GW - 349

PERMITS, RENEWALS, & MODS Application

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

John Bemis
Cabinet Secretary

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey
Division Director
Oil Conservation Division

MAY 21, 2013

CERTIFIED MAIL
RETURN RECEIPT NO: 3341 8907

Mr. Thomas R. Wynn
Site Manager RM&R
ConocoPhillips Company
P.O. Box 1354
Bartlesville OK 74004

Dear Mr. Wynn:

Based on your response given in the "Oil & Gas Facilities Questionnaire for Determination of a WQCC Discharge Permit" and a file review, the Oil Conservation Division (OCD) has determined that ConocoPhillips must renew its WQCC Discharge Permit for the Phillips Line NM-1-1 Site **(GW-349)** because of the discharge of treated ground water directly to ground water. Please submit a complete permit renewal application pursuant to 20.6.2.3106 NMAC within 120 days of your receipt of this letter. Please include the $100.00 filing fee specified in 20.6.2.3114 NMAC. Please note the renewal application informational requirements specified in 20.6.2.3106 - .3108 NMAC.

If you have any questions regarding this matter, please contact me at 505-476-3488.

Thank you for your cooperation.

Glenn von Gonten
Senior Hydrologist

GvG/gvg

CONESTOGA-ROVERS
& ASSOCIATES

2135 S. Loop 250 West
Midland, Texas 79703
Telephone: (432) 686-0086 Fax: (432) 686-0186
http://www.craworld.com

GW 0349

June 26, 2007

Reference No. 048258

RECEIVED

JUN 28 2007

Oil Conservation Division
Environmental Bureau

VIA FEDEX EXPRESS

Mr. Glenn von Gonten
NEW MEXICO OIL CONSERVATION DIVISION
1220 S. St. Francis Drive
Santa Fe, NM 87505

Re: Discharge Plan Renewal Application
NM1-1 Groundwater Remediation Project
GW 349, AP-10
Section 9, T-19-S; R-38-E
Lea County, New Mexico

Dear Mr. Von Gonten:

Conestoga-Rovers & Associates (CRA) is pleased to present this Discharge Plan Renewal Application for the GW 349, AP-10 groundwater remediation project. This document has been prepared on behalf of ConocoPhillips. The contents of the application were developed based on conversations between you and Ms. Eunice Klinski with CRA's Houston, Texas office.

One electronic and one paper copy of the report are enclosed for your records. We have also provided copy to the OCD Hobbs District 1 Office. Please feel free to contact the office if you have any questions at (432) 686-0086.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Thomas C Larson

Thomas C. Larson
Senior Project Manager

Enclosures

Cc: Mr. Chris Williams, OCD District 1 Hobbs
ConocoPhillips – EDMS project file

ACKNOWLEDGEMENT OF RECEIPT
OF CHECK/CASH

I hereby acknowledge receipt of check No. _____ dated 1/18/07

or cash received on _____ in the amount of $ 2700 00

from Conoco Phillips

for GW-0349

Submitted by: Lawrence Romero Date: 1/30/07

Submitted to ASD by: Lawrence Romero Date: 1/30/07

Received in ASD by: _____ Date: _____

Filing Fee _____ New Facility _____ Renewal ✓

Modification _____ Other _____.

Organization Code 521.07 Applicable FY 2004

To be deposited in the Water Quality Management Fund.

Full Payment ✓ or Annual Increment _____

GW0349

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Revised June 10, 2003

Submit Original
Plus 1 Copy
to Santa Fe
1 Copy to Appropriate
District Office

DISCHARGE PLAN APPLICATION FOR SERVICE COMPANIES,GAS PLANTS, REFINERIES, COMPRESSOR, GEOTHERMAL FACILITES AND CRUDE OIL PUMP STATIONS

(Refer to the OCD Guidelines for assistance in completing the application)

☐ New ☒ Renewal ☐ Modification

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JUN 28 2007

Oil Conservation Division
Environmental Bureau

1. Type: Soil and groundwater remediation system (GW 349, AP-10)

2. Operator: ConocoPhillips Pipe Line Company NM1-1 Remediation Shed

   Address: ConocoPhillips PB 1354, Bartlesville, Oklahoma 74004

   Contact Person: Mr. Tom Wynn Phone: 918-661-5283

3. Location: _____/4 _____/4 Section 9 Township 19 S Range 38E

   Submit large scale topographic map showing exact location.

   The topographic map showing the exact location is provided as Figure 1.

4. Attach the name, telephone number and address of the landowner of the facility site.
   Mr. William F. McNeill, P.O. Box 1058, Hobbs, NM 88241

5. Attach the description of the facility with a diagram indicating location of fences, pits, dikes and tanks on the facility.
   The facility is a soil and groundwater remediation system. The facility diagram is provided as Figure 2.

6. Attach a description of all materials stored or used at the facility.
   No materials are stored or used at the facility.

7. Attach a description of present sources of effluent and waste solids. Average quality and daily volume of waste water must be included.
   There are no present sources of effluent and waste solids generated at the Site, the groundwater extraction, treatment and re-injection system was shut down on September 21, 2005 with verbal approval from NMCOD.

8. Attach a description of current liquid and solid waste collection/treatment/disposal procedures.
   The remediation system installation consists of a crude oil recovery system, groundwater extraction, treatment and re-injection system and an enhanced-bioremediation system consisting of bio-venting and nutrient injection.

   Please refer to the attached Stage 2 Abatement Plan for Groundwater Abatement AP-10 section 2.0 for further descriptions of the above mentioned procedures provided as Appendix A.

9. Attach a description of proposed modifications to existing collection/treatment/disposal systems.
   To enhance crude oil recovery rates while reducing the amount of groundwater being recovered in the free petroleum Hydrocarbon recovery system weekly measurements of LPH thickness in the recovery wells; adjusting of skimmer pump intake depths according to fluctuations in the crude oil/groundwater interface; adjusting the pumping cycle of the skimmer pumps; and rotating wells on and offline according to the thickness of crude oil measured in the well.

10. Attach a routine inspection and maintenance plan to ensure permit compliance.
Quarterly groundwater monitoring and sampling activities are conducted and analyzed per NMOCD Discharge Permit GW-349 requirements.

Free petroleum hydrocarbon gauging is measured in selected wells during the quarterly monitoring events.

Maintenance of the nutrient injection system required replacement of the nitrous oxide tanks as needed and monitoring of the nutrient uptake volumes.

Please refer to the attached Stage 2 Abatement Plan for Groundwater Abatement AP-10 section 4.0 Monitoring Program and 5.0 Site Maintenance Activities provided as Appendix B for additional details.

11. Attach a contingency plan for reporting and clean-up of spills or releases.
The groundwater treatment system has been designed with numerous fail safes to prevent accidental discharges of untreated groundwater to the surface or subsurface. In the unlikely event that an accidental discharge of process water would occur, ConocoPhillips maintains a Company Core Plan for Emergency Response which addresses spills/releases. The ConocoPhillips Company Emergency Response Plan-Core Plan is provided as Appendix C.

12. Attach geological/hydrological information for the facility. Depth to and quality of ground water must be included.
Information obtained from the soil borings and the drilling monitoring wells, the geology consists primarily of caliche mixed with sands and some gravel. Groundwater was encountered in the monitoring wells at approximately 27 feet below ground surface.

Please refer to the attached Stage 2 Abatement Plan for Groundwater Abatement AP-10 section 1.5 Summary of Geology and Hydrogeology provided as Appendix D.

13. Attach a facility closure plan, and other information as is necessary to demonstrate compliance with any other OCD rules, regulations and/or orders.
The anticipated closure monitoring program will include collecting groundwater samples quarterly from the monitoring wells. Groundwater samples will be analyzed for concentrations of BTEX and TPH.

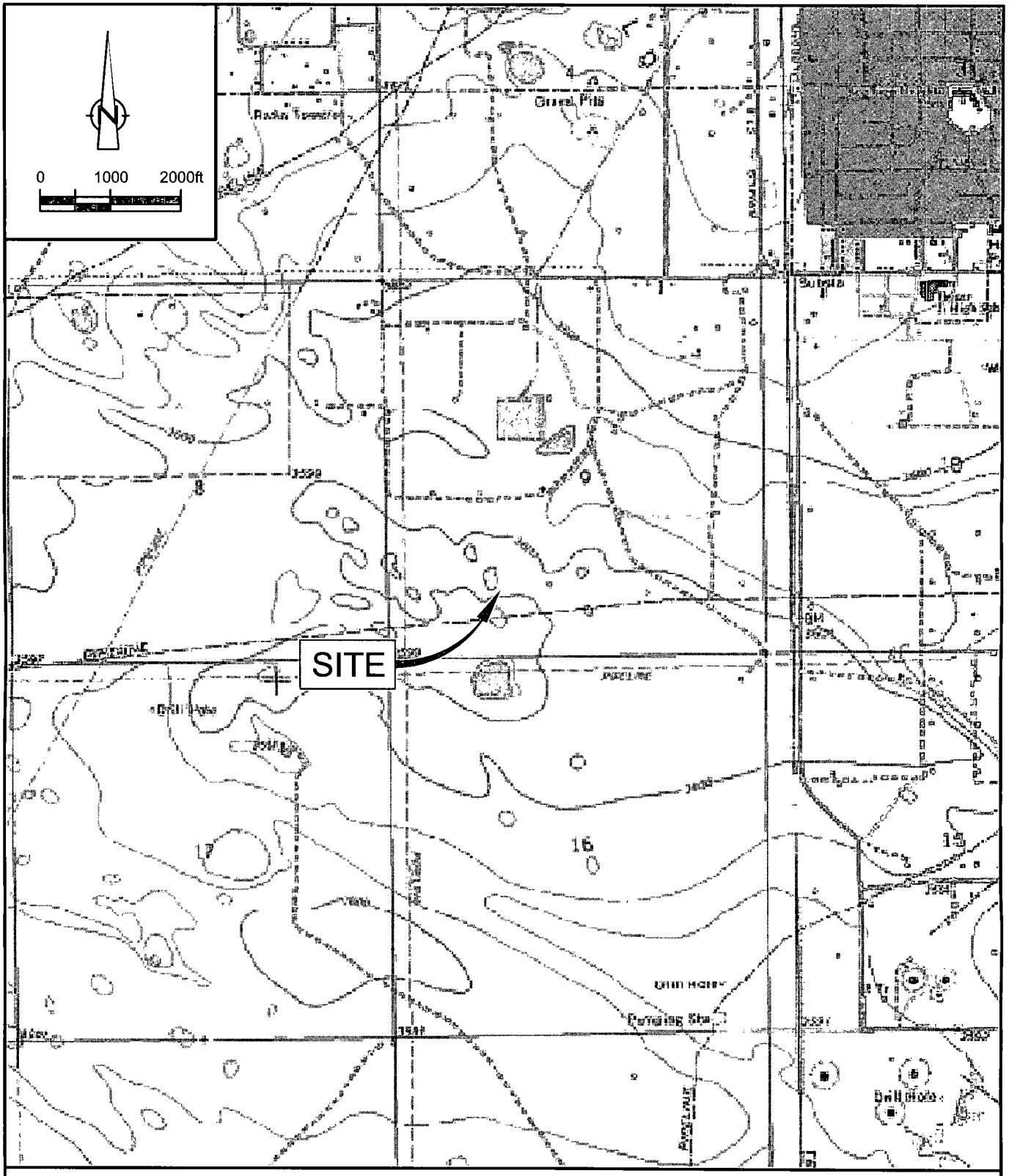
Please refer to the attached Stage 2 Abatement Plan for Groundwater Abatement AP-10 section 5.4 Closure Plan provided as Appendix E.

14. CERTIFICATIONI hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

Name: William J. Lundeen Title: RM & R Central Reg mgr

Signature: William J Lundeen Date: 6/19/2007

E-mail Address: bill.j.lundeen@conocophillips.com



SOURCE: USGS QUADRANGLE MAP;
WHALEN LAKE, TEXAS (1971)

32° 20' 38" N, 102° 48' 01" W

figure 1

SITE LOCATION MAP
PPL LINE NM-1-1 GROUNDWATER PERMIT RENEWAL
HOBBS, LEA COUNTY, NEW MEXICO
ConocoPhillips

LEGEND

MW-1 MONITOR WELL LOCATION

figure 2

SITE PLAN
PPL LINE NM-1-1 GROUNDWATER PERMIT RENEