closure*

III.E.2.a. Existing Wells

The monitoring wells in the compliance and assessment network shown in Attachment III.1 must be fully operational for the duration of this Permit. Unless otherwise specified in the corrective action plan, well integrity of all monitoring wells listed in Condition III.B. must be monitored by the Permittee and reported to DEQ according to the following schedule:

III.E.2.a.i. Well depths must be measured at least once a year; and

III.E.2.a.ii. A visual well inspection for evidence of well damage must be performed every sampling event.

III.E.2.b. Construction, Development and Maintenance Requirements

III.E.2.b.i. All new monitoring wells must be constructed in accordance with the provisions in 40 CFR 264.97(c) and this condition. New well construction, development,

and maintenance must follow the techniques described in the Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, September 1986 unless the Permittee can demonstrate to DEQ that an alternative technique is appropriate for protection of human health and the environment.

III.E.2.b.ii. The Permittee shall submit well plans and specifications to DEQ for approval forty-five (45) days prior to well installation or at the time of a permit modification request. DEQ shall approve in writing the number and location of new wells prior to installation.

III.E.2.b.iii. All monitoring wells must be cased to maintain the integrity of the monitoring well bore hole. This casing must be screened or perforated and the annular space packed with gravel or sand where necessary above the sampling depth. The new well must be sealed to prevent contamination of samples and the groundwater.

III.E.2.c. Submittals After Well Installation

The Permittee shall submit monitoring well completion reports which include boring logs, sieve analysis (grain size) and standard penetration tests if performed, results from all analytical tests performed on soils (Atterberg limits, etc.), water level elevations, water contour maps including the latest surveyed wellhead reference elevations, well development results including recharge rates, cross sections or fence diagrams and all other pertinent data within ninety (90) calendar days after completing well installation.

III.E.2.d. Additional Saturated Zone Monitoring Wells

Additional saturated zone monitoring wells must be installed to maintain compliance if subsurface conditions significantly change or if DEQ's or Permittee's understanding of subsurface conditions significantly changes after permit issuance. Such changes may include but are not limited to, water level elevation or apparent flow direction changes, or detection of organic constituents in a well. DEQ may require the Permittee to install and sample additional wells at any time during post-closure or compliance periods if new information or unforeseen circumstances reveal a need for additional monitoring to protect human health and the environment.

III.E.2.e. Monitoring Requirements for New Monitoring Wells

For newly constructed monitoring wells, the Permittee shall conduct the following:

III.E.2.e.i. At least one evaluation of PHC parameters listed in Attachment III.2, Table 2 immediately following completion of the well(s). Monitoring for PHCs must begin the next sampling event following installation of the well(s). If hazardous organic constituents are detected above permit concentration limits, the Permittee shall follow the protocol in Condition III.G.4.; and

III.E.2.e.ii. One year of quarterly sampling for all water quality indicator parameters listed in Attachment III.2, Table 2.

III.E.2.f. Improperly Operating Monitoring Wells
The Permittee shall notify DEQ when a well is no longer properly functioning (including a marked change in pumping rate, presence of sandy or silty materials, and cracked or broken casings) or when the Permittee intends to close one or more wells associated with the regulated unit. DEQ shall specify the conditions for replacement or correction of improperly operating well(s).

III.E.3. *Analytical Definitions and Monitoring Parameters*

III.E.3.a. Analytical Definitions
Analytical definitions used in this Module are found in Condition I.J.10.b.

III.E.3.b. Monitoring Parameters
The following parameters must be used for groundwater monitoring of the OLF.

III.E.3.b.i. Principal Hazardous Constituents (PHCs)

III.E.3.b.i.1. PHCs for groundwater monitoring consist of organic and inorganic constituents listed in Attachment III.2, Table 2. PHCs in Table 2 include constituents on the Modified Skinner List commonly found in refinery waste, light non-aqueous phase liquids (LNAPL) and other compounds detected during groundwater monitoring of the regulated unit and during facility-wide corrective action activities required under Module II. PHCs must be evaluated as outlined in Conditions III.G. and III.H., and the condition below.

(i) In the event PHCs are detected in soils below the treatment zone of the OLF or in groundwater, DEQ may require the Permittee to analyze for a more extensive list of constituents.

III.E.3.b.i.2. Water Quality Indicator and Field Parameters
Water quality indicator and field parameters are listed in Attachment III.2, Table 2 and must be measured during each monitoring event.

III.E.3.b.i.3. Appendix IX Constituents
Appendix IX constituents are listed in Attachment III.2, Table 3. Constituents in Table 3 are derived from Appendix IX to 40 CFR Part 264 – Groundwater Monitoring List. The Appendix IX list may be modified under Condition III.G.3.d.iii. Annual sampling for Appendix IX compounds may be suspended while the regulated unit is under a corrective action groundwater monitoring program.

III.E.4. *Background Groundwater Quality*

III.E.4.a. Background groundwater concentrations of organic PHCs in the aquifer underlying the regulated unit are based on previous sampling that showed below-detection levels in upgradient wells. Background levels for all other organic

hazardous constituents are assumed to be below detection, i.e. lower than the groundwater protection standard established in Condition III.D.

III.E.4.b. Background groundwater concentrations of inorganic PHCs in the aquifer underlying the regulated unit are based on previous sampling of inorganic compounds in upgradient wells.

III.E.4.c. The Permittee may petition DEQ to modify the background data, based on future monitoring results obtained during the term of this Permit. The Permittee may use analytical data collected from a background well that meets the requirements of Condition III.B.2.a.

III.E.5. *Sampling and Analysis Procedures*
The Permittee shall consistently sample and analyze groundwater pursuant to a monitoring program designed to ensure reliable monitoring results of groundwater quality near the regulated unit.

III.E.5.a. General
Groundwater samples must be sampled and analyzed according to the methods and procedures specified in Attachment III.2, Table 2, Attachment III.3, and SW-846 in addition to the following:

III.E.5.a.i. The Permittee shall monitor all wells listed in Condition III.B. in accordance with the Groundwater Sampling and Analysis Plan in Attachment III.3;

III.E.5.a.ii. If bailers are used, bailer rope must be as specified in the TEGD and changed each time a bailer is used. Bailers must be rinsed with solvent following the distilled water rinse in accordance with the TEGD; and

III.E.5.a.iii. At least one set of field replicates, one field blank, one trip blank when sampling for volatiles, and one laboratory blank per 20 field samples must be included for each sampling event.

III.E.5.b. Sampling Schedule
III.E.5.b.i. The groundwater monitoring wells listed in Condition III.B.1. through III.B.3. (POC, background, and assessment wells) must be monitored according to the schedule in Attachment III.2, Table 1.

III.E.5.c. Water Quality
The Permittee shall monitor all water quality indicator and field parameters listed in Attachment III.2, Table 2 during each sampling event at each monitoring well.

III.E.5.c.i. The Permittee shall determine whether there has been a significant change at each monitoring well for each parameter described in Attachment III.2, Table 2 by simple comparison to historical data presented in previous annual reports. The Permittee shall include an analysis of each of the parameters with each sampling

report, with data assembled in an understandable form.

III.E.5.d. Groundwater Elevation and Flow Rate

III.E.5.d.i. The Permittee shall determine the groundwater surface elevation using the methods and procedures outlined in Attachment III.3 for each monitoring well at the regulated unit for each sampling event unless otherwise instructed by DEQ.

III.E.5.d.ii. The Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer during spring runoff and during high and low groundwater season. Flow rate and direction must be determined using the methods and procedures outlined in Attachment III.3. Updated groundwater contour maps must be included in the Annual Soil and Groundwater Monitoring Report as required by Conditions I.P.4.f.i.

III.E.6. *Permit Modification*

III.E.6.a. If the Permittee or DEQ determines the corrective action program for the regulated unit no longer satisfies the requirements of this permit or applicable regulations, the Permittee shall, within ninety (90) calendar days after the determination, submit an application for a permit modification to make appropriate changes to the program.

III.E.6.b. The Permittee shall take monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard under Condition III.D. during the term of permit modification and any plan approval by DEQ.

III.E.7. *Recordkeeping*

The Permittee shall enter all monitoring, testing, and analytical data into the operating record as required by Condition I.P.1.

III.E.8. *Reporting Requirements*

III.E.8.a. Annual Soil and Groundwater Report

A groundwater report for the previous calendar year must be included in the Annual Soil and Groundwater Report. The report must include the information set forth in Condition I.P.4.f.i.

III.E.8.b. Sampling Event Reports

The Permittee shall follow notification and reporting requirements in Condition III.G.4.c. when a determination is made that there has been a statistically significant increase in PHCS in accordance with Condition III.G.4.b.

III.E.8.c. Annual Corrective Action Effectiveness Report

III.E.8.c.i. The Permittee shall report annually in writing to DEQ on the effectiveness of the corrective action program. The corrective action effectiveness report may be included in the Annual Soil and Ground Water Monitoring Report. The report must include the information set forth in Condition I.P.4.f.iii.

III.E.8.d. OLF Progress Summary in Module II Reports
The Permittee shall include a progress summary of any corrective action, and closure and/or post-closure activities at the OLF in the RFI, IM, and/or CMI Progress Reports.

III.F. **Detection Monitoring Requirements**
The Permittee shall submit a permit modification to return the regulated unit to detection monitoring, if groundwater monitoring indicates the need.

III.G. **Compliance Monitoring Requirements**
At the time of permit issuance, the regulated unit is under the Corrective Action Program described in Condition III.H. In accordance with Condition III.H., the Permittee shall maintain a groundwater monitoring program based on the requirements of Conditions III.G. and III.H.

III.G.1. *Groundwater Protection Standard*
The compliance monitoring program applies to all wells identified in Condition III.B. and must extend throughout the compliance period as defined in Condition III.G.2. The Permittee shall monitor the groundwater to determine whether the regulated unit is in compliance with the groundwater protection standard as defined under Condition III.D.

III.G.2. *Compliance Period*
The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting and the closure period). The Permittee shall ensure monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard are taken during the compliance period.

III.G.2.a. If the Permittee is engaged in a corrective action program at the end of the compliance period, the compliance period is extended until the Permittee can demonstrate that the groundwater protection standard of Condition III.D. has not been exceeded for a period of three consecutive years.

III.G.3. *Sampling and Analysis for Compliance Monitoring*
III.G.3.a. Sampling Schedule
The Permittee shall conduct sampling in accordance with Condition III.E.5., the monitoring schedule in Attachment III.2, Table 1, and the Groundwater Sampling and Analysis Plan in Attachment III.3.

III.G.3.b. Analytical Requirements
The Permittee must analyze samples for:

III.G.3.b.i. Inorganic and organic compounds listed in Attachment III.2, Table 2; and

III.G.3.b.ii. Any additional hazardous constituents DEQ determines to be appropriate. Should

DEQ make such a determination, DEQ shall notify the Permittee, in writing, of additional monitoring requirements.

III.G.3.c. LNAPL Thickness

III.G.3.c.i. LNAPL thickness must be determined in all monitoring and recovery wells during each sampling event.

III.G.3.d. Appendix IX Sampling

Annual sampling for Appendix IX constituents may be suspended for the duration of a corrective action program under Condition III.H.

III.G.3.d.i. Should the regulated unit return to a compliance monitoring program, the Permittee shall analyze samples from monitoring wells identified in Condition III.B. for all constituents contained in the amended Appendix IX list in Attachment III.2, Table 3. Appendix IX sampling must be conducted annually to determine whether additional hazardous constituents are present in the uppermost aquifer.

III.G.3.d.ii. If the Permittee finds Appendix IX constituents in the groundwater that are not identified in the Permit as PHCs, the Permittee shall report the concentrations of the additional constituents to DEQ within seven (7) calendar days after the date the Permittee or a representative receives the analytical results. The Permittee may follow the Compliance Monitoring Protocol in Condition III.G.4. for resampling and notification. If the repeat sampling and evaluation protocol indicates the presence of Appendix IX constituents in the groundwater that are not PHCs, those new constituents must be added to the PHC list in Attachment III.2, Table 2.

III.G.3.d.iii. The Permittee may petition DEQ for a modification of the Appendix IX list in Attachment III.2, Table 3. The petition must contain a list of Appendix IX compounds or groups of compounds detected in the groundwater or reasonably expected to be found in or derived from waste contained in the regulated unit. A justification for elimination of any compound from the annual Appendix IX monitoring requirement must also be included.

III.G.4. *Compliance Monitoring Protocol*

III.G.4.a. Repeat Sampling

For any well where one or more hazardous constituents are found at or above the groundwater protection standard as shown in Attachment III.2, Table 2 (a critical value), the well must be re-sampled within thirty (30) calendar days after the Permittee receives the information, unless DEQ has determined a re-sampling is unnecessary.

III.G.4.a.i. The Permittee may choose to re-sample immediately upon receipt of initial data results which indicate the concentrations or presence of PHCs have reached a critical value.

III.G.4.a.ii. Re-sampling need only take place for those compounds and at those wells where critical values are indicated. Water Quality Indicator Parameters (Attachment III.2, Table 2) and static water level measurements must also be taken during every repeat sampling event.

III.G.4.a.iii. Original sample and re-sample data must be provided to DEQ within thirty (30) calendar days after the Permittee receives the analytical results.

III.G.4.a.iv. Once the monitoring data has been submitted to DEQ, the Permittee may investigate, under Condition III.G.4.d., whether the contamination comes from a source other than the regulated unit.

III.G.4.b. Determining Statistically Significant Increases of Hazardous Constituents
The Permittee shall determine whether there is a statistically significant increase over the permit concentration limit for each PHC each time the concentration of hazardous constituents is determined at a monitoring well.

III.G.4.b.i. A statistically significant increase for inorganic and organic compounds must be determined as follows:

III.G.4.b.i.1. If a hazardous constituent is detected in a well that showed no concentration of that constituent in the previous sampling event, a statistically significant increase for that constituent must be any value greater than the concentration limit for that constituent as defined in Condition III.D.1.b.; and/or

III.G.4.b.i.2. If a hazardous constituent is detected in a well that had measured concentrations of that parameter in previous sampling events, a statistically significant increase for that parameter must be any value greater than the concentration limit as defined in Condition III.D.1.b. and that value determined to be the upper tolerance limit with 95% coverage as calculated using the procedure outlined in Attachment III.4 or using an alternative statistical test approved by DEQ.

III.G.4.b.ii. The presence of LNAPL in assessment wells shall be considered a statistically significant increase and the Permittee shall follow the requirements of Conditions III.G.4.c and/or III.G.4.d.

III.G.4.c. Actions Upon Determination of Statistically Significant Increases
If, after evaluation of sampling and re-sampling results, the Permittee determines there has been a statistically significant increase under Condition III.G.4.b. for any hazardous constituent at any monitoring well he or she shall:

III.G.4.c.i. Notify DEQ of this finding in writing within seven (7) calendar days of receipt of re-sampling analytical results. The notification must indicate which concentration limits have been exceeded.

III.G.4.c.ii. Within 30 days of notification in Condition III.G.4.c.i., submit a report to DEQ for approval that includes:

III.G.4.c.ii.1. Analytical reports containing the information listed in Condition I.J.10.c. and any additional analysis and evaluation deemed appropriate by the Permittee to explain any exceedances of permit concentration limits of PHCs;

III.G.4.c.ii.2. Any compound not listed in Attachment III.2, Table 2 but detected during analysis;

III.G.4.c.ii.3. A determination of whether there has been a statistically significant increase in PHCs as defined in Condition III.G.4.b.;

III.G.4.c.ii.4. A discussion of possible causes of the increase; and

III.G.4.c.ii.5. A detailed description of how the corrective action plan under Condition III.H. will be modified to achieve compliance with the groundwater protection standard specified in Condition III.D., and a plan for a groundwater monitoring program that will demonstrate the effectiveness of the modified plan; or

III.G.4.c.ii.6. Justification for continuation of the current corrective action plan without modification.

III.G.4.d. Demonstration of Contamination from Another Source
The Permittee may demonstrate that a source other than a regulated unit caused the increase or that the increase resulted from error in sampling, analysis, or evaluation. The Permittee is not relieved of the burden of submitting notification and reports under Condition III.G.4.c. unless the demonstration successfully shows that a source other than a regulated unit caused the increase or that the increase resulted from error in sampling, analysis, or evaluation. In making a demonstration, the Permittee shall:

III.G.4.d.i. Notify DEQ in writing within seven (7) calendar days after determining a statistically significant increase under Condition III.G.4.b. that the Permittee intends to make a demonstration under this paragraph;

III.G.4.d.ii. Within ninety (90) calendar days after determining a statistically significant increase under Condition III.G.4.b., submit a report to DEQ which demonstrates that a source other than the regulated unit caused the increase, or that the increase resulted from error in sampling, analysis or evaluation;

III.G.4.d.iii. Within ninety (90) calendar days after determining a statistically significant increase under Condition III.G.4.b., submit to DEQ an application for a permit modification and plan to make any appropriate changes to the compliance monitoring program at the facility; and

III.G.4.d.iv. Continue to monitor in accordance with the compliance monitoring program established under this section (Section V.G).

III.G.4.e. Changes to the Compliance Monitoring Program
If the Permittee determines the compliance monitoring program no longer satisfies the requirements of this section, he or she shall, within ninety (90) calendar days from the determination, submit an application for a plan approval and permit modification to make any appropriate changes to the program.

III.H. **Corrective Action Requirements**
Groundwater monitoring at the regulated unit has demonstrated contamination in downgradient POC wells. The Permittee has established a corrective action program which includes a groundwater monitoring program based on the requirements for a compliance monitoring program under 40 CFR 264.99, Condition III.G., Condition III.H., and in accordance with the monitoring schedule outlined in Attachment III.2, Table 1.

III.H.1. *Standard Requirements for a Corrective Action Program*
A groundwater corrective action program is required to remediate groundwater contamination at permitted facilities in accordance with 40 CFR 264.100, and 40 CFR 270.14(c)(8)(iii).

III.H.1.a. If a groundwater corrective action program is required, the Permittee shall:

III.H.1.a.i. Take corrective action to ensure the regulated unit is in compliance with the groundwater protection standard under Condition III.D.;

III.H.1.a.ii. Implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance points by removing the hazardous constituents or treating them in place; and

III.H.1.a.iii. Begin corrective action within a reasonable time specified by DEQ.

III.H.1.b. In conjunction with a corrective action program, the Permittee shall establish and implement a groundwater monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program must be based on the requirements for a compliance monitoring program under 40 CFR 264.99.

III.H.2. *Current Status of the Corrective Action Program*
DEQ has approved a detailed corrective action plan, submitted by the Permittee, for controlling releases from the regulated unit. This plan is contained in the Ground Water Corrective Action Plan (GWCAP) submitted by CHS on December 2, 1994, and revised on June 23, 1997. The plan includes a summary of the results of a study of alternatives for controlling off-site releases, a recommendation of the types of controls to be installed and a plan for implementing controls.

III.H.2.a. DEQ has approved Alternative 7 - Oil Barrier/Passive LNAPL Recovery as the selected corrective action remedy. The selected remedy has been installed and is operational at permit issuance. The remedy consists of a bentonite slurry barrier wall placed at the downgradient edge of the regulated unit, groundwater monitoring wells, and NAPL-recovery wells.

III.H.3. *General Requirements for Corrective Action*

III.H.3.a. Appendix IX Sampling

The requirement for annual Appendix IX sampling may be suspended while the regulated unit is under a corrective action program.

III.H.3.b. Light Non-Aqueous Phase Liquid (LNAPL) Recovery

III.H.3.b.i. Active recovery is defined, for the purposes of this permit, as pumping or skimming LNAPL from groundwater monitoring and recovery wells. The Permittee shall initiate active recovery from the monitoring wells listed in Condition III.B.1. and recovery wells listed in Condition III.B.4. whenever LNAPL thickness is greater than:

III.H.3.b.i.1. One (1) foot in any groundwater monitoring well; and/or

III.H.3.b.i.2. Greater than 0.5 feet in recovery wells.

III.H.3.b.ii. The Permittee may initiate passive recovery activities, such as periodic bailing or use of hydrophobic socks, when LNAPL thickness is:

III.H.3.b.ii.1. Less than 1 foot in any groundwater monitoring well for two consecutive seasonal low groundwater LNAPL bail-down tests; and/or

III.H.3.b.ii.2. Less than 0.5 feet in recovery wells for four (4) consecutive semiannual well gauging events.

III.H.3.c. Maintenance of Wells for LNAPL Recovery

III.H.3.c.i. Wells recovering LNAPL must be maintained in optimum operable condition.

III.H.3.c.ii. Recovery systems must be cleaned and inspected when removed for repairs or adjustment, or when transferred to another monitoring or recovery well.

III.H.3.d. Corrective Action during the Compliance Period

The Permittee shall continue corrective action measures during and beyond the compliance period for as long as necessary to achieve compliance with the groundwater protection standard. If the Permittee is conducting a corrective action at the end of the compliance period, corrective action must be continued for as long as necessary to achieve compliance with the groundwater protection standard. The Permittee may terminate corrective action measures taken beyond the period equal to the active life of the waste management area (including the

closure period) if the Permittee can demonstrate, based on data from the groundwater monitoring program, that the groundwater protection standard of Condition III.D. has not been exceeded for a period of three (3) consecutive years.

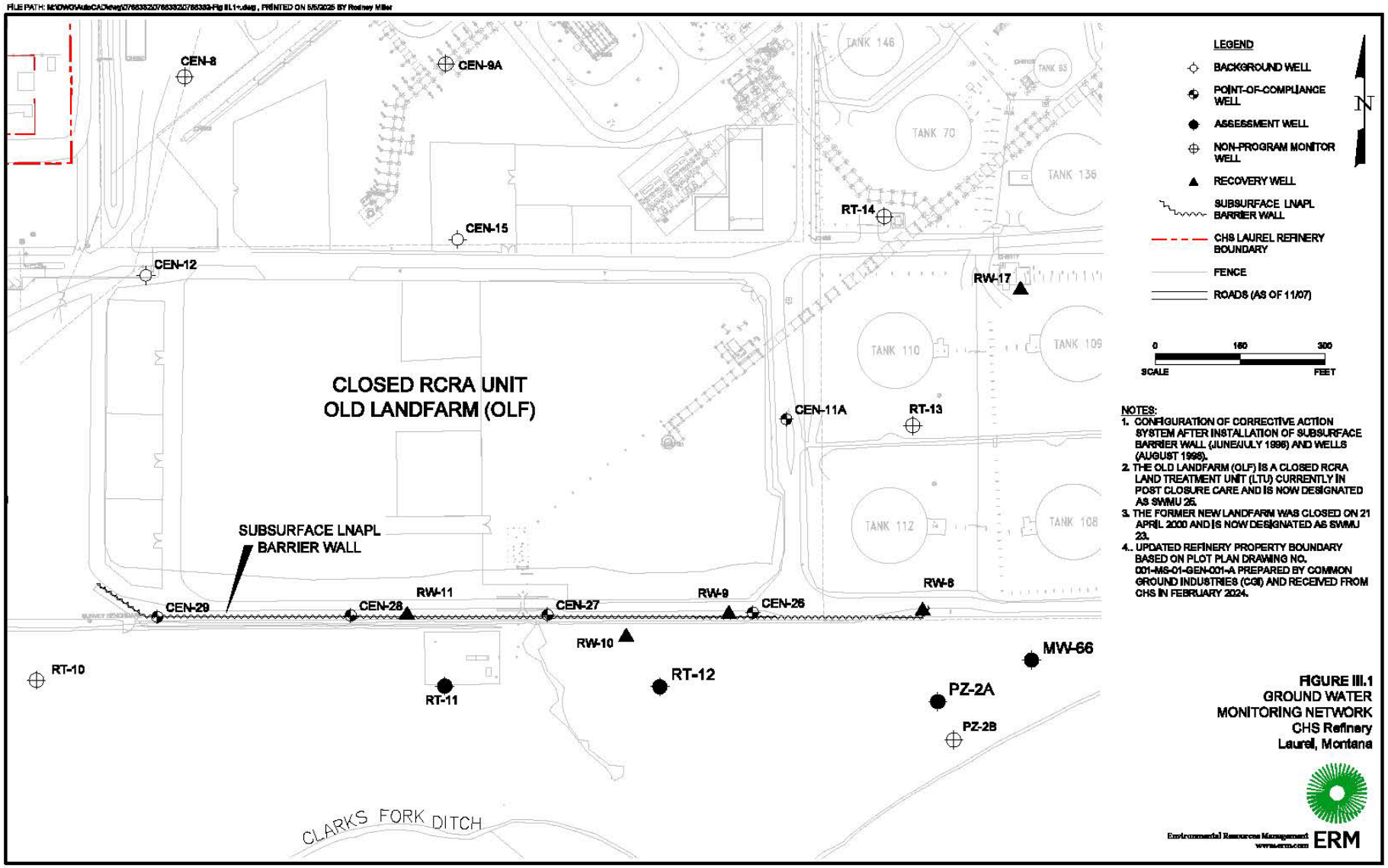
III.H.3.e. Modification of the Corrective Action Plan

If the Permittee determines a corrective action program is no longer needed or no longer satisfies the requirements of this section, he or she shall, within ninety (90) calendar days from that determination, submit a permit modification request to DEQ in accordance with Condition I.K.3. The written modification request must include a copy of the amended corrective action plan which is subject to approval by DEQ.

III.I. **Closure/Post-Closure**

During the closure and post-closure periods, the Permittee shall follow the requirements of Module IV (Closure and Post-Closure) for groundwater monitoring.

Attachment III.1
Groundwater Monitoring Network



Attachment III.2
Groundwater Monitoring Schedule and Parameters

Table 1: OLF Groundwater Monitoring Schedule
Table 2: OLF Groundwater Monitoring Parameters
Table 3: Amended Appendix IX Groundwater Monitoring List

Attachment III.2
Table 1
OLF Groundwater Monitoring Schedule

Monitoring Wells	**Sample Frequency**	**Monitoring Parameters**	
		Water Quality Indicator and Field Parameters	**PHCs and LNAPL**
• Background • Point of Compliance (Conditions III.B.1., III.B.2., III.B.4.)	Semi-Annually	– Depth to Water – Depth to Product – pH – SC – Temperature – DO – ORP	– LNAPL Recovery Volume[1] – Volatiles
	Annually (Spring)		– Semi-Volatiles – Metals
• Recovery (Condition III.B.4.)	Semi-Annually		– LNAPL Recovery Volume[1]
• Assessment (Condition III.B.3.)	Semi-Annually	– Depth to Water – Depth to Product – pH – SC – Temperature – DO – ORP	– Volatiles – LNAPL
	Annually (Spring)		– Semi-Volatiles – Metals
• All Wells	Semi-Annually	Total Well Depth	Not applicable

Notes
[1] As per condition III.H.3.b., LNAPL volume must be measured at totalizing flow meter on oil recovery tank piping system, or by other appropriate methods. LNAPL recovery volume must be reported for the duration of the corrective action program.
DO – Dissolved Oxygen
LNAPL – Light Non-Aqueous Phase Liquid
PHC – Principal Hazardous Constituent
ORP – Oxidation-Reduction Potential
SC – Specific Conductance

Attachment III.2
Table 2
OLF Groundwater Monitoring Parameters

Principle Hazardous Constituents	CAS No.	SW-846 Method	Detection Limit (µg/L)	Permit Concentration Limit (µg/L)	
				Point of Compliance Wells	Assessment Wells
Inorganic Hazardous Constituents					
Antimony	7440-36-0	6020	1.0	50	6
Arsenic	7440-38-2	6020	1.0	50[(a)]	22[(c)]
Barium	7440-39-3	6020	1.0	1,000[(a)]	1,000
Beryllium	7440-41-7	6020	1.0	50	4
Cadmium	7440-43-9	6020	1.0	10[(a)]	5
Chromium (total)	7440-47-3	6020	1.0	50[(a)]	100
Cobalt	7440-48-4	6020	1.0	50	6[(d)]
Copper	7440-50-8	6020	1.0	60	1,300
Lead	7439-92-1	6020	0.5	50[(a)]	15
Mercury	7439-97-6	7471/7470	0.04	2[(a)]	2
Nickel	7440-02-0	6020	0.5	50	100
Selenium	7782-49-2	6020	0.5	14[(b)]	50
Silver	7440-22-4	6020	1.0	50[(a)]	100
Thallium	7440-28-0	6020	1.0	50	2
Vanadium	7440-62-2	6020	1.0	80	86
Zinc	7440-66-6	6020	2.0	57[(b)]	6,000[(d)]
Volatile Organic Compounds					
Benzene	71-43-2	8260	1.0	5	5
Carbon disulfide	75-15-0	8260	1.0	5	810[(d)]
Chloroform	67-66-3	8260	1.0	5	70
Ethylbenzene	100-41-4	8260	1.0	5	700
Isopropyltoluene	99-87-6	8260	1.0	5	450[(d) (e)]
Methyl ethyl ketone (2-Butanone)	78-93-3	8260	2.0	20	5,600 [(d)]
Styrene	100-42-5	8260	1.0	5	100
Toluene	108-88-3	8260	1.0	5	1,000
Xylenes (total)	1330-20-7	8260	3.0	5	10,000
1,2,4,-Trimethylbenzene	95-63-6	8260	1.0	5	56 [(d)]
1,3,5,-Trimethylbenzene	108-67-8	8260	1.0	5	60 [(d)]
Semi-Volatile Organic Compounds					
Anthracene	208-96-8	8270	0.2	10	2,100
Benzenethiol	108-98-5	8270	0.2	20	17[(d)]
Benzo(a)anthracene	56-55-3	8270	0.2	10	0.5
Benzo(b)flouranthene	205-99-2	8270	0.2	10	0.5
Benzo(j)flouranthene	205-82-3	8270	0.2	10	0.65[(c) (d)]

Principle Hazardous Constituents	CAS No.	SW-846 Method	Detection Limit (µg/L)	Permit Concentration Limit (µg/L)	
				Point of Compliance Wells	Assessment Wells
Benzo(k)flouranthene	207-08-9	8270	0.2	10	5
Benzo(a)pyrene	50-32-8	8270	0.05	10	0.05
Bis(2-ethylhexyl)phthalate	117-81-7	8270	0.2	10	6
Butylbenzyl phthalate	85-68-7	8270	0.2	10	1,500
Chrysene	218-01-9	8270	0.2	10	50
m-Cresol (3-Methylphenol)	108-39-4	8270	0.2	10	930[(d)]
o-Cresol (2-Methylphenol)	95-48-7	8270	0.2	10	930[(d)]
p-Cresol (4-Methylphenol)	106-44-5	8270	0.2	10	370[(d)]
Dibenz(a,h)anthracene	53-70-3	8270	0.2	10	0.05
7,12-Dimethylbenzo(a)anthracene	57-97-6	8270	0.05	10	0.001[(c)] [(d)]
2,4-Dimethylphenol	105-67-9	8270	0.2	10	380
Dimethyl phthalate	131-11-3	8270	0.2	10	270,000
Di-n-butyl phthalate	84-74-2	8270	0.2	10	2,000
2,4-Dinitrophenol	51-28-5	8270	1.0	50	69
Fluoranthene	206-44-0	8270	0.2	10	130
Fluorene	86-73-7	8270	0.2	10	1,100
Indene	95-13-6	8270	0.2	10	0.5 [(e)]
Methyl chrysene	1705-85-7	8270	0.2	10	50 [(e)]
1-Methyl naphthalene	90-12-0	8270	0.2	10	1.1[(d)]
2-Methyl naphthalene	91-57-6	8270	0.2	10	36[(d)]
Naphthalene	91-20-3	8270	0.2	10	100
4-Nitrophenol	100-02-7	8270	0.2	50	60
Phenanthrene	85-01-8	8270	0.2	10	830 [(e)]
Phenol	108-95-2	8270	0.2	10	300
Pyrene	129-00-0	8270	0.2	10	830
Pyridine	110-86-1	8270	1.0	10	20[(d)]
Quinoline	91-22-5	8270	0.02	10	0.24[(c)] [(d)]
Other Hydrocarbons					
Light Non-Aqueous Phase Liquid (LNAPL)	N/A	N/A	N/A	N/A	Sheen

Notes

CAS No. - Chemical Abstract Service Number

N/A – Not applicable

(a) Maximum Concentration Limit (40 CFR 264.94, Table 1)

(b) Site-specific background value

(c) PCL was proposed in technical justification letter dated 25 July 2023 and approved in a DEQ letter dated 9 December 2024.

(d) EPA Regional Screening Levels (RSLs) for Tap Water (THQ= 1.0) (November 2023)

(e) Surrogates were used for the following compounds:

Constituent	Surrogate	CAS no.	Reference
Isopropyltoluene	cumene	98-82-8	RSL (November 2023)
Indene	indeno(1,2,3,-cd)pyrene	193-39-5	DEQ-7 (June 2019)
Methyl chrysene	chrysene	218-01-9	DEQ-7 (June 2019)
Phenanthrene	pyrene	129-00-0	DEQ-7 (June 2019)

Attachment III.2
Table 3
Amended Appendix IX Groundwater Monitoring List

Common Name[1]	CAS RN[2]	Common Name[1]	CAS RN[2]
Inorganic Compounds			
Antimony	(Total)	Mercury	(Total)
Arsenic	(Total)	Nickel	(Total)
Barium	(Total)	Selenium	(Total)
Beryllium	(Total)	Silver	(Total)
Cadmium	(Total)	Sulfide	18496–25–8
Chromium	(Total)	Thallium	(Total)
Cyanide	57–12–5	Tin	(Total)
Cobalt	(Total)	Vanadium	(Total)
Copper	(Total)	Zinc	Total
Lead	(Total)		
Volatile Organic Compounds			
Acetone	67–64–1	Ethyl methacrylate	97–63–2
Acetonitrile	75–05–8	2-Hexanone	591–78–6
Acrolein	107–02–8	Isobutyl alcohol	78–83–1
Acrylonitrile	107–13–1	Methacrylonitrile	126–98–7
Allyl chloride	107–05–1	Methyl bromide	74–83–9
Benzene	71–43–2	Methyl chloride	74–87–3
Bromodichloromethane	75–27–4	Methylene bromide	74–95–3
Bromoform	75–25–2	Methylene chloride	75–09–2
Carbon disulfide	75–15–0	Methyl ethyl ketone; MEK	78–93–3
Carbon tetrachloride	56–23–5	Methyl iodide	74–88–4
Chlorobenzene	108–90–7	Methyl methacrylate	80–62–6
Chloroethane	75–00–3	4-Methyl-2-pentanone	108–10–1
Chloroform	67–66–3	Pentachloroethane	76–01–7
Chloroprene	126–99–8	Propionitrile	107–12–0
Dibromochloromethane	124–48–1	Styrene	100–42–5
1,2-Dibromo-3-chloropropane	96–12–8	1,1,1,2-Tetrachloroethane	630–20–6
1,2-Dibromoethane	106–93–4	1,1,2,2-Tetrachloroethane	79–34–5
1,2-Dichloropropane	78–87–5	Tetrachloroethene	127–18–4
cis-1,3-Dichloropropene	10061–01–5	Toluene	108–88–3
trans-1,3-Dichloropropene	10061–02–6	1,1,1-Trichloroethane	71–55–6
trans-1,4-Dichloro-2-butene	110–57–6	1,1,2-Trichloroethane	79–00–5
Dichlorodifluoromethane	75–71–8	Trichloroethene	79–01–6
1,1-Dichloroethane	75–34–3	Trichlorofluoromethane	75–69–4
1,2-Dichloroethane	107–06–2	1,2,3-Trichloropropane	96–18–4
1,1-Dichloroethylene	75–35–4	Vinyl acetate	108–05–4
trans-1,2-Dichloroethylene	156–60–5	Vinyl chloride	75–01–4
1,4-Dioxane	123–91–1	Xylene (total)	1330–20–7
Ethylbenzene	100–41–4		
Semi-Volatile Organic Compounds			
Acenaphthene	83–32–9	Hexachlorobutadiene	87–68–3

Common Name[1]	CAS RN[2]	Common Name[1]	CAS RN[2]
Acenaphthylene	208–96–8	Hexachlorocyclopentadiene	77–47–4
Acetophenone	98–86–2	Hexachloroethane	67–72–1
2-Acetylaminofluorene	53–96–3	Hexachlorophene	70–30–4
4-Aminobiphenyl	92–67–1	Hexachloropropene	1888–71–7
Aniline	62–53–3	Indeno(1,2,3-cd)pyrene	193–39–5
Anthracene	120–12–7	Isodrin	465–73–6
Aramite	140–57–8	Isophorone	78–59–1
Benzo[a]anthracene	56–55–3	Isosafrole	120–58–1
Benzo[b]fluoranthene	205–99–2	Methapyrilene	91–80–5
Benzo[k]fluoranthene	207–08–9	3-Methylcholanthrene	56–49–5
Benzo[ghi]perylene	191–24–2	Methyl methanesulfonate	66–27–3
Benzo[a]pyrene	50–32–8	2-Methylnaphthalene	91–57–6
Benzyl alcohol	100–51–6	Naphthalene	91–20–3
Bis(2-chloroethoxy)methane	111–91–1	1,4-Naphthoquinone	130–15–4
Bis(2-chloroethyl)ether	111–44–4	1-Naphthylamine	134–32–7
Bis(2-chloro-1-methylethyl) ether	108–60–1	2-Naphthylamine	91–59–8
Bis(2-ethylhexyl) phthalate, -	117–81–7 1	o-Nitroaniline	88–74–4
4-Bromophenyl phenyl ether	101–55–3	m-Nitroaniline	99–09–2
Butyl benzyl phthalate	85–68–7	p-Nitroaniline	100–01–6
p-Chloroaniline	106–47–8	Nitrobenzene	98–95–3
Chlorobenzilate	510–15–6	o-Nitrophenol	88–75–5
p-Chloro-m-cresol	59–50–7	p-Nitrophenol	100–02–7
2-Chloronaphthalene	91–58–7	4-Nitroquinoline 1-oxide	56–57–5
2-Chlorophenol	95–57–8	N-Nitrosodi-n-butylamine	924–16–3
4-Chlorophenyl phenyl ether	7005–72–3	N-Nitrosodiethylamine	55–18–5
Chrysene	218–01–9	N-Nitrosodimethylamine	62–75–9
m-Cresol	108–39–4	N-Nitrosodiphenylamine	86–30–6
o-Cresol	95–48–7	N-Nitrosodipropylamine	621–64–7
p-Cresol	106–44–5	N-Nitrosomethylethalamine	10595–95–6
Diallate	2303–16–4	N-Nitrosomorpholine	59–89–2
Dibenz[a,h]anthracene	53–70–3	N-Nitrosopiperidine	100–75–4
Dibenzofuran	132–64–9	N-Nitrosopyrrolidine	930–55–2
Di-n-butyl phthalate	84–74–2	5-Nitro-o-toluidine	99–55–8
o-Dichlorobenzene	95–50–1	Polychlorinated dibenzo-pdioxins;PCDDs	See footnote 5
m-Dichlorobenzene	541–73–1	Polychlorinated dibenzofurans; PCDFs	See footnote 6
p-Dichlorobenzene	106–46–7	Pentachlorobenzene	608–93–5
3,3'-Dichlorobenzidine	91–94–1	Pentachloronitrobenzene	82–68–8
2,6-Dichlorophenol	87–65–0	Pentachlorophenol	87–86–5
Diethyl phthalate	84–66–2	Phenacetin	62–44–2
O,O-Diethyl O-2-pyrazinyl phosphorothioate	297–97–2	Phenanthrene	85–01–8
Dimethoate	60–51–5	Phenol	108–95–2
p-(Dimethylamino)azobenzene	60–11–7	p-Phenylenediamine	106–50–3

Common Name[1]	CAS RN[2]	Common Name[1]	CAS RN[2]
7,12-Dimethylbenz[a]anthracene	57–97–6	2-Picoline	109–06–8
3,3'-Dimethylbenzidine	119–93–7	Pronamide	23950–58–5
alpha,alpha-Dimethylphenethylamine	122–09–8	Pyrene	129–00–0
2,4-Dimethylphenol	105–67–9	Pyridine	110–86–1
Dimethyl phthalate	131–11–3	Safrole	94–59–7
m-Dinitrobenzene	99–65–0	2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746–01–6
4,6-Dinitro-o-cresol	534–52–1	1,2,4,5-Tetrachlorobenzene	95–94–3
2,4-Dinitrophenol	51–28–5	2,3,4,6-Tetrachlorophenol	58–90–2
2,4-Dinitrotoluene	121–14–2	Tetraethyl dithiopyrophosphate	3689–24–5
2,6-Dinitrotoluene	606–20–2	o-Toluidine	95–53–4
Di-n-octyl phthalate	117–84–0	1,2,4-Trichlorobenzene	120–82–1
Diphenylamine	122–39–4	2,4,5-Trichlorophenol	95–95–4
Ethyl methanesulfonate	62–50–0	2,4,6-Trichlorophenol	88–06–2
Fluoranthene	206–44–0	O,O,O-Triethyl phosphorothioate	126–68–1
Fluorene	86–73–7	sym-Trinitrobenzene	99–35–4
Hexachlorobenzene	118–74–1		

Notes

1 Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

2 Chemical Abstracts Service registry number. Where "Total" is entered, all species in the groundwater that contain this element are included.

3 CAS index names are those used in the 9th Cumulative Index.

4 Polychlorinated biphenyls (CAS RN 1336–36–3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 12674–11–2), Aroclor-1221 (CAS RN 11104– 28–2), Aroclor-1232 (CAS RN 11141–16–5), Aroclor-1242 (CAS RN 53469–21–9), Aroclor- 1248 (CAS RN 12672–29–6), Aroclor-1254 (CAS RN 11097–69–1), and Aroclor-1260 (CAS RN 11096–82–5).

5 This category contains congener chemicals, including tetrachlorodibenzo-p-dioxins (see also 2,3,7,8-TCDD), pentachlorodibenzo-p-dioxins, and hexachlorodibenzo-p-dioxins

6 This category contains congener chemicals, including tetrachlorodibenzofurans, pentachlorodibenzofurans, and hexachlorodibenzofurans.

[70 FR 34582, June 14, 2005, as amended at 70 FR 44151, Aug. 1, 2005]

Attachment III.3
Old Landfarm
Ground Water Sampling and Analysis Plan

From: Report VI – Appendix VI-E-1
RCRA Permit Application
Closed RCRA Land Treatment Unit,
CHS Refinery, Laurel, Montana
February 21, 2024

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1.0 Introduction

CHS Inc. (CHS), owner and operator of the Laurel Refinery, manages their industrial hazardous waste program under a Montana Hazardous Waste Permit which is authorized as a Resource Conservation and Recovery Act (RCRA) Permit. The Old Landfarm (OLF) was operated from 1965 to 1981 as a land treatment unit (LTU) for refinery waste. The unit is regulated under RCRA, as the waste materials that were treated at the LTU (after July 26, 1982) are designated as hazardous under RCRA. The purpose of the document is to provide guidance for ground water sampling and analysis activities that apply to the OLF.

2.0 Objectives and Scope

The objective of the ground water sampling and analysis activities is to collect sufficient quality data to meet the MDEQ monitoring requirements for the OLF. The goals of this Sampling and Analysis Plan (SAP) are to:

- Outline a consistent sampling methodology that, when implemented, will provide adequate data to meet the specific goals of the OLF monitoring;
- Provide a specific set of instructions to follow when samples are being collected;
- Provide a framework to help determine if constituent concentrations in ground water beneath the OLF meet permit concentration limits; and
- Provide data capable of tracking the effectiveness of constituent degradation in ground water at the OLF.

3.0 Ground Water Elevation

This section explains the procedures for gauging ground water levels in monitor with and without LNAPL. In addition, it explains the protocol for determining the ground water flow rate and direction based on the ground water gauging results.

3.1 *Determination of Ground Water Elevation in Monitor Wells without LNAPL*

The water level and total depth in each well will be measured at the beginning of each sampling event before initiating purging or sampling activities, and will be recorded in the field logbook. The distance from the top of casing to the water surface will be measured to the nearest 0.01 foot with an electric water level probe. Total well depth will be measured by slowly lowering the probe to the bottom of the well and determining at what depth the measuring tape becomes slack. The calculated height of standing water in the wells to be sampled will be recorded in the field logbook. The calculated height will be used to determine maximum purge volume.

The following equation describes how ground water elevations will be calculated from monitor wells without LNAPL. The equation for ground water elevation is:

$$GWE = TOC - DTW$$

Where:

GWE = Ground water elevation (feet msl),
TOC = Top of Casing Elevation (feet msl), and
DTW = Depth to water from TOC (feet)

At each well, the probe will be cleaned following the procedures described in Section 8.3 after measuring the water level.

3.2 *Determination of Ground Water Elevation in Monitor Wells with LNAPL*

If the oil/water interface probe emits a signal that corresponds to LNAPL, or if LNAPL is observed on the probe upon removal from the well, the LNAPL thickness and depth to water will be measured as discussed in Section 4.2.1.

The following equation describes how ground water elevations will be calculated from monitor wells with LNAPL. The equation for ground water elevation is:

$$GWE = TOC - DTW + [(DTW-DTP)*SG]$$

Where:

GWE = Ground water elevation (ft msl),
TOC = Top of Casing Elevation (ft msl),
DTW = Depth to water from TOC (feet)
DTP = Depth to LNAPL from TOC (feet), and
SG = Specific Gravity of LNAPL

At each well, the probe will be cleaned following the procedures described in Section 8.3 after measuring the water level.

3.3 *Determination of Ground Water Flow Rate and Direction*

Ground water velocity through soil pores can be calculated using measured hydraulic properties for the LTU and the Darcy equation modified for determining the average ground water flow velocity. The modified Darcy equation is:

$$V = \frac{KI}{N_e}$$

Where:

V = average ground water velocity (ft/yr);
K = hydraulic conductivity (224,465 ft/yr) from the *Landfarm Ground Water Assessment; Aquifer Characteristic Investigation* (ERM, 1991a);
I = average hydraulic gradient (feet/feet) calculated for each water level measurement event, and
Ne = effective porosity for well graded sandy gravel and cobbles with silt (= 0.25 to 0.40) (Freeze and Cherry, 1979).

The equation for hydraulic gradient is:

$$I = \frac{GWE_2 - GWE_1}{x_2 - x_1}$$

Where:

GWE_1 =	Ground water elevation at point 1 (ft MSL),
GWE_2 =	Ground water elevation at point 2 (ft MSL), and
$x_2 - x_1$	Distance between point 1 and point 2 (feet)

4.0 Ground Water Sampling Activities

This section discusses the procedures to follow for sampling of monitor wells with and without LNAPL.

4.1 *Sample Collection from Monitor Wells without LNAPL*

The ground water sampling program is designed to provide monitoring information that reliably indicates the quality of the ground water below and/or near the regulated unit. In general low-flow sampling methodology will be utilized to the extent practical. Collection procedures and equipment are presented below.

4.1.1 Purging of Wells

Prior to collecting samples, each well will be purged by removing water until monitored parameters stabilize or until a maximum of three well casing volumes of water have been removed. A plastic sheet will be placed on the ground at the base of each well prior to purging and sampling to protect the purging and sampling equipment from contact with potentially contaminated surfaces.

The purge volume calculation will be recorded in the field log book. The maximum volume of water to be removed (*i.e.*, three well casings) will be calculated using one of the following standardized formulas:

- for 2-inch wells V = 0.489 H
- for 4-inch wells V = 1.959 H
- for 6-inch wells V = 4.406 H

where; H = height of standing water in well (feet), and
V = three casing volumes (gallons)

The wells will be purged by using a pumping system (*i.e.*, peristaltic, diaphragm, centrifugal, two stage or submersible pumps). To reduce the potential for cross-contamination of monitor wells during purging and sampling, well-dedicated or disposable equipment will be used for purging and sampling activities whenever possible. If equipment must be reused, it will be thoroughly decontaminated between wells (see Section 8.3).

When purging the well, the pump or intake hose will be lowered in a manner to reduce the potential for disturbing the water column or sediments at the well bottom. The intake hose will be positioned within the upper two feet of the screened interval or within the upper two feet of the water column if the water table is lower than the top of the screened interval.

Wells will be purged at a flow rate that has minimal drawdown effect (*i.e.*, <0.3 feet) on the water surface per the recommendations of the EPA (Puls and Barcelona, 1996). To minimize disruption in the water column, the flow rate during purging will not exceed 0.5 gallon per minute.

Water will be collected in a calibrated bucket or drum to determine the volume removed. A visual determination of the clarity or color of the purged water will be noted at regular time intervals of 5-10 minutes. Fluids generated during well purging will be stored temporarily in either a 200-gallon polyethylene tank or equivalent container, and subsequently will be discharged into the CHS API Separator.

The following parameters will be monitored during purging of every well: depth to water, pH, temperature, specific conductance (SC), dissolved oxygen (DO), and oxidation-reduction potential (ORP). The monitored parameters will be measured and recorded every three to five minutes. Purging will continue until pH, SC, DO, and ORP stabilize or until three well casing volumes are removed. Parameters are considered stabilized if they vary within the following ranges for three consecutive readings:

Parameter	***Variance***
pH	± 0.15 standard pH unit
SC	± 5%
DO	± 10%
ORP	± 10 mV

4.1.2 Sample Collection

When purging is complete, samples will be collected within 24 hours. At each well, samples will be collected in the following order, as applicable:

1. Volatile organic compounds (VOCs);
2. Measured field parameters including pH, temperature, SC, and DO. This set of readings is independent of the readings recorded during well purging;
3. Semivolatile organic compounds (SVOCs), if required; and
4. Metals, if required.

Analytical parameter classes, container size and type, preservatives, and holding times are listed in Table 1. Any required preservatives will be added to the bottles by the laboratory prior to delivery to the site. The samples will be collected from the well and transferred to the appropriate sampling container in a manner to minimize exposure to the ambient environment. Water will be transferred directly from the dedicated tubing to the appropriate sample container using low-flow sampling procedures. Samples will be collected in such a manner as to minimize aeration of the sample. For example, water should be carefully poured down the inner walls of the sample bottle.

Samples targeted for VOC analysis will be collected in 40-ml glass vials that will be filled completely so that a meniscus is formed above the vial lip. Then, the Teflon-lined, threaded septum cap should be screwed carefully onto the vial with no air bubbles trapped in the vial. To check for air bubbles, the vial will be inverted. If any bubbles are observed in the vial, the vial exhibiting air bubbles will be discarded and a new vial with acid preservative will be filled. The presence or absence of preservatives should be noted on the vial.

Sample targeted for other analyses should be filled to nearly full (*i.e.*, small headspace left). Ground water samples to be analyzed for metals will be filtered in the field using a dedicated 0.45-micron filter to remove suspended solids. The sediment-free water will be pumped directly into laboratory-supplied containers.

Quality Control (QC) samples such as blind duplicate samples and field blanks will be collected during each sampling event as described in Section 8.1.

After sampling is completed, the well cap will be secured on the well casing, and the well will be locked before proceeding to the next well.

4.2 *Sample Collection from Monitor Wells with LNAPL*

4.2.1 Gauging LNAPL

An oil/water interface probe will be used during well gauging to identify the presence of LNAPL in the well; if present, the probe will also be used to determine its thickness. The instrument will be grounded and the probe switched on to test for correct operation. The probe will be carefully lowered down the center of the well casing until the probe indicates a completed circuit (e.g., alarm sounds on the probe). The depth to the first fluid layer encountered will be measured to the nearest 0.01 foot and recorded on the field data sheet. If LNAPL is encountered, the probe will be lowered until water is reached. The depth to water will be measured at least twice to the nearest 0.01 foot, and the final measurement will be recorded. The calculated height of the standing water column in the well will be recorded in the field log. The calculated height will be used to determine maximum purge volume.

If CHS believes that the apparent LNAPL thickness determined by the oil/water interface probe is anomalous, then a disposable or decontaminated clear bailer may be lowered into the well to check for the presence of an emulsion layer below the LNAPL-water contact and to determine its thickness. Measuring apparent LNAPL thickness at the refinery can be complicated by an emulsion layer that is sometimes present between the LNAPL and ground water. As a QC check when LNAPL is present, a clear bailer is sometimes used to verify the LNAPL thickness because the oil/water interface probe can interpret the emulsion layer as if it were water (thereby underestimate the LNAPL thickness). This QC check is particularly important to make sure that the ground water sample is not collected from the emulsion zone. If used, the clear bailer will be slowly lowered into the fluids and should not be completely immersed in order to prevent LNAPL entering the top of the bailer.

4.2.2 Sampling Ground Water Beneath LNAPL Layers

If a program well containing LNAPL is required by MDEQ to be sampled, then the well will be purged and sampled using an inner PVC sampling casing known as a *well stinger* (Figure 1). To obtain representative ground water samples and to protect the probes, the bottom of the stinger will be placed immediately below any emulsion layer identified. The length of PVC stinger required to place the bottom approximately two feet below the water-LNAPL contact (or below an emulsion layer) will be calculated and the stinger constructed accordingly in the field.

Stingers will be connected using either threaded 2-inch diameter PVC pieces or pressure-fitted couplings. The stinger will be wrapped in a plastic bag and stored on site in a secured location. The bottom of the stinger should be cut and capped with new aluminum foil secured with new electrical tape prior to insertion into the well. The stinger should be held in the appropriate position by a suitable mounting device that fits securely on the well casing. If more than one section of PVC is needed to reach a desired depth, in *no* case shall those sections be connected with PVC-cemented couplings.

A peristaltic (or similar) pump with dedicated tubing should be used for purging and sampling of all LNAPL-affected wells. Dedicated plastic tubing will be inserted into the stinger and punched through the aluminum foil cap. The bottom end of the tubing will be advanced no further than approximately one foot below the bottom of the stinger. This method will allow purging and sampling of ground water from beneath the LNAPL layer with minimal disturbance of the emulsion (if present) or hydrocarbon-water interface.

5.0 Sample Preservation and Shipment

Preservatives necessary for analysis will be added by the laboratory prior to supplying containers for the sampling event. Because preservatives may be specific to an analytical parameter, the preservative added to the sample container for a specific parameter will be noted on each container.

Samples will be labeled, packaged and shipped using the following procedures:

- A sample bottle label will be affixed to each sample container. The exact sample bottle label will change depending on the analytical laboratory contract in place at the time of sampling. The analytical parameter portions of the label will be completed by the laboratory.
- The field sampler will record the sample number/ID, date, time, and initial the sample label. The required sampling information for that sample will also be recorded on the chain-of-custody form. Samples will not be analyzed by the laboratory that are not properly labeled and sealed.
- Immediately upon collection, the sample bottles will be placed in insulated coolers with sufficient ice to lower and maintain a sample temperature of approximately 4º C. Individual samples will be packed with cushioning material sufficient to prevent breakage of glass sample containers during transport. In addition, individual sample bottles will be placed in re-sealable plastic bags. After sampling is completed each day, the samples will be stored in the insulated sample cooler at approximately 4º C until sent to the contracted analytical laboratory.

- The insulated coolers containing the samples will be delivered by the sampling team to the laboratory or to a courier service for overnight delivery. For shipment, signed chain-of-custody forms will be placed in the cooler and the coolers will be secured with high-quality packing tape, and a tamper-evident custody seal will be attached securely across the lid of the cooler prior to shipment.

6.0 Chain-of-Custody Control

These chain-of-custody procedures are intended to document sample possession from the time of collection to analysis. For the purpose of these procedures, a sample is considered in custody if it is:

- In one's actual possession;
- In view, after being in physical possession;
- Locked so that no one can tamper with it, after having been in physical custody; or
- In a secured area, restricted to authorized personnel.

A chain-of-custody record will be initiated in the field. This record will be completed with all pertinent information, including all appropriate analytical parameters for each different group of sample bottles. The original record will accompany the samples during transit to the laboratory. The field log will supplement the logbook record and chain-of-custody record.

7.0 Analytical Procedures

All samples will be analyzed in accordance with the most recent procedures described in EPA SW-846 entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, or American Society for Testing and Materials (ASTM) Standard Test Methods, or other EPA- or MDEQ-approved methods. Current Analytical Procedures are shown below:

- Metals – SW846 6020 (mercury 7471)
- VOCs – SW846 8260
- SVOCs – SW846 8270C

The Method Quantitation Limits (MQLs) will be equivalent to, but not less than the Estimated Quantitation Limits (EQLs) specified in SW-846 for each respective method. For reporting purposes, the Method Detection Limits (MDLs) will be included. The laboratory will be required to provide MDLs that meet, but are not less than, the Montana DEQ-7 standards (should the lab be able to provide those lower limits). In the event that concentrations less than the EQLs are reported, the values will be flagged by the laboratory as estimated, and will be considered non-quantitative.

8.0 Quality Assurance and Quality Control

8.1 *Quality Control Sampling*

For quality control (QC) purposes, one blind duplicate ground water sample will be collected during each sampling event. The duplicate sample will be collected from a

randomly selected well from the LTU ground water monitoring program. The duplicate sample will be labeled with an appropriate identification number other than the well number. The identification number will be recorded in the field logbook or on a separate field sampling log form. The sample bottles for the regular and duplicate samples will be filled in alternate succession for each required analysis (*e.g.*, fill the sample VOC vial and then the duplicate VOC vial, *etc*.).

One field blank sample will be prepared for each sampling event at a random well location other than a well location targeted for blind duplicate sample collection. The field blank will be prepared by pouring commercial distilled water into sample containers in the same quantities as the ground water samples. The samples should be labeled appropriately and stored in the same manner as the ground water samples.

A trip blank for VOC analysis (only) will be provided by the laboratory to check for potential contamination resulting from the transportation of the collected samples. The trip blank will not be opened, and it will accompany the VOC samples from the field to the laboratory. One trip blank will be analyzed for VOCs for each shipment of sample coolers to the laboratory, regardless of the number of samples collected. Whenever possible for each shipment of samples to the laboratory, all VOC samples will be stored in one insulated cooler with the trip blank.

8.2 *Field Quality Assurance Procedures*

The following key procedures are designed to minimize potential cross-contamination of samples:

- Clean, disposable nitrile gloves will be worn when handling equipment that will be placed into the well.
- Wells should be sampled starting with the least affected (or not affected), and proceeding to the most affected based on historical results.
- Properly cleaned and functioning pumps will be used.
- Monitor wells will be purged no more than 24 hours before sampling.
- QC samples such as trip blanks, field blanks, equipment blanks, and blind duplicate samples will be collected to evaluate sample collection, transport, and analysis.
- Samples and bottles will be handled carefully to minimize exposure time and potential for evaporative loss and/or airborne contamination.
- Containerized ice will be used to maintain sample temperature during transit to the laboratory and to minimize breakage of sample containers.

8.3 *Equipment Decontamination*

The decontamination of sampling equipment is necessary to reduce the potential for the spread of constituents to clean areas, to reduce exposure to personnel, and to reduce the potential cross-contamination when equipment is used more than once.

The electric water level probe and oil/water interface probe will be wiped clean with a disposable cloth, washed with a solution of phosphate-free cleaner (*e.g.*, Liquinox® or equivalent) and distilled water, then triple-rinsed with distilled water after use at each

well. Portions of the pH, temperature, SC, DO, and ORP probes that contact the sample shall be cleaned prior to usage.

Non-dedicated pumps and discharge and safety lines will be washed with solution of phosphate-free soap and water, then triple rinsed with distilled water. Equipment will be dried before next use.

8.4 *Laboratory Quality Assurance*

All samples will be analyzed in accordance with the most recent procedures described in EPA SW-846 entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, or ASTM Standard Test Methods, or other EPA- or MDEQ-approved methods. The methods used by subcontracted laboratories to calibrate instruments, perform standard dilutions, manage data, clean glassware, and analyze samples are available in quality assurance manuals published and periodically revised by the individual contract laboratory. Included in such documents is the normal Analytical Control Program used during analysis of samples. Typical analytical quality programs used by laboratories include the following elements: standard curves, tests for precision and accuracy, control standards and method blanks. Samples used to assess laboratory *precision* and *accuracy* will be chosen randomly by the laboratory from within a batch of samples to be analyzed on any given day (*i.e.*, laboratory batch QC).

A laboratory Quality Assurance Plan (QAP) for the site has been submitted to MDEQ previously and is incorporated into this permit renewal application by reference. The QAP was included as an appendix to the *RCRA Facility Investigation Work Plan, Phase I Ground Water Investigation* (ERM, 1997) and describes the review process of the laboratory quality control elements to assess the following:

- Precision and accuracy between samples and laboratory QC elements (*e.g.*, laboratory control samples, matrix spike samples, surrogate data, laboratory duplicates, *etc*.);
- Presence of sample cross contamination from laboratory blanks; and
- Compliance with method criteria for laboratory analyses based on QC elements (*e.g.*, standard curves, initial calibration data, interference check sample data, *etc*.) and sample package documentation (*e.g.*, chain-of-custody forms, sample receipt temperatures, holding times, *etc*.).

A copy of the QAP will be provided to MDEQ upon request (Permit Condition IV.E.5.d.iii.).

Additionally, the analytical laboratory package will be evaluated for usability of the data by reviewing the QC elements list about (e.g., sample preservation, detections in QC blanks, surrogate recoveries, etc.). These data validation assessments will be summarized and documented on a form.

9.0 Waste Management and Disposition

Contaminated purge water generated during sampling events and decontamination water will be containerized temporarily on site, and will be subsequently discharged into the refinery's API oil/water separator. Other items used during sampling (*i.e.*, gloves, plastic, paper towels) will be disposed properly as trash.

TABLE 1

ANALYTICAL PARAMETERS, SAMPLE CONTAINERS, PRESERVATIVES AND HOLDING TIMES (a)
Ground Water Sampling and Analysis Plan

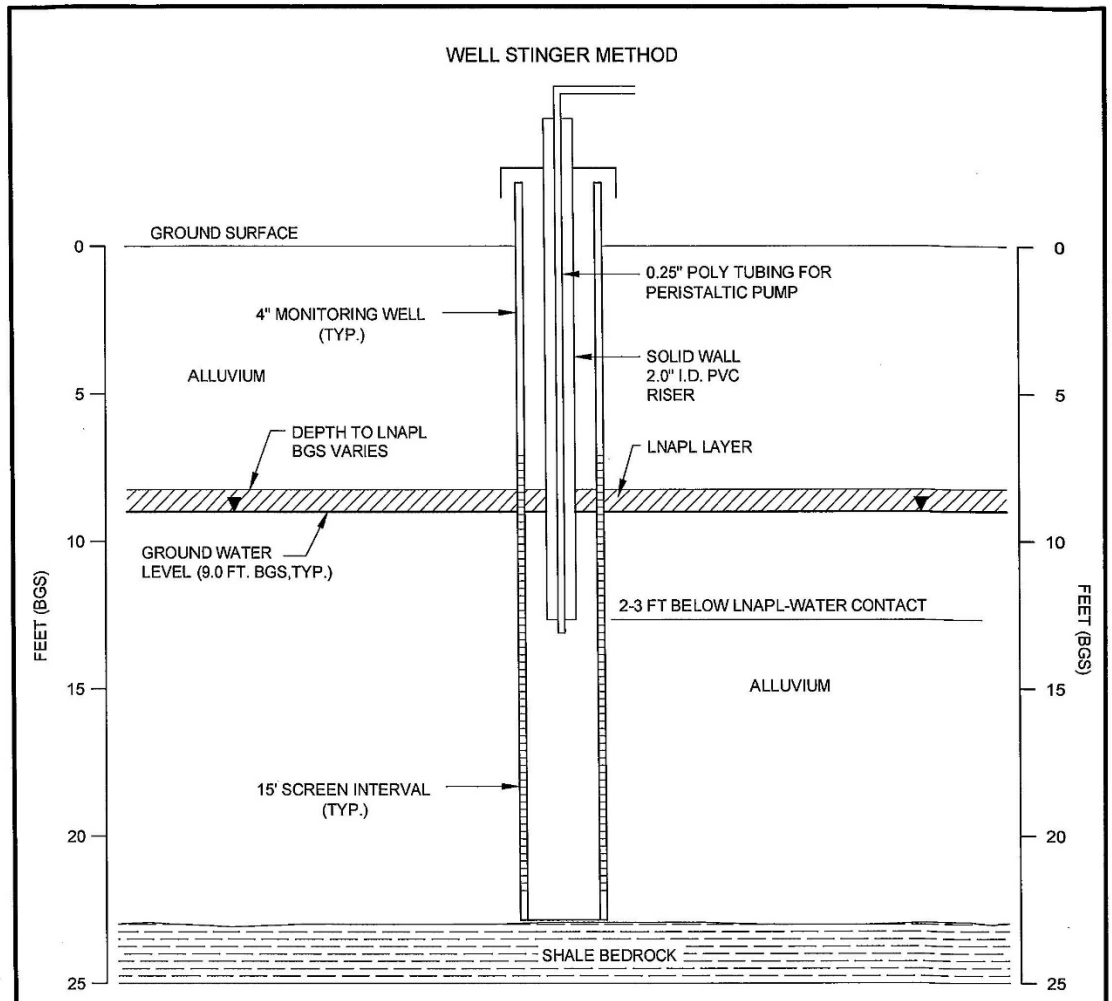
CHS Refinery
Laurel, Montana

Parameter	Recommended Container Size & Type	Collection Information/ Preservatives/Temperature	Maximum Holding Time
pH	NA (b)	NA (b)	On-site
Specific Conductance (SC)	NA (b)	NA (b)	On-site
Temperature	NA (b)	NA (b)	On-site
Dissolved Oxygen (DO)	NA (b)	NA (b)	On-site
Volatile Organic Compounds	2 – 40 ml glass vials, with Teflon lined septum caps	Cool, 6°C HCL to pH <2 No Headspace	14 Days
Semivolatile Organic Compounds	2 – 1000 ml amber glass	Cool, 6°C	7/40 days (c)
Inorganics – Metals	500 ml glass, plastic, or PTFE	Cool, 6°C HNO_3 to pH <2 Field Filtration with 0.45 micron Filter	6 months except for Mercury (28 Days)

NOTES:

NA = Not Applicable
PTFE = Polytetrafluoroethylene
(a) References: "Test Methods of Evaluating Solid Waste – Physical/Chemical Methods", SW-846 (3rd Edition 2007)
(b) Field Measurement
(c) Seven days for extraction; analyze within 40 days after extraction.

FIGURE 1



NOTES:

1. BGS = BELOW GROUND SURFACE.
2. LNAPL = LIGHT NON-AQUEOUS PHASE LIQUID

ERM-Southwest, Inc. TX PE Firm No. 2393

Environmental Resources Management

DESIGN: MLR	DRAWN: EFC/RLM	CHKD.:
DATE: 4/12/2011	SCALE: AS SHOWN	REV.:
W.O. NO.: H:\DWG\D11\0127313a217.dwg, 4/12/2011 2:12:27 PM		

FIGURE VI-E-1
WELL STINGER SAMPLING METHOD FOR WELLS CONTAINING LNAPL
CHS Refinery
Laurel, Montana

ERM

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Also compute the adjustment for ties with equation [17.10]. There is only one group of distinct tied observations — the non-detects — containing 12 samples. Thus, the adjusted Kruskal-Wallis statistic is given by:

$$H^* = 10.56 \Big/ \left[1 - \left(\frac{12^3 - 12}{25^3 - 25}\right)\right] = 11.87$$

Step 4. Determine the critical point of the Kruskal-Wallis test: with $\alpha = .05$, the upper 95th percentage point of the chi-square distribution with $(k–1) = 4–1 = 3$ degrees of freedom [*df*] is needed. **Table 17-2** of **Appendix D** gives $\chi^2_{cp} = \chi^2_{.95,3} = 7.81$.

Step 5. Since the observed Kruskal-Wallis statistic of 11.87 is greater than the chi-square critical point, there is evidence of significant differences between the well groups. Therefore, post-hoc pairwise comparisons are necessary.

Step 6. To determine the significance level appropriate for post-hoc comparisons, note there are three compliance wells that need to be tested against background. Therefore, each of these contrasts should be run at the $\alpha^* = 0.05/3 = 0.0167$ significance level.

Step 7. Calculate the standard error of the difference for the three contrasts using equation [17.14]. Since the sample size at each compliance well is five, the *SE* will be identical for each comparison, namely,

$$SE_i = \sqrt{\frac{25 \cdot 26}{12}\left(\frac{1}{10} + \frac{1}{5}\right)} = 4.031$$

Step 8. Form the post-hoc Z-statistic for each contrast using equation [17.15]:

$$\text{Well 3: } Z_2 = \left(12.2 - 7.9\right) \Big/ 4.031 = 1.07$$
$$\text{Well 4: } Z_3 = \left(17.7 - 7.9\right) \Big/ 4.031 = 2.43$$
$$\text{Well 5: } Z_4 = \left(19.3 - 7.9\right) \Big/ 4.031 = 2.83$$

Step 9. Find the upper $(1–\alpha^*) \times 100$th percentage point from the standard normal distribution in **Table 10-1** in **Appendix D**. With $\alpha^* = .0167$, this gives a critical point (by linear interpolation) of $z_{cp} = z_{.9833} = 2.127$.

Step 10. Since the Z-statistics at wells 4 and 5 exceed the critical point, there is significant evidence of increased concentration levels at wells 4 and 5, but not at well 3. ◄

17.2 TOLERANCE LIMITS

A *tolerance interval* is a concentration range designed to contain a pre-specified proportion of the underlying population from which the statistical sample is drawn (*e.g.*, 95 percent of all possible population measurements). Since the interval is constructed from random sample data, a tolerance interval is expected to contain the specified population proportion only with a certain level of statistical

confidence. Two coefficients are thus associated with any tolerance interval. One is the population proportion that the interval is supposed to contain, called the coverage (γ). The second is the degree of confidence with which the interval reaches the specified coverage. This is sometimes known as the tolerance coefficient or more simply, the confidence level ($1-\alpha$). A tolerance interval with 95% coverage and a tolerance coefficient of 90 percent is constructed to contain, on average, 95% of the distribution of all possible population measurements with a confidence probability of 90%.

A *tolerance limit* is a one-sided tolerance interval. The upper limit is typically of most interest in groundwater monitoring. Tolerance limits are a standard statistical method that can be useful in groundwater data analysis, especially as an alternative to *t*-tests or ANOVA for interwell testing. The RCRA regulations allow greater flexibility in the choice of α when using tolerance and prediction limits and control charts, so a larger variety of data configurations may be amenable to one of these approaches. The Unified Guidance still recommends prediction limits or control charts over tolerance limits for formal compliance testing in detection monitoring, and confidence intervals over tolerance limits in compliance/assessment monitoring when a background standard is needed.

An interwell tolerance limit constructed on background data is designed to cover all but a small percentage of the background population measurements. Hence background observations should rarely exceed the upper tolerance limit. By the same token, when testing a null hypothesis (H_0) that the compliance point population is identical to background, *compliance point* measurements also should rarely exceed the upper tolerance limit, unless H_0 is false. The upper tolerance limit thus gauges whether or not concentration measurements sampled from compliance point wells are too extreme relative to background.

17.2.1 PARAMETRIC TOLERANCE LIMITS

BACKGROUND AND PURPOSE

To test the null hypothesis (H_0) that a compliance point population is identical to that of background, an upper tolerance limit with high coverage (γ) can be constructed on the sample background data. Coverage of 95% is usually recommended. In this case, random observations from a distribution identical to background should exceed the upper tolerance limit less than 5% of the time. Similarly, a tolerance coefficient or confidence level of at least 95% is recommended. This gives 95% confidence that the (upper) tolerance limit will contain at least 95% of the distribution of observations in background or in any distribution similar to background. Note that a tolerance coefficient of 95% corresponds to choosing a significance level (α) equal to 5%. Hence, as with a one-way ANOVA, the overall false positive rate for a tolerance interval is set to approximately 5%.

Once the limit is constructed on background, each compliance point observation (perhaps from several different wells) is compared to the upper tolerance limit. This is different from the comparison of sample means in an ANOVA test. If any compliance point measurement exceeds the limit, the well from which it was drawn is flagged as showing a significant increase over background. Note that the factors κ used to adjust the width of the tolerance interval (**Table 17-3** in **Appendix D**) are designed to provide *at least* 95% coverage of the parent population. Applied over many data sets, the *average* coverage of these intervals will often be close to 98% or more (see Guttman, 1970). Therefore, it would be unusual to find

more than 2 or 3 samples out of every 100 exceeding the tolerance limit under the null hypothesis. This fits with the purpose behind the use of a tolerance interval, which is to establish an upper limit on background that will rarely be exceeded, unless some change in the groundwater causes concentration levels to rise significantly at one or more compliance points.

Testing a large number of compliance point samples against such a background tolerance limit even under conditions of no releases practically ensures a few measurements will occasionally exceed the limit. The Unified Guidance therefore recommends that tolerance limits be used in conjunction with verification resampling of those wells suspected of possible contamination, in order to either verify or disconfirm the initial round of sampling and to avoid false positive results.

REQUIREMENTS AND ASSUMPTIONS

Standard parametric tolerance limits assume normality of the sample background data used to construct the limit. This assumption is critical to the statistical validity of the method, since a tolerance limit with high coverage can be viewed as an estimate of a *quantile* or *percentile* associated with the *tail probability* of the underlying distribution. If the background sample is non-normal, a normalizing transformation should be sought. If a suitable transformation is found, the limit should be constructed on the transformed measurements and can then be *back-transformed* to the raw concentration scale prior to comparison against individual compliance point values.

If no transformation will work, a non-parametric tolerance limit should be considered instead. Unfortunately, non-parametric tolerance limits generally require a much larger number of observations to provide the same levels of coverage and confidence as a parametric limit. It is recommended that a parametric model be fit to the data if at all possible.

A tolerance limit can be computed with as few as three observations from background. However, doing so results in a high upper tolerance limit with limited statistical power for detecting increases over background. Usually, a background sample size of at least eight measurements will be needed to generate an adequate tolerance limit. If multiple background wells are screened in equivalent hydrostratigraphic positions and the data can reasonably be combined (**Chapter 5**), one should consider using pooled background data from multiple wells to increase the background sample size.

Like many tests described in the Unified Guidance, tolerance limits as applied to groundwater monitoring assume *stationarity* of the well field populations both temporally (*i.e.*, over time) and spatially. The data also needs to be statistically *independent*. Since an adequately-sized background sample will have to be amassed over time (in part to maintain enough temporal spacing between observations so that independence can be assumed), the background data should be checked for apparent *trends* or *seasonal effects*. As long the background mean is stable over time, the amassed data from a longer span of sampling will provide a better statistical description of the underlying background population.

As a primarily interwell technique, tolerance limits should only be utilized when there is minimal *spatial variability*. Explicit checks for spatial variation should be conducted using box plots and/or ANOVA.

In the usual test setting, one new compliance point observation from each distinct well is compared against the tolerance limit during each statistical evaluation. Under the null hypothesis of identical

populations, the compliance point measurements are assumed to follow the same distribution as background. Further, the compliance data are assumed to be mutually statistically independent. Such assumptions are almost impossible to check with only one new value per compliance well. However, periodic checks of the key assumptions are recommended after accumulating several sampling rounds of compliance data.

PROCEDURE

Step 1. Calculate the mean $\bar{x}$, and the standard deviation s, from the background sample.

Step 2. Construct the one-sided upper tolerance limit as

$$TL = \bar{x} + \kappa(n, \gamma, 1-\alpha) \cdot s \qquad [17.16]$$

where $\kappa(n, \gamma, 1-\alpha)$ is the one-sided normal tolerance factor found in **Table 17-3** of **Appendix D** associated with a sample size of n, coverage coefficient of γ, and confidence level of $(1-\alpha)$.

Equation [17.16] applies to normal data. If a transformation is needed to normalize the sample, the tolerance limit needs to be constructed on the transformed measurements and the limit back-transformed to the original concentration scale. If the limit was constructed, for example, on the logarithms of the original observations, where $\bar{y}$ and s_y are the log-mean and log-standard deviation, the tolerance limit can be back-transformed to the concentration scale by exponentiating the limit. The tolerance limit is computed as:

$$TL = \exp\left[\bar{y} + \kappa(n, \gamma, 1-\alpha) \cdot s_y\right] \qquad [17.17]$$

Step 3. Compare each observation from the compliance well(s) to the upper tolerance limit found in Step 2. If any observation exceeds the tolerance limit, there is statistically significant evidence that the compliance well concentrations are elevated above background. Verification resampling should be conducted to verify or disconfirm the initial result.

►EXAMPLE 17-3

The table below consists of chrysene concentration data (ppb) found in water samples obtained from two background wells (Wells 1 and 2) and three compliance wells (Wells 3, 4, and 5). Compute the upper tolerance limit on background for coverage of 95% with 95% confidence and determine whether there is evidence of possible contamination at any of the compliance wells.

	Chrysene Concentration (ppb)				
Month	Well 1	Well 2	Well 3	Well 4	Well 5
1	19.7	10.2	68.0	26.8	47.0
2	39.2	7.2	48.9	17.7	30.5
3	7.8	16.1	30.1	31.9	15.0
4	12.8	5.7	38.1	22.2	23.4
Mean	19.88	9.80	46.28	24.65	28.98
SD	13.78	4.60	16.40	6.10	13.58

SOLUTION

Step 1. A Shapiro-Wilk test of normality on the pooled set of eight background measurements gives $W = 0.7978$ on the original scale and $W = 0.9560$ after log-transforming the data, suggesting that the data are better fit by a lognormal distribution. Therefore, construct the tolerance limit on the logged observations, listed below along with the log-means and log-standard deviations.

	Log Chrysene log(ppb)				
Month	Well 1	Well 2	Well 3	Well 4	Well 5
1	2.981	2.322	4.220	3.288	3.850
2	3.669	1.974	3.890	2.874	3.418
3	2.054	2.779	3.405	3.463	2.708
4	2.549	1.740	3.640	3.100	3.153
Mean	2.813	2.204	3.789	3.181	3.282
SD	0.685	0.452	0.349	0.253	0.479
BG Mean	2.509				
BG SD	0.628				

Step 2. Compute the upper tolerance limit on the pooled background data using the logged chrysene concentration data. The tolerance factor for a one-sided upper normal tolerance limit with 95% coverage and 95% probability and $n = 8$ observations is equal to (from **Table 17-3** of **Appendix D**) $\kappa = 3.187$. Therefore, the upper tolerance limit is computed using equation [17.17] as:

$$TL = \exp\left[2.509 + 3.187 \times 0.628\right] = 90.96 \text{ ppb}$$

Step 3. Compare the measurements at each compliance well to the upper tolerance limit, that is TL = 90.96 ppb. Since none of the original chrysene concentrations exceeds the upper TL, there is insufficient evidence of chrysene contamination in these data. ◄

17.2.2 NON-PARAMETRIC TOLERANCE INTERVALS

BACKGROUND AND PURPOSE

When an assumption of normality cannot be justified especially with a significant portion of non-detect observations, the use of non-parametric tolerance intervals should be considered. The upper tolerance limit in a non-parametric setting is usually chosen as an order statistic of the sample data (Guttman, 1970), commonly the maximum value or maybe the second or third largest value observed.

Because the maximum observed background value is often taken as the upper tolerance limit, non-parametric tolerance intervals are easy to construct and use. The sample data needs to be ordered, but no

Module IV
Closure and Post-Closure Care of the Old Landfarm

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Attachments

MODULE IV
CLOSURE AND POST-CLOSURE CARE OF THE LAND TREATMENT UNIT

IV.A. **Applicability**

The requirements of this Module apply to closure, maintenance, and monitoring of the regulated unit identified in Condition I.C.2. during the closure and post-closure periods. The Permittee shall close, maintain, and monitor the regulated unit in accordance with this permit, applicable requirements in Title 17, Chapter 53, ARM, and as specified in this Module.

IV.A.1. *Regulated Unit*

The Old Landfarm (OLF) covers 13.8 acres (Attachment IV.1).

IV.A.1.a. DEQ designated the OLF as a CAMU in 2002; however, CHS did not use the OLF as a CAMU during this permit issuance. The OLF is closed and is in post-closure care.

IV.A.1.b. The OLF was designated as SWMU 25 during permit reissuance MTHWP-14-02 and is included in the list of SWMUs and AOCs of Attachment II.1a.

IV.A.2. *Closure and Post-Closure Plans*

Module IV is considered the Closure and Post-Closure Plan for the OLF.

IV.B. **Land Treatment and Closure History**

IV.B.1. *Historical Waste Application*

CHS operated two land treatment units at the Laurel refinery. The OLF was in operation from 1964 to 1981 and the New Landfarm (NLF) from 1981 to 1988. Refinery sludges, tank bottoms and refinery wastewaters were land treated. Managed hazardous wastes were API Separator Sludge (K051); dissolved air floatation (DAF) float (K048); Leaded Tank Bottoms (K052); and Heat Exchanger Bundle Cleaning Sludge (K050). Managed non-hazardous wastes included river silt; cooling tower sludge; crude tank bottoms; intermediate tank bottoms; product tank bottoms; biological treatment pond sludge; oil contaminated soil and gravel; process vessel wastes; monitoring well waters; various debris; and asbestos-containing material (ACM).

IV.B.2. *Historical Closure Activities*

Permits MTHWP-91-01 and MTHWP-02-02 contained closure and post-closure requirements for the land treatment units. During initial closure activities, TZ and BTZ soil exceeding 0.5% oil and grease was excavated, land-treated to meet treatment standards, and then placed back into the excavations. Excavation and remediation efforts began in 1993 and were completed in 2001. Debris found during closure activities was properly removed and disposed off-site, according to type.

IV.B.3. *Closure of NLF*
The NLF was closed to industrial risk-based standards and was designated as SWMU 23 in 2006.

IV.C. **General Requirements for Closure and Post-Closure**

IV.C.1. *Reporting and Recordkeeping Requirements*
The Permittee shall follow the reporting and recordkeeping requirements of Condition I.P. and this condition during closure and post-closure of the OLF.

IV.C.1.a. Annual OLF Soil and Groundwater Report
The Permittee shall submit an annual soil and groundwater report by April 1 of each year. The annual report must include the reporting requirements of Condition I.P.4.f.i.

IV.C.1.b. OLF Progress Summary in Module II Progress Reports
The Permittee shall include a progress summary of any corrective action, and closure and/or post-closure activities at the OLF in the RFI, IM, and/or CMI Progress Reports.

IV.C.2. *Cost Estimates and Financial Assurance for Closure and Post-Closure Care*
The Permittee shall follow the requirements of Condition I.G.2. for cost estimates and financial assurance.

IV.C.3. *Food Crop Prohibition*
No food crops or commercial forage may be grown on the OLF during the closure or post-closure periods.

IV.C.4. *Security, Inspection and Emergency Planning*

IV.C.4.a. Security

IV.C.4.a.i. The Permittee shall comply with security requirements set forth in 40 CFR 264.14(b)(2) and (c), and the *CHS Refinery Emergency Response Plans and Agreements*. Security measures must include:

IV.C.4.a.ii. A perimeter fence surrounding the facility and means to control entry at all times to the regulated unit; and

IV.C.4.a.iii. Signs with the following warnings and instructions must be maintained on the perimeter fence adjacent to the regulated unit: “Danger – Unauthorized Personnel Keep Out”. New or replacement signs must convey the same or similar warnings.

IV.C.4.b. Inspection Requirements

IV.C.4.b.i. The Permittee shall record on the inspection log form shown in Attachment IV.2. Log notations must include the date and time of inspection, name of inspector, observations, and date and nature of any repairs or other remedial actions.

IV.C.4.b.ii. Inspection records must be kept in accordance with Condition I.P.1.b.ii.

IV.C.4.b.iii. The Permittee shall inspect the OLF on the following schedule:

IV.C.4.b.iii.1. After each rainfall event in which greater than one-half inch of precipitation has fallen in less than 12 hours;

IV.C.4.b.iii.2. Weekly basis, to determine if releases or mismanagement of waste or product has occurred during refinery operations. Inspections should also be conducted on a daily basis up to one week (or more as needed) during and after any releases and;

IV.C.4.b.iii.3. Monthly, to evaluate the cover, run-on/run-off system, monitoring wells, and any disturbances.

IV.C.4.b.iv. The Permittee shall remedy any deterioration or malfunction of equipment or structures within a week of discovery to ensure the problem does not lead to an environmental or human health hazard.

IV.C.4.b.iv.1. Where a hazard is imminent or has already occurred, remedial action must be taken immediately.

IV.C.5. *General Maintenance Requirements*
During the post-closure period, the Permittee shall:

IV.C.5.a. Treatment Zone (TZ) Operations
Continue all operations specified in this permit necessary to maximize degradation, transformation, or immobilization of hazardous constituents within the TZ, to the extent they are consistent with other closure and post-closure activities.

IV.C.5.b. Measures to Control Soil Moisture and Wind Dispersal

IV.C.5.b.i. Moisture content in the TZ must be controlled to minimize blowing of wastes and surficial soils.

IV.C.5.b.ii. The Permittee may use soil stabilization methods both inside and outside treatment areas to control airborne dispersal of wastes and surface soils.

IV.C.5.b.iii. The Permittee shall note in the operating record incidents of blowing soils or wastes, and document efforts made to control wind dispersal.

IV.C.5.c. Run-On and Run-Off Control Systems

IV.C.5.c.i. The OLF run-on/run-off system is comprised of a series of berms, located as indicated in Attachment IV.1. The Permittee shall operate and maintain, until completion of post-closure care, a system around the OLF that will:

IV.C.5.c.i.1. Prevent flow onto the TZ during peak discharge from a 24-hour, 25-year storm; and

IV.C.5.c.i.2. Collect and control the run-off or volume of water resulting from a 24-hour, 25-year storm.

IV.C.5.c.ii. The Permittee shall perform repairs or maintenance as necessary to ensure berm heights and performance are maintained. Repairs must be made within one week of the time damage is noted on the OLF inspection log, unless conditions do not allow access to the damaged area. If conditions are such that repairs cannot be made in that timeframe, the reason must be noted on the inspection log.

IV.C.5.d. Weed Control

Noxious weed must be controlled and minimized. Migration of noxious weeds off-site must be prevented.

IV.D. **Closure Requirements**

The OLF was closed in 2015 and is currently in post-closure care. The OLF met the Closure Performance Standards specified in permit MTHWP-14-02.

IV.D.1. *Groundwater Monitoring*

IV.D.1.a. The Permittee shall follow the groundwater monitoring requirements of Module III for the duration of the post-closure care periods.

IV.D.2. *Institutional and Land Use Controls*

The Permittee filed a deed notice and survey plat with the Yellowstone County in 2015 following closure of the OLF.

IV.D.2.a. Changes to Deed Notices, Deed Restrictions, and/or Survey Plat

Any changes to filed deed notices, deed restrictions, and/or survey plat must be approved by DEQ prior to filing the changes with the appropriate State or local authorities. DEQ must be notified and given copies of the changed documents within thirty (30) days after any modification or changes have been submitted to the appropriate authorities.

IV.D.2.b. Inclusion in Facility-Wide Corrective Action

The Permittee shall include institutional and land use controls for the OLF in any facility-wide deed notice(s), restrictive covenant(s), or other land use controls established under Module II.

IV.D.2.c. Actual Notice

The Permittee shall provide direct notice of environmental information by certified mail to potential successors of title in the property. Where this notice is not provided, the transaction may be voided or damages may be sought by the successors of title in the property.

IV.D.2.d. Notice to Government Authority of Land Transaction
The Permittee shall provide notice to DEQ within ten (10) days prior to completion of any land transaction.

IV.E. **Post-Closure Requirements**

IV.E.1. *Applicability*

IV.E.1.a. If, after closure, hazardous constituents remain in the soil of the OLF at a level which poses a risk to human health and the environment, the Permittee shall perform post-closure care in accordance with this Section.

IV.E.1.b. The post-closure period will begin with the receipt and approval by DEQ of the closure certification for the OLF.

IV.E.1.c. The Permittee shall monitor the OLF throughout the post-closure care period in a manner that will ensure detection of a release of hazardous waste, hazardous waste constituents, leachate, contaminated run-off or waste decomposition products to the groundwater or surface water from the closed unit. The Permittee shall maintain all monitoring equipment throughout the post-closure care period in a manner that will ensure detection of a release from the closed unit.

IV.E.1.d. The Permittee shall comply with all post-closure requirements in this Module.

IV.E.2. *Post-Closure Care and Use of Property*

IV.E.2.a. In accordance with 40 CFR 264.117, post-closure care must begin after closure is completed and must continue for thirty (30) years after the closure date, unless specified as in Condition IV.E.2.b.

IV.E.2.b. In accordance with 40 CFR 264.117(2), at any time preceding partial closure of a land treatment unit subject to post-closure care requirements or final closure, or any time during the post-closure period, DEQ, in accordance with the permit modification procedures in Condition I.K.2., may:

IV.E.2.b.i. Shorten the post-closure care period applicable to the OLF if DEQ finds that the reduced period is sufficient to protect human health and the environment (e.g., soils or groundwater monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the OLF is secure); or

IV.E.2.b.ii. Extend the post-closure care period applicable to the OLF if DEQ finds that the extended period is necessary to protect human health and the environment (e.g., soils or groundwater monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment).

IV.E.2.c. DEQ may require, at partial and final closure, continuation of any of the security requirements of Condition IV.C.4.a. during part or all of the post-closure period when:

IV.E.2.c.i. Hazardous wastes may remain exposed after completion of partial or final closure; or

IV.E.2.c.ii. Access by the public or domestic livestock may pose a hazard to human health.

IV.E.2.d. Post-closure use of property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover or any other components of the containment system, or the function of the unit's monitoring systems, unless DEQ finds that the disturbance:

IV.E.2.d.i. Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or

IV.E.2.d.ii. Is necessary to reduce a threat to human health or the environment.

IV.E.2.e. All post-closure care activities must be in accordance with the provisions of the post-closure conditions as specified in Condition IV.E.2.

IV.E.3. *General Post-Closure Requirements*

IV.E.3.a. Post-Closure Contact

Personnel listed in Attachment IV.3 shall be the contact(s) concerning the OLF or facility during the closure/post-closure care period.

IV.E.3.b. Location of Permit during Post-Closure

Until final closure of the facility, a copy of the permit must be furnished to DEQ upon request, including request by mail. After final closure has been certified, the permit must be kept at the CHS Laurel Refinery offices during the remainder of the post-closure period.

IV.E.3.c. Amendment of Post-Closure Conditions

The Permittee may request a permit modification in compliance with 40 CFR 270.41 and Condition I.K.3. to change the post-closure conditions in this permit.

IV.E.3.c.i. The Permittee may submit a written request to DEQ for a permit modification to amend post-closure conditions in Module IV at any time during the active life of the facility or during the post-closure care period.

IV.E.3.c.ii. The Permittee shall submit a written request for a permit modification to authorize a change in post-closure conditions in Module IV whenever:

IV.E.3.c.ii.1. Changes in operating plans or facility design affect post-closure;

IV.E.3.c.ii.2. There is a change in the expected year of final closure; or

IV.E.3.c.ii.3. Events that occur during the active live of the facility, including partial and final closures, affect post-closure.

IV.E.3.c.iii. The Permittee shall submit a written request for a permit modification at least sixty (60) calendar days prior to the proposed change in facility design or operation, or no later than sixty (60) calendar days after an unexpected event has occurred which has affected post-closure conditions, or no later than sixty (60) calendar days after an unexpected event has occurred which has affected post-closure conditions.

IV.E.3.c.iv. DEQ may require modifications to post-closure conditions under Condition IV.E.3.c.ii. and IV.E.3.c.iii. The Permittee shall submit the modified post-closure plan no later than ninety (90) calendar days after DEQ's request. Any modifications to Module IV shall be conducted in accordance with the procedures in 40 CFR 270 subpart D.

IV.E.4. *Operation and Soil Monitoring During the Post-Closure Period*
During the post-closure period, the Permittee shall:

IV.E.4.a. Continue all maintenance and operations specified in Condition IV.C.5.;

IV.E.4.b. Maintain the protective cover(s);

IV.E.4.c. Continue to comply with prohibitions and conditions concerning growth of food chain crops under IV.C.3.; and

IV.E.4.d. Conduct BTZ soil monitoring in compliance with Conditions IV.E.5. and IV.E.6. on portions of the OLF covered with a permeable cap. All unit areas which have received waste must continue to be evaluated. The BTZ soil monitoring must occur every four years unless another frequency is agreed upon in writing by the Department. The next BTZ sample event must be conducted in 2027. A sampling event will be conducted at 30 years after closure certification (2045), and the status of the unit will be reassessed at that time.

IV.E.4.e. Portions of the OLF covered by an impermeable cap are exempt from BTZ soil monitoring unless:

IV.E.4.e.i.1. The impermeable cap is compromised, and a release of hazardous constituents occurs or is suspected to have occurred, or other information indicates sampling of BTZ soils beneath the cap is warranted.

IV.E.4.f. During the post-closure period, DEQ may require more frequent BTZ soil monitoring, at which time DEQ will notify the Permittee in writing. Examples of conditions warranting more frequent BTZ sampling may include, but not limited to: oil and grease exceedances; one or more hazardous constituent is detected at or above the PCL requirements; the appearance of hazardous constituents in groundwater immediately downgradient of the OLF; or inadvertent damage to the engineered cover.

IV.E.4.g. The Permittee will no longer be subject to Condition IV.E.4. if the Permittee can demonstrate to DEQ that levels of hazardous constituents, including inorganic constituents, in the treatment zone soil do not exceed the background value of those constituents by an amount that is statistically significant when using a test as specified in 40 CFR 264.280(d)(3).

IV.E.5. *Below Treatment Zone (BTZ) Monitoring Requirements*

IV.E.5.a. General

IV.E.5.a.i. The Permittee shall:

IV.E.5.a.i.1. Follow a regular monitoring schedule, as shown in Condition IV.E.4.d. and Attachment IV.4, Table 1;

IV.E.5.a.i.2. Collect and analyze samples according to the methods and procedures established in this Section, including criteria established for quality assurance and quality control measures; and

IV.E.5.a.i.3. Follow evaluation requirements established in Condition IV.E.6.

IV.E.5.a.ii. Results of all land treatment monitoring activities must be noted and maintained in the operating record, in accordance with Condition I.P.1.

IV.E.5.b. General Sampling Requirements

IV.E.5.b.i. The Soil Sampling and Analysis Plan in Attachment IV.5 must be followed.

IV.E.5.b.ii. All samples are to be collected in accordance with methods outlined in SW-846, Attachment IV.5 (Soil Sampling and Analysis Plan), and as otherwise specified in this permit.

IV.E.5.b.iii. All samples will be iced or preserved, as specific analytical methods dictate, at the time of collection and during transport to the laboratory. A chain-of-custody from the field to the laboratory must be maintained and documented.

IV.E.5.b.iv. All sampling equipment must be cleaned and/or decontaminated between samples.

IV.E.5.b.v. Records of all sampling methods and events must be incorporated into the operating record, in accordance with Condition I.P.1.

IV.E.5.c. Selection of Random Sampling Sites
Where random soil samples are required, the sample sites will be selected as follows:

IV.E.5.c.i. The OLF is divided into four application areas as shown in Attachment IV.1. The Permittee shall choose soil-sampling points in the following manner:

IV.E.5.c.i.1. Step 1: Two random numbers will be selected from a random numbers table. These numbers will be used to locate two points along a coordinate grid for each sampling area.

IV.E.5.c.i.2. Step 2: The intersection point of two lines drawn perpendicular to the two base line points will be located. This intersection point represents one randomly selected location for collection of one soil core or sample. If the point of intersection is outside the OLF, within thirty (30) feet of another sampling location, or within twenty (20) feet of the area boundary, the point must be discarded and another random point must be selected.

IV.E.5.c.ii. Steps 1 and 2 must be repeated as many times as necessary to obtain the required number of sampling sites.

IV.E.5.c.iii. The procedure for random selection of sampling sites within application areas must be performed for each soil or soil core sampling event.

IV.E.5.c.iv. The Permittee shall keep accurate records of all sample locations.

IV.E.5.d. General Analytical Requirements

IV.E.5.d.i. Attachment IV.4, Table 2 lists all applicable analytical methods to be used in the BTZ monitoring program.

IV.E.5.d.ii. The Permittee shall follow analytical and reporting requirements as set forth in Condition I.J.10.

IV.E.5.d.iii. The Permittee shall submit to DEQ, upon request, the Quality Assurance Plan and the name of a contact person for each analytical laboratory used by the Permittee.

IV.E.5.d.iv. Results of all monitoring activities must be maintained in the operating record as specified in Condition I.P.1.

IV.E.5.d.v. If analysis detects an analyte not included in the monitoring parameters or permit concentration limits in Attachment IV.4, Table 2, DEQ may add the analyte to those lists for future sampling and/or require re-sampling for the detected analyte. An analyte is detected when its concentration is at or above the MDL (for inorganic analytes) or EQL (for organic analytes).

IV.E.5.e. Below Treatment Zone Soil Core Monitoring

IV.E.5.e.i. Number of Samples and Sampling Frequency

IV.E.5.e.i.1. Two randomly selected un-composited Below BTZ core samples must be collected from each application area.

IV.E.5.e.i.2. The BTZ sampling schedule is shown in Condition IV.E.4.d. and Attachment IV.4, Table 1.

IV.E.5.e.ii. Sample Collection Methods

IV.E.5.e.ii.1. Random sampling sites must be selected according to Condition IV.E.5.c.

IV.E.5.e.ii.2. Soil core depths will be determined by the depth to the bottom of the TZ. BTZ samples must be collected a minimum of 0.5 feet from the base of the TZ. The depth to the bottom of the TZ varies from approximately three (3) feet below ground surface (bgs) in the southeast area to approximately five (5) feet bgs in the western portion of the OLF.

IV.E.5.e.ii.3. BTZ samples must be analyzed individually and must not be composited.

IV.E.5.e.ii.4. The Permittee shall take precautions, when collecting BTZ soil samples, to minimize the potential for contamination from overlying surface soils.

IV.E.5.e.iii. Analytical Parameters

BTZ samples must be analyzed for oil and grease, metals, and organic compounds. Analytical parameters and methods are shown in Attachment IV.4, Table 2.

IV.E.6. *Monitoring Results Evaluation*

IV.E.6.a. General

BTZ soils must be analyzed routinely to monitor for migration of hazardous constituents within and out of the TZ. Levels of PHCs listed in Attachment IV.4, Table 2 must be evaluated routinely in BTZ soils. In the event PHCs are detected in the BTZ or in the groundwater, the Permittee may be required to analyze for a more extensive list of constituents.

IV.E.6.b. Organic Constituents

Organic constituents listed in Attachment IV.4, Table 2 must be evaluated as outlined below and in Attachment IV.6.

IV.E.6.b.i. BTZ Oil and Grease Evaluation

If oil and grease analytical results are above 0.5% in any BTZ soil core, DEQ shall be notified within fifteen (15) days after the Permittee receives the analytical information. Within thirty (30) days after the Permittee receives analytical information, four additional cores must be taken 50 feet north, south, east and west from the location where the first core was sampled and analyzed for oil and grease. If the original sampling point is less than 50 feet from the

boundary of the OLF in any compass direction(s), then the corresponding additional core sample will be taken from a location 10 feet inside the land treatment boundary in that direction.

IV.E.6.b.ii. BTZ Oil and Grease Exceedances

IV.E.6.b.ii.1. If the original BTZ soil core sample exceeds:

(a) 3.5% oil and grease; or

(b) one or more of the four additional samples exceeds 2.5% oil and grease; or

(c) two or more of the four additional samples exceeds 1.5% oil and grease; or

(d) three or more of the four additional samples exceed 0.75% oil and grease; or

(e) all four of the additional samples exceed 0.5% oil and grease; then

IV.E.6.b.ii.2. The Permittee shall either:

(a) Notify DEQ, in lieu of the analyses required in Condition IV.E.6.b.ii.2.(c), within seven (7) days after receipt of the analytical results and submit a modification request to modify the permit in accordance with Condition IV.E.6.b.v.;

(b) Notify DEQ, in lieu of the analyses required in Condition IV.E.6.b.ii.2.(c), within seven (7) days after receipt of the analytical results and submit a request to remove the impacted materials in accordance with Condition IV.E.6.b.iv.; or

(c) Analyze the samples (from the set of four additional samples) which exhibited oil and grease concentrations of 0.5% or more for the constituents in Attachment IV.4, Table 2 and compare to the PCLs in accordance with Conditions IV.E.6.b.iii.

IV.E.6.b.iii. Organic Constituents above the PCL

If, under Condition IV.E.6.b.ii.2.(c), the analyses indicate the presence of at least one organic constituent above the PCL listed in Attachment IV.4, Table 2, the Permittee shall either:

IV.E.6.b.iii.1. Notify DEQ, in lieu of the analyses required in Condition IV.E.6.b.iii.3., within seven (7) days after receipt of the analytical results and submit a modification request to modify the permit in accordance with Condition IV.E.6.b.v.;

IV.E.6.b.iii.2. Notify DEQ, in lieu of the analyses required in Condition IV.E.6.b.iii.3., within seven (7) days after receipt of the analytical results and submit a request to remove the impacted materials in accordance with Condition IV.E.6.b.iv.; or

IV.E.6.b.iii.3. Use the Synthetic Precipitation Leaching Procedure (SPLP) (U.S. EPA SW-846 Method 1312) to determine the presence of leachable quantities of those constituents above the PCL. The Permittee shall analyze the SPLP extract of each soil sample exhibiting constituent concentrations above the PCL, but only for those constituents detected above the PCL. The Permittee must notify DEQ of the results of the SPLP evaluation within seven (7) days after the Permittee receives the analytical results from the laboratory. The Permittee shall evaluate the SPLP analytical results in the following manner:

(a) If the SPLP extract of any sample contains levels of any organic constituents above either the PCL for that constituent or the practical quantitation limit (PQL) for constituents with no PCL, it is considered a statistically significant increase. The Permittee must either:

i) Follow the permit modification requirements of Condition IV.E.6.b.v.; or

ii) Follow the requirements for removal of impacted materials in Condition IV.E.6.b.iv.

(b) If SPLP analysis does not show the presence of any constituents above its respective PCL or PQL, no statistically significant increase has occurred, and the Permittee must then follow the requirements of Conditions IV.E.6.b.vi. and IV.E.6.b.vii.

IV.E.6.b.iv. Hotspot Removal Work Plan

CHS may submit a Hotspot Removal Work Plan(s), within a timeframe specified by DEQ. The Work Plan(s) must include the proposed excavation, confirmation sampling, waste management, and confirmation reporting activities for removal of the impacted material. The Work Plan(s) must be approved in writing by DEQ prior to implementation.

IV.E.6.b.v. Modification Request

IV.E.6.b.v.1. The Permittee shall submit a request to modify the permit if:

(a) The Permittee submits a seven-day notification in accordance with Conditions IV.E.6.b.ii.2(a) or IV.E.6.b.iii.1.; or

(b) The SPLP procedure indicates a statistically significant increase as defined in Condition IV.E.6.b.iii.2.

IV.E.6.b.v.2. The modification request must be submitted:

(a) Within thirty (30) days of the seven-day notifications required by Conditions IV.E.6.b.ii.2(a) or IV.E.6.b.iii.1., or

(b) Within thirty (30) days of determining there has been a statistically significant increase under Condition IV.E.6.b.iii.2.

IV.E.6.b.v.3. In the request, the Permittee must propose changes in the permit which will maximize the success of degradation, transformation or immobilization in the OLF TZ; or propose a remediation plan for removal of migrated waste.

IV.E.6.b.vi. No Statistically Significant Increase
If it is determined there has been no statistically significant increase, the Permittee shall maintain accurate records at the facility of all sampling locations and analytical results for comparison to future monitoring events.

IV.E.6.b.vii. Accumulative Area of Oil and Grease Exceedances
After each sampling event, the Permittee shall determine the accumulative area of all samples that exceed 0.5% oil and grease with no associated significant increase in organic constituents as determined by Conditions IV.E.6.b.i. through IV.E.6.b.iii. If the accumulative area exceeds 4% of the total area of the OLF, the Permittee shall submit a modification request for the permit within thirty (30) days making the determination. The modification request must describe changes in the permit which will maximize the success of degradation, transformation or immobilization in the OLF TZ; or a remediation plan.

IV.E.6.b.vii.1. A summary of the accumulative area must be included in the annual report required in Condition IV.C.1.a.

IV.E.6.c. <u>Inorganic Constituents</u>

IV.E.6.c.i. Permit concentration limits (PCLs) for inorganic constituents are listed in Attachment IV.4, Table 2.

IV.E.6.c.ii. If inorganic constituents are detected above the PCL, the Permittee shall:

IV.E.6.c.ii.1. Notify DEQ within fifteen (15) days after receipt of analytical information by the Permittee of the suspected detection above the PCL;

IV.E.6.c.ii.2. Resample, within thirty (30) days after receipt of analytical information, for the borings which showed inorganic concentrations above the PCL and only for those inorganic constituents detected;

IV.E.6.c.ii.3. Evaluate analytical results from the repeat sampling. If repeat sampling detects at least one inorganic constituent above the PCL, it is considered a

statistically significant increase; and

IV.E.6.c.ii.4. Notify DEQ of the results of the evaluation seven (7) days after receipt of analytical results from resampling.

IV.E.6.c.iii. If there has been a statistically significant increase, as determined by Condition IV.E.6.c.ii.3., the Permittee shall submit a modification request for the permit within thirty (30) days of the seven-day notification in Condition IV.E.6.c.ii.4. The modification request must describe changes in the permit which will maximize the success of degradation, transformation or immobilization in the OLF TZ; or a remediation plan for removal of migrated waste.

IV.E.6.c.iv. Inorganic compound concentrations in the BTZ soil samples must also be evaluated by comparison to background tolerance limits computed for the background BTZ samples in accordance with Attachment IV.7. The background tolerance limits (BTL) for inorganic compounds are listed in Attachment IV.4, Table 2. Statistically significant concentrations must be reported annually in accordance with Condition IV.C.1.a.

IV.E.6.c.iv.1. The Permittee may propose a background tolerance limit for inorganic constituents. Such calculation must be based on a minimum of eight discrete samples representative of background for the OLF and be calculated in accordance with Attachment IV.7 or other statistical method approved by DEQ.

(a) Following approval by DEQ, the Permittee may request a permit modification to incorporate the new tolerance limit into Attachment IV.7.

IV.E.6.d. <u>Demonstration of Contamination from Another Source</u>
The Permittee may demonstrate that a source other than the OLF caused the increase or that the increase resulted from error in sampling, analysis, or evaluation. The Permittee is not relieved of the burden of submitting notification and reports under Condition IV.E.6. unless the demonstration successfully shows that a source other than the OLF caused the increase or that the increase resulted from error in sampling, analysis, or evaluation. In making a demonstration, the Permittee shall:

IV.E.6.d.i. Notify DEQ in writing within seven (7) days after determining an increase in oil and grease concentration exists under Condition IV.E.6.b., or inorganic concentration under Condition IV.E.6.c., that the Permittee intends to make a demonstration under this paragraph;

IV.E.6.d.ii. Within ninety (90) days after a determination under Condition IV.E.6.b. or IV.E.6.c., submit a report to DEQ which demonstrates that a source other than the regulated unit caused the increase, or that the increase resulted from error in sampling, analysis or evaluation;

IV.E.6.d.iii. Within ninety (90) days after the determination under Condition IV.E.6.b. or IV.E.6.c., submit to DEQ a permit modification request and a plan to make any appropriate changes to the operation of the OLF; and

IV.E.6.d.iv. Continue to monitor in accordance with the monitoring requirements of this Module until permit modifications are approved by DEQ.

IV.E.6.e. Other Analytes
If analysis detects an analyte not included in the PHC lists in Attachment IV.4, Table 2, DEQ may add the analyte to the PHC list for future sampling events and/or require re-sampling for the detected analyte. An analyte is detected when its concentration is at or above the MDL (for an inorganic analyte) or EQL (for an organic analyte).

IV.E.7. *Groundwater Monitoring During the Post-Closure Period*
The Permittee shall continue groundwater monitoring in accordance with Module III throughout the post-closure period.

IV.E.8. *Post-Closure Notices*

IV.E.8.a. The Permittee shall ensure that all requirements for institutional and land use controls, as set forth in Condition IV.D.2. are current for the OLF during and at termination of post-closure care.

IV.E.8.b. In accordance with 40 CFR 264.119(c), if the Permittee or any subsequent Permittee of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes, hazardous waste residues, or contaminated soils, he or she shall request a modification to this permit in accordance with Condition I.K.3. The Permittee shall demonstrate that the removal of hazardous wastes will satisfy Condition IV.E.2.d. By removing hazardous waste, the Permittee may become a generator of hazardous waste and shall manage such waste in accordance with all applicable requirements of Title 17, Chapter 53, Subchapter 6, ARM. If the Permittee is granted a permit modification or otherwise granted approval to conduct such removal activities, the Permittee may request DEQ approval for either:

IV.E.8.b.i. The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or

IV.E.8.b.ii. The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.

IV.E.9. *Certification of Completion of Post-Closure Care*

IV.E.9.a. No later than 60 calendar days after completion of the established post-closure care period for the OLF, the Permittee shall submit to DEQ, by registered mail, a certification that the post-closure care period for the OLF was performed in accordance with the specifications in the approved post-closure plan.

IV.E.9.a.i. The certification must be signed by the Permittee and an independent registered professional engineer.

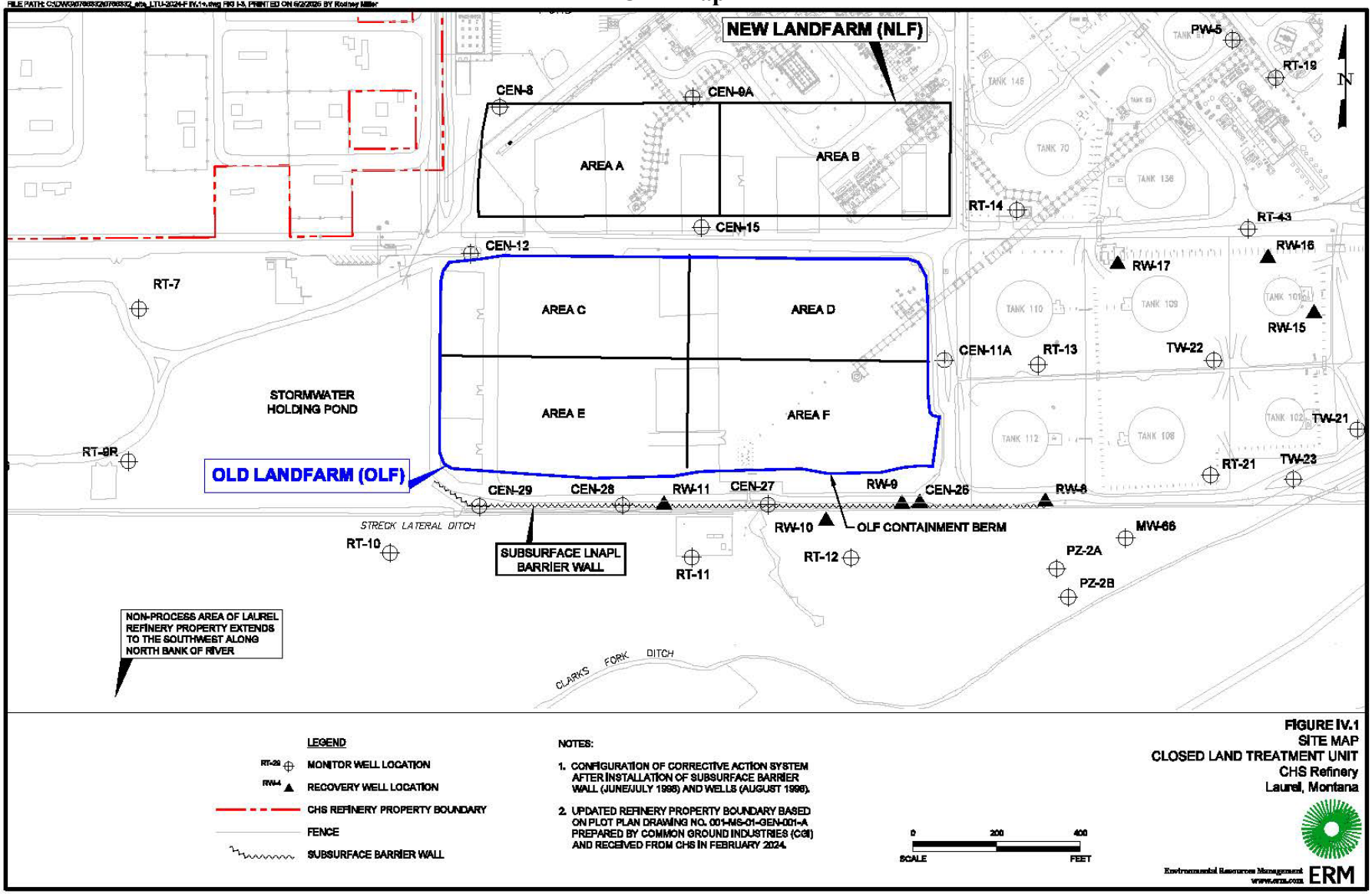
IV.E.9.a.ii. The certification must state that the Permittee has recorded notations on all instruments of conveyance and submitted a survey plat to the authority with jurisdiction over local land use, in accordance with Condition IV.D.14.

IV.E.9.a.iii. The certification must include copies of the document in which the notations have been placed, and the survey plat.

IV.E.9.b. Documentation supporting the independent professional engineer's certification must be furnished to DEQ upon request until the Permittee is released from financial assurance requirements for post-closure under Condition IV.E.10.

IV.E.10. *Release from Post-Closure Care Financial Requirements*
In accordance with 40 CFR 264.145(i), within sixty (60) days after receiving certifications from the Permittee and an independent registered professional engineer that the post-closure care period has been completed for the OLF in accordance with Module IV, DEQ shall notify the Permittee in writing that he/she is no longer required to maintain financial assurance for those regulated unit(s) that have completed post-closure care, unless DEQ has reason to believe that post-closure care has not been in accordance with the post-closure conditions in Module IV. DEQ shall provide the Permittee with a detailed written statement of any such reason to believe that post-closure care has not been in accordance with Module IV.

Attachment IV.1
OLF Map



Attachment IV.2
Post-Closure Inspection Log

GENERAL INSPECTION INFORMATION		
Inspection Date:	**Weather Conditions:**	
Inspection Time:		
Inspector:	**Supervisor Approval:**	**Date:**

RELEASE INSPECTION

	Yes	No
Has a release been observed at the OLF?		

If a release has occurred, then complete the following.

Release Information

Approximate location of the release within the OLF	
Source of the release	
Amount and material released	
Approximate duration of release	

Immediate Response Actions Taken

Source release stopped (e.g., container valve closed, etc.)	
Release extent controls deployed (e.g., use of absorbent materials, etc.)	
Released material removed (e.g., vacuum truck, excavation, etc.)	
CHS Environmental Department notified	

INTEGRITY INSPECTION

Item No.	Inspection Item	Check List	Pass	Fail	Remedial Action Taken	Date Fixed	Procedure and Amount of Material Used	Date of Reinspection
1	Visual Inspection	1a. Hard Cover			Asphalt mix and/or road base application	_____	_____	_____
2	Excessive Erosion	2a. Eroded Hard Cover			Asphalt mix, road base application, or equivalent	_____	_____	_____
3	Drainage Ditches	3a. Soil and debris build up			Clean Ditch	_____	_____	_____
4	Monitor Wells (RT-11, RT-12, PZ-2A, MW-66, CEN-11A, CEN-12, CEN-15, CEN-26, CEN-27, CEN-28, CEN-29)	4a. Check above-ground structural integrity			Repair above ground without replacing entire well	_____	_____	_____
		4b. Well locked			If problem is below grade, replace entire well	_____	_____	_____
5	Benchmarks	5a. Check for signs of disturbance			Resurvey as needed	_____	_____	_____

COMMENTS:

Attachment IV.3
Post-Closure Facility Contact

Refinery Environmental, Health, and Safety Director
CHS Inc.
803 Highway 212S
P.O. Box 909
Laurel, MT 59044-0909

Phone:
406-628-5347 (office)
406-628-5200 (main refinery office)

Attachment IV.4
Below Treatment Zone Sampling Schedule and Parameters

Table 1
Soil Monitoring Schedule

Sample Type	Frequency	Number and Type	Analytes and Parameters
BTZ soil	During the summer months, per Condition IV.E.4.d.	2 per application area	Attachment IV.4, Table 2

Table 2
BTZ Principal Hazardous Constituents and Permit Concentration Limits

BTZ Principle Hazardous Constituents	CAS No.	SW-846 Method	Detection Limit (mg/kg)	Permit Concentration Limit (mg/kg)	
Oil & Grease	N/A	9071	50	<0.5% (dry weight)	
Monitoring Parameters					
% Solids	N/A		N/A	N/A	
Percent Moisture	N/A		N/A	N/A	
pH	N/A	S-1.10	N/A	6.5 to 9.0	
Inorganic Compounds					
				BTL	PCL
Chromium	7740-47-3	6020	0.09	23.7	400
Lead	7439-92-1	6020	0.050	16.5	500
Mercury	7439-97-6	7470/7471	0.00047	N/A	0.1
Volatile Organic Compounds					
Benzene	71-43-2	8260	0.005	0.005	
Carbon disulfide	75-15-0	8260	0.01	0.01	
Chloroform	67-66-3	8260	0.005	0.005	
Ethylbenzene	100-41-4	8260	0.005	0.005	
Isopropyltoluene	99-87-6	8260	0.005	0.005	
Methyl Ethyl Ketone (2-Butanone) (MEK)	78-98-3	8260	0.01	0.01	
Styrene	100-42-5	8260	0.005	0.005	
Toluene	108-88-3	8260	0.005	0.005	
1,2,4-Trimethylbenzene	95-63-6	8260	0.005	0.005	
1,3,5-Trimethylbenzene	108-67-8	8260	0.005	0.005	
Xylene (total)	1330-20-7	8260	0.01	0.01	
Semi-Volatile Organic Compounds					
Base/Neutrals Extractables					
Anthracene	120-12-7	8270	0.0066	0.0066	
Benzo(a)anthracene	56-55-3	8270	0.0066	0.0066	
Benzo(b)flouranthene	205-99-2	8270	0.0066	0.0066	
Benzo(j)flouranthene	205-82-3	8270	0.0066	0.0066	

BTZ Principle Hazardous Constituents	CAS No.	SW-846 Method	Detection Limit (mg/kg)	Permit Concentration Limit (mg/kg)
Benzo(k)flouranthene	207-08-9	8270	0.0066	0.0066
Benzo(a)pyrene	50-32-8	8270	0.0066	0.0066
Bis(2-ethylhexyl)phthalate	117-81-7	8270	0.0066	0.0066
Butylbenzy phthalate	85-68-7	8270	0.0066	0.0066
Chrysene	218-01-9	8270	0.0066	0.0066
Dibenzo(a,h)anthracene	53-70-3	8270	0.0066	0.0066
7-12-Dimethylbenzene(a)anthracene	57-97-6	8270	0.0066	0.0066
Dimethyl phthalate	131-11-3	8270	0.0066	0.0066
Di-n-butyl phthalate	84-74-2	8270	0.0066	0.0066
Fluouranthene	206-44-0	8270	0.0066	0.0066
Fluorene	86-73-7	8270	0.0066	0.0066
Indene	95-13-6	8270	0.0066	0.0066
Methylchrysene, total	1705-85-7	8270	0.0066	0.0066
1-Methylnaphthalene	90-12-0	8270	0.0066	0.0066
2-Methylnaphthalene	91-57-6	8270	0.0066	0.0066
Naphthalene	91-20-3	8270	0.0066	0.0066
Phenanthrene	85-01-8	8270	0.0066	0.0066
Pyrene	129-00-0	8270	0.0066	0.0066
Pyridine	110-86-1	8270	0.0066	0.0066
Quinoline	91-22-5	8270	0.0066	0.0066
Acid Extractables		8270		
Benzenethiol	108-98-5	8270	0.0066	0.0066
o-Cresol (2-Methylphenol)	95-48-7	8270	0.0066	0.0066
m-Cresol (3-Methylphenol)	108-39-4	8270	0.0066	0.0066
p-Cresol (4-Methylphenol)	106-44-5	8270	0.0066	0.0066
2,4-Dimethyphenol	105-67-9	8270	0.0066	0.0066
2,4-Dinitrophenol	51-28-5	8270	0.0132	0.0132
4-Nitrophenol	100-02-7	8270	0.0132	0.0132
Phenol	108-95-2	8270	0.0066	0.0066

Notes
CAS No. – Chemical Abstract Service Number
BTL: Background Tolerance Limit established in the 10/1/1995 permit modification and as specified in Condition IV.E.6.c.iv.
PCL: Permit Concentration Limit for lead and chromium established in the 10/1/1995 permit modification.

Attachment IV.5
OLD LANDFARM
SOIL SAMPLING AND ANALYSIS PLAN

From: Report VI – Appendix VI-E-2
RCRA Permit Application
Closed RCRA Land Treatment Unit,
CHS Refinery, Laurel, Montana
February 21, 2024

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OLD LANDFARM
SOIL SAMPLING AND ANALYSIS PLAN

1.0 Introduction

CHS Inc. (CHS), owner and operator of the Laurel Refinery, manages their industrial hazardous waste program under a Montana Hazardous Waste Permit authorized under the Montana Hazardous Waste Act. The Old Landfarm (OLF) was operated from 1965 to 1981 as a land treatment unit (LTU) for refinery waste. The unit is regulated under the Federal Resource Conservation and Recovery Act (RCRA), as the waste materials that were treated at the LTU (after July 26, 1982) are designated as hazardous under RCRA. For background purposes, Montana has received RCRA authorization from the US Environmental Protection Agency (USEPA), which allows MDEQ to administer and enforce the states hazardous waste management rules.

The purpose of the document is to provide guidance for soil core sampling and analysis activities that would be required during post-closure monitoring. Soil core samples are collected and analyzed to monitor the conditions of the unsaturated zone of the OLF which applies to the Zone of Incorporation (ZOI), Treatment Zone (TZ), and Below Treatment Zone (BTZ) soils.

2.0 Objectives

The objective of the soil sampling and analysis activities is to collect sufficient quality data to meet the MDEQ monitoring requirements for the OLF. The goals of this Sampling and Analysis Plan (SAP) are to:

- Outline a consistent sampling methodology that, when implemented, will provide adequate data to meet the specific goals of the OLF monitoring;
- Provide a specific set of instructions to follow when samples are being collected;
- Provide a framework to help determine if soil concentrations at the OLF meet permit concentration limits; and
- Provide data capable of tracking the effectiveness of constituent degradation at the OLF.

3.0 Soil Core Sampling Activities

The terms “ZOI”, “TZ”, and “BTZ” will be retained, and will represent the following:

- ZOI - uppermost 12 inches of soil at the OLF;
- TZ – 6-8 feet of soil (approximately) underlying the OLF ZOI; and

- BTZ - remainder of the soil underlying the OLF TZ, and above the seasonal high-water table (typically 3 feet of soil column).

During post-closure care activities for the OLF, only BTZ soil sampling is required. Furthermore, for areas in the OLF with hard covers (e.g., flare foundation), soil core sampling will not be required for those portions.

3.1 *Selection of Random Sampling Sites*

Random sampling will be performed from each of the four areas of the OLF (Sub Areas C, D, E, and F) as approved in previous permits and as described below:

- Step 1 - Two random numbers will be selected from a random numbers table. These numbers will be used to locate two points along a coordinate grid for each sampling area.
- Step 2 - The intersection point of two lines drawn perpendicular to the two base line points will be identified. This intersection point represents one randomly selected location for collection of one soil core or sample. If the point of intersection is outside the OLF, within 30 feet of another sampling location, or within 20 feet of the area boundary, the point will be discarded and another random point will be selected.
- Steps 1 and 2 will be repeated as many times as necessary to obtain the required number of sampling sites.
- The procedure for random selection of sampling sites within application areas will be performed for each soil or soil core sampling event.
- Accurate records will be kept for all sampling locations and events.

3.2 *Below Treatment Zone Soil Core Monitoring*

BTZ sampling will consist of collection of two randomly selected uncomposited soil cores from each area of the OLF. Soil core depths will be determined by the depth to the bottom of the TZ. BTZ samples will be collected at a minimum of 0.5 feet from the base of the TZ. The depth to the bottom of the TZ varies from approximately three feet below ground surface (bgs) in the southeast area to approximately five feet bgs in the western portion of the OLF.

Soil recovered from a given location is collected and submitted for laboratory analysis. BTZ samples will be analyzed for oil and grease, metals, and organic compounds by the analytical methods shown Permit Attachment IV.4, Table 2. The procedure provided in Permit Condition IV.E.6. will be followed if a BTZ sample exceeds the permit concentration limit of 0.5% for oil and grease.

4.0 Sample Preservation and Shipment

Preservatives necessary for analysis will be added by the laboratory prior to supplying containers for the sampling event. Because preservatives may be specific to an analytical parameter, the preservative added to the sample container for a specific parameter will be noted on each container.

Samples will be labeled, packaged and shipped using the following procedures:

- A sample bottle label will be affixed to each sample container. The exact sample bottle label will change depending on the analytical laboratory contract in place at the time of sampling. The analytical parameter portions of the label will be completed by the laboratory.
- The field sampler will record the sample number/ID, date, time, and initial the sample label. The required sampling information for that sample will also be recorded on the chain-of-custody form. Samples will not be analyzed by the laboratory that are not properly labeled and sealed.
- Immediately upon collection, the sample bottles will be placed in insulated coolers with sufficient ice to lower and maintain a sample temperature of approximately 4º C. Individual samples will be packed with cushioning material sufficient to prevent breakage of glass sample containers during transport. In addition, individual sample bottles will be placed in re-sealable plastic bags. After sampling is completed each day, the samples will be stored in the insulated sample cooler at approximately 4º C until sent to the contracted analytical laboratory.
- The insulated coolers containing the samples will be delivered by the sampling team to the laboratory or to a courier service for overnight delivery. For shipment, signed chain-of-custody forms will be placed in the cooler and the coolers will be secured with high-quality packing tape, and a tamper-evident custody seal will be attached securely across the lid of the cooler prior to shipment.

5.0 Chain-of-Custody Control

These chain-of-custody procedures are intended to document sample possession from the time of collection to analysis. For the purpose of these procedures, a sample is considered in custody if it is:

- In one's actual possession;
- In view, after being in physical possession;
- Locked so that no one can tamper with it, after having been in physical custody; or
- In a secured area, restricted to authorized personnel.

A chain-of-custody record will be initiated in the field. This record will be completed with all pertinent information, including all appropriate analytical parameters for each different group of sample bottles. The original record will accompany the samples during transit to the laboratory. The field log will supplement the logbook record and chain-of-custody record.

6.0 General Analytical Procedures

All samples will be analyzed in accordance with the most recent procedures described in EPA SW-846 entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, or American Society for Testing and Materials (ASTM) Standard Test Methods, or other MDEQ- or EPA- approved methods. Current analytes and analytical methods for the BTZ are shown below:

BTZ - Analyze BTZ soil samples for the following constituents in accordance with Attachment IV.4, Table 2:

- Oil and grease - SW846 9071;
- Lead – SW846 6020;
- Chromium – SW846 6020;
- Mercury – SW846 7471;
- Organic Compounds – Attachment IV.4, Table 2;
- pH;
- Percent moisture; and
- Percent solids.

The Method Quantitation Limits (MQLs) will be equivalent to, but not less than the Estimated Quantitation Limits (EQLs) specified in SW-846, for each respective method. For reporting purposes, the Method Detection Limits (MDLs) will be included. The laboratory will provide MDLs that meet the Montana DEQ-7 standards. In the event that concentrations less than the EQLs are reported, the values will be flagged by the laboratory as estimated and will be considered non-quantitative.

7.0 Quality Assurance and Quality Control

7.1 *Quality Control Sampling*

For quality control (QC) purposes, one blind duplicate soil sample will be collected during each sampling event for the BTZ soil sampling. The duplicate samples will be collected from a randomly selected test pit and/or sampling location. The duplicate samples will be labeled with an appropriate identification number other than the test pit number. The identification number will be recorded in the field logbook or on a separate field sampling log form. The sample bottles for the regular and duplicate samples will be filled in alternate succession for each

required analysis (*e.g.*, fill the sample Oil & Grease jar and then the duplicate Oil & Grease jar, etc.).

One equipment blank sample will be prepared for each sampling event at a random test pit location other than a test pit location targeted for blind duplicate sample collection. The equipment blank will be prepared by pouring commercial distilled water over the decontaminated sampling equipment into sample containers. The samples should be labeled appropriately and stored in the same manner as the soil samples.

A trip blank for VOC analysis (only) will be provided by the laboratory to check for potential contamination resulting from the transportation of the collected samples. The trip blank will not be opened, and it will accompany the VOC samples from the field to the laboratory. One trip blank will be analyzed for VOCs for each shipment of sample coolers to the laboratory, regardless of the number of samples collected. Whenever possible for each shipment of samples to the laboratory, all VOC samples will be stored in one insulated cooler with the trip blank.

7.2 *Field Quality Assurance Procedures*

The following key procedures are designed to minimize potential cross-contamination of samples:

- Clean, disposable nitrile gloves will be worn when sampling.
- Properly cleaned and functioning sampling equipment will be used.
- QC samples such as trip blanks, equipment blanks, and blind duplicate samples will be collected to evaluate sample collection, transport, and analysis.
- Samples and bottles will be handled carefully to minimize exposure time and potential for evaporative loss and/or airborne contamination.
- Containerized ice will be used to maintain sample temperature during transit to the laboratory and to minimize breakage of sample containers.

7.3 *Equipment Decontamination*

The decontamination of sampling equipment is necessary to reduce the potential for the spread of constituents to clean areas, to reduce exposure to personnel, and to reduce the potential cross-contamination when equipment is used more than once. If appropriate, decontamination water will be containerized temporarily on site, and will be subsequently discharged into the CHS API Separator.

The sampling equipment (*e.g.*, shovel, hand tools) will be wiped clean with a disposable cloth, washed with solution of phosphate-free cleaner (*e.g.*, Liquinox®

or equivalent) and distilled water, then triple-rinsed with distilled water after use at each location.

7.4 *Laboratory Quality Assurance*

All samples will be analyzed in accordance with the most recent procedures described in EPA SW-846 entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, or American Society for Testing and Materials (ASTM) Standard Test Methods, or other EPA- or MDEQ-approved methods. The methods used by subcontracted laboratories to calibrate instruments, perform standard dilutions, manage data, clean glassware, and analyze samples are available in quality assurance manuals published and periodically revised by the individual contract laboratory. Included in such documents is the normal Analytical Control Program used during analysis of samples. Typical analytical quality programs used by laboratories include the following elements:

- Standard curves;
- Tests for precision and accuracy; and
- Control standards and method blanks.

Samples used to assess laboratory *precision* and *accuracy* will be chosen randomly by the laboratory from within a batch of samples to be analyzed on any given day (*i.e*., laboratory batch QC).

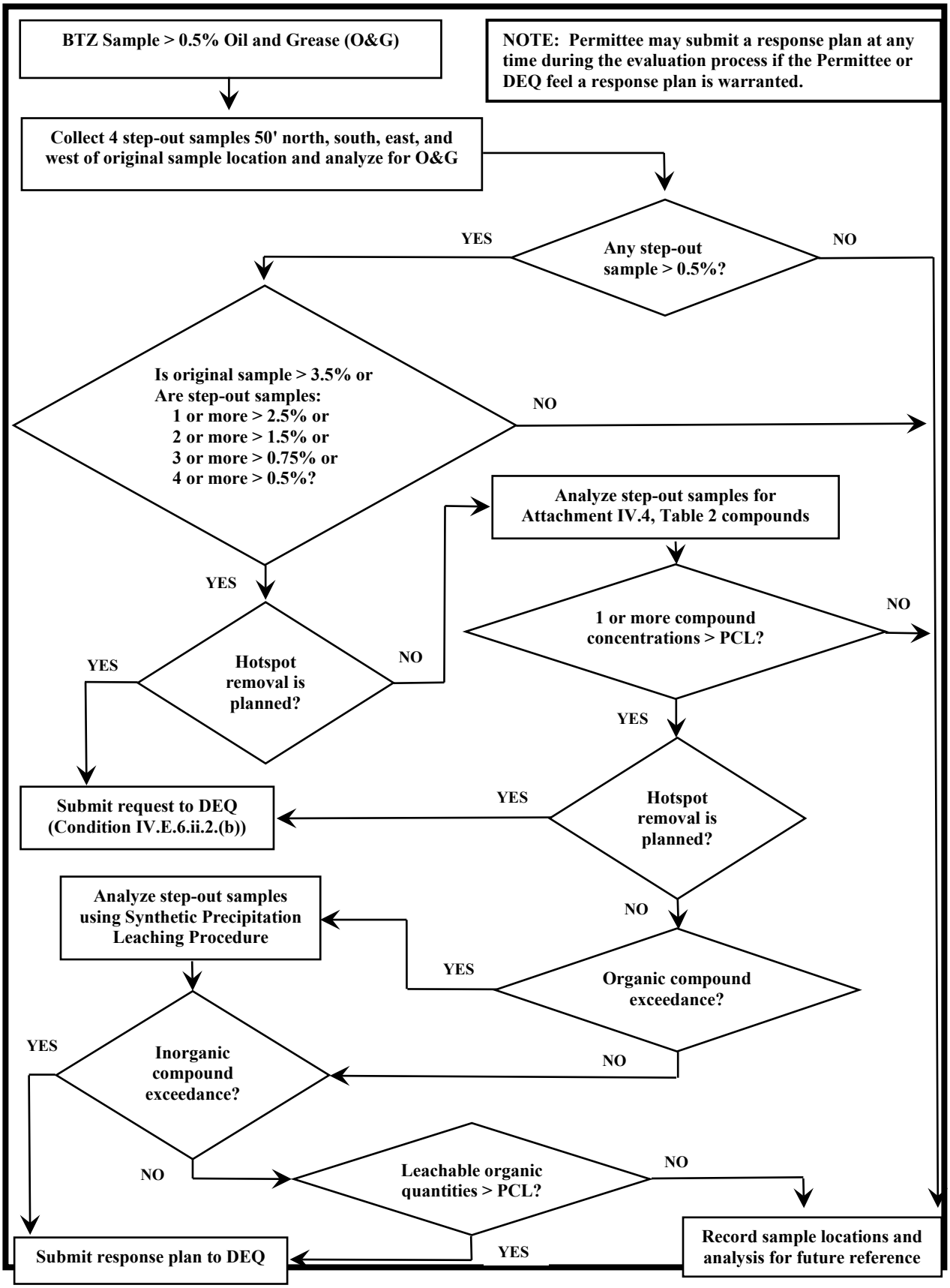
A laboratory Quality Assurance Plan (QAP) has been submitted to MDEQ previously and is incorporated into this SAP by reference. The QAP was included as an appendix to the *RCRA Facility Investigation Work Plan, Phase I Ground Water Investigation* (ERM, 1997). A QAP will be provided to MDEQ upon request (IV.E.5.d.iii.).

Additionally, the analytical laboratory package will be evaluated for usability of the data by reviewing the QC elements listed about (e.g., sample preservation, detection in QC blanks, surrogate recoveries, etc.). These data validation assessments will be summarized and documented on a form.

8.0 Waste Management and Disposition

Disposable items used during sampling (i.e., gloves, plastic, paper towels) will be disposed properly as trash in refinery waste containers.

Attachment IV.6
BTZ Resampling Procedure Flowchart



Also compute the adjustment for ties with equation [17.10]. There is only one group of distinct tied observations — the non-detects — containing 12 samples. Thus, the adjusted Kruskal-Wallis statistic is given by:

$$H^* = 10.56 \Big/ \left[1 - \left(\frac{12^3 - 12}{25^3 - 25}\right)\right] = 11.87$$

Step 4. Determine the critical point of the Kruskal-Wallis test: with $\alpha = .05$, the upper 95th percentage point of the chi-square distribution with $(k–1) = 4–1 = 3$ degrees of freedom [*df*] is needed. **Table 17-2** of **Appendix D** gives $\chi^2_{cp} = \chi^2_{.95,3} = 7.81$.

Step 5. Since the observed Kruskal-Wallis statistic of 11.87 is greater than the chi-square critical point, there is evidence of significant differences between the well groups. Therefore, post-hoc pairwise comparisons are necessary.

Step 6. To determine the significance level appropriate for post-hoc comparisons, note there are three compliance wells that need to be tested against background. Therefore, each of these contrasts should be run at the $\alpha^* = 0.05/3 = 0.0167$ significance level.

Step 7. Calculate the standard error of the difference for the three contrasts using equation [17.14]. Since the sample size at each compliance well is five, the *SE* will be identical for each comparison, namely,

$$SE_i = \sqrt{\frac{25 \cdot 26}{12}\left(\frac{1}{10} + \frac{1}{5}\right)} = 4.031$$

Step 8. Form the post-hoc Z-statistic for each contrast using equation [17.15]:

$$\text{Well 3: } Z_2 = \left(12.2 - 7.9\right) \Big/ 4.031 = 1.07$$
$$\text{Well 4: } Z_3 = \left(17.7 - 7.9\right) \Big/ 4.031 = 2.43$$
$$\text{Well 5: } Z_4 = \left(19.3 - 7.9\right) \Big/ 4.031 = 2.83$$

Step 9. Find the upper $(1–\alpha^*) \times 100$th percentage point from the standard normal distribution in **Table 10-1** in **Appendix D**. With $\alpha^* = .0167$, this gives a critical point (by linear interpolation) of $z_{cp} = z_{.9833} = 2.127$.

Step 10. Since the *Z*-statistics at wells 4 and 5 exceed the critical point, there is significant evidence of increased concentration levels at wells 4 and 5, but not at well 3. ◄

17.2 TOLERANCE LIMITS

A *tolerance interval* is a concentration range designed to contain a pre-specified proportion of the underlying population from which the statistical sample is drawn (*e.g.*, 95 percent of all possible population measurements). Since the interval is constructed from random sample data, a tolerance interval is expected to contain the specified population proportion only with a certain level of statistical

confidence. Two coefficients are thus associated with any tolerance interval. One is the population proportion that the interval is supposed to contain, called the coverage (γ). The second is the degree of confidence with which the interval reaches the specified coverage. This is sometimes known as the tolerance coefficient or more simply, the confidence level ($1-\alpha$). A tolerance interval with 95% coverage and a tolerance coefficient of 90 percent is constructed to contain, on average, 95% of the distribution of all possible population measurements with a confidence probability of 90%.

A *tolerance limit* is a one-sided tolerance interval. The upper limit is typically of most interest in groundwater monitoring. Tolerance limits are a standard statistical method that can be useful in groundwater data analysis, especially as an alternative to *t*-tests or ANOVA for interwell testing. The RCRA regulations allow greater flexibility in the choice of α when using tolerance and prediction limits and control charts, so a larger variety of data configurations may be amenable to one of these approaches. The Unified Guidance still recommends prediction limits or control charts over tolerance limits for formal compliance testing in detection monitoring, and confidence intervals over tolerance limits in compliance/assessment monitoring when a background standard is needed.

An interwell tolerance limit constructed on background data is designed to cover all but a small percentage of the background population measurements. Hence background observations should rarely exceed the upper tolerance limit. By the same token, when testing a null hypothesis (H_0) that the compliance point population is identical to background, *compliance point* measurements also should rarely exceed the upper tolerance limit, unless H_0 is false. The upper tolerance limit thus gauges whether or not concentration measurements sampled from compliance point wells are too extreme relative to background.

17.2.1 PARAMETRIC TOLERANCE LIMITS

BACKGROUND AND PURPOSE

To test the null hypothesis (H_0) that a compliance point population is identical to that of background, an upper tolerance limit with high coverage (γ) can be constructed on the sample background data. Coverage of 95% is usually recommended. In this case, random observations from a distribution identical to background should exceed the upper tolerance limit less than 5% of the time. Similarly, a tolerance coefficient or confidence level of at least 95% is recommended. This gives 95% confidence that the (upper) tolerance limit will contain at least 95% of the distribution of observations in background or in any distribution similar to background. Note that a tolerance coefficient of 95% corresponds to choosing a significance level (α) equal to 5%. Hence, as with a one-way ANOVA, the overall false positive rate for a tolerance interval is set to approximately 5%.

Once the limit is constructed on background, each compliance point observation (perhaps from several different wells) is compared to the upper tolerance limit. This is different from the comparison of sample means in an ANOVA test. If any compliance point measurement exceeds the limit, the well from which it was drawn is flagged as showing a significant increase over background. Note that the factors κ used to adjust the width of the tolerance interval (**Table 17-3** in **Appendix D**) are designed to provide *at least* 95% coverage of the parent population. Applied over many data sets, the *average* coverage of these intervals will often be close to 98% or more (see Guttman, 1970). Therefore, it would be unusual to find

more than 2 or 3 samples out of every 100 exceeding the tolerance limit under the null hypothesis. This fits with the purpose behind the use of a tolerance interval, which is to establish an upper limit on background that will rarely be exceeded, unless some change in the groundwater causes concentration levels to rise significantly at one or more compliance points.

Testing a large number of compliance point samples against such a background tolerance limit even under conditions of no releases practically ensures a few measurements will occasionally exceed the limit. The Unified Guidance therefore recommends that tolerance limits be used in conjunction with verification resampling of those wells suspected of possible contamination, in order to either verify or disconfirm the initial round of sampling and to avoid false positive results.

REQUIREMENTS AND ASSUMPTIONS

Standard parametric tolerance limits assume normality of the sample background data used to construct the limit. This assumption is critical to the statistical validity of the method, since a tolerance limit with high coverage can be viewed as an estimate of a *quantile* or *percentile* associated with the *tail probability* of the underlying distribution. If the background sample is non-normal, a normalizing transformation should be sought. If a suitable transformation is found, the limit should be constructed on the transformed measurements and can then be *back-transformed* to the raw concentration scale prior to comparison against individual compliance point values.

If no transformation will work, a non-parametric tolerance limit should be considered instead. Unfortunately, non-parametric tolerance limits generally require a much larger number of observations to provide the same levels of coverage and confidence as a parametric limit. It is recommended that a parametric model be fit to the data if at all possible.

A tolerance limit can be computed with as few as three observations from background. However, doing so results in a high upper tolerance limit with limited statistical power for detecting increases over background. Usually, a background sample size of at least eight measurements will be needed to generate an adequate tolerance limit. If multiple background wells are screened in equivalent hydrostratigraphic positions and the data can reasonably be combined (**Chapter 5**), one should consider using pooled background data from multiple wells to increase the background sample size.

Like many tests described in the Unified Guidance, tolerance limits as applied to groundwater monitoring assume *stationarity* of the well field populations both temporally (*i.e.*, over time) and spatially. The data also needs to be statistically *independent*. Since an adequately-sized background sample will have to be amassed over time (in part to maintain enough temporal spacing between observations so that independence can be assumed), the background data should be checked for apparent *trends* or *seasonal effects*. As long the background mean is stable over time, the amassed data from a longer span of sampling will provide a better statistical description of the underlying background population.

As a primarily interwell technique, tolerance limits should only be utilized when there is minimal *spatial variability*. Explicit checks for spatial variation should be conducted using box plots and/or ANOVA.

In the usual test setting, one new compliance point observation from each distinct well is compared against the tolerance limit during each statistical evaluation. Under the null hypothesis of identical

populations, the compliance point measurements are assumed to follow the same distribution as background. Further, the compliance data are assumed to be mutually statistically independent. Such assumptions are almost impossible to check with only one new value per compliance well. However, periodic checks of the key assumptions are recommended after accumulating several sampling rounds of compliance data.

PROCEDURE

Step 1. Calculate the mean $\bar{x}$, and the standard deviation s, from the background sample.

Step 2. Construct the one-sided upper tolerance limit as

$$TL = \bar{x} + \kappa(n, \gamma, 1-\alpha) \cdot s \qquad [17.16]$$

where $\kappa(n, \gamma, 1-\alpha)$ is the one-sided normal tolerance factor found in **Table 17-3** of **Appendix D** associated with a sample size of n, coverage coefficient of γ, and confidence level of $(1-\alpha)$.

Equation [17.16] applies to normal data. If a transformation is needed to normalize the sample, the tolerance limit needs to be constructed on the transformed measurements and the limit back-transformed to the original concentration scale. If the limit was constructed, for example, on the logarithms of the original observations, where $\bar{y}$ and s_y are the log-mean and log-standard deviation, the tolerance limit can be back-transformed to the concentration scale by exponentiating the limit. The tolerance limit is computed as:

$$TL = \exp\left[\bar{y} + \kappa(n, \gamma, 1-\alpha) \cdot s_y\right] \qquad [17.17]$$

Step 3. Compare each observation from the compliance well(s) to the upper tolerance limit found in Step 2. If any observation exceeds the tolerance limit, there is statistically significant evidence that the compliance well concentrations are elevated above background. Verification resampling should be conducted to verify or disconfirm the initial result.

►EXAMPLE 17-3

The table below consists of chrysene concentration data (ppb) found in water samples obtained from two background wells (Wells 1 and 2) and three compliance wells (Wells 3, 4, and 5). Compute the upper tolerance limit on background for coverage of 95% with 95% confidence and determine whether there is evidence of possible contamination at any of the compliance wells.

	Chrysene Concentration (ppb)				
Month	Well 1	Well 2	Well 3	Well 4	Well 5
1	19.7	10.2	68.0	26.8	47.0
2	39.2	7.2	48.9	17.7	30.5
3	7.8	16.1	30.1	31.9	15.0
4	12.8	5.7	38.1	22.2	23.4
Mean	19.88	9.80	46.28	24.65	28.98
SD	13.78	4.60	16.40	6.10	13.58

SOLUTION

Step 1. A Shapiro-Wilk test of normality on the pooled set of eight background measurements gives $W = 0.7978$ on the original scale and $W = 0.9560$ after log-transforming the data, suggesting that the data are better fit by a lognormal distribution. Therefore, construct the tolerance limit on the logged observations, listed below along with the log-means and log-standard deviations.

	Log Chrysene log(ppb)				
Month	Well 1	Well 2	Well 3	Well 4	Well 5
1	2.981	2.322	4.220	3.288	3.850
2	3.669	1.974	3.890	2.874	3.418
3	2.054	2.779	3.405	3.463	2.708
4	2.549	1.740	3.640	3.100	3.153
Mean	2.813	2.204	3.789	3.181	3.282
SD	0.685	0.452	0.349	0.253	0.479
BG Mean	2.509				
BG SD	0.628				

Step 2. Compute the upper tolerance limit on the pooled background data using the logged chrysene concentration data. The tolerance factor for a one-sided upper normal tolerance limit with 95% coverage and 95% probability and $n = 8$ observations is equal to (from **Table 17-3** of **Appendix D**) $\kappa = 3.187$. Therefore, the upper tolerance limit is computed using equation [17.17] as:

$$TL = \exp\left[2.509 + 3.187 \times 0.628\right] = 90.96 \text{ ppb}$$

Step 3. Compare the measurements at each compliance well to the upper tolerance limit, that is TL = 90.96 ppb. Since none of the original chrysene concentrations exceeds the upper TL, there is insufficient evidence of chrysene contamination in these data. ◄

17.2.2 NON-PARAMETRIC TOLERANCE INTERVALS

BACKGROUND AND PURPOSE

When an assumption of normality cannot be justified especially with a significant portion of non-detect observations, the use of non-parametric tolerance intervals should be considered. The upper tolerance limit in a non-parametric setting is usually chosen as an order statistic of the sample data (Guttman, 1970), commonly the maximum value or maybe the second or third largest value observed.

Because the maximum observed background value is often taken as the upper tolerance limit, non-parametric tolerance intervals are easy to construct and use. The sample data needs to be ordered, but no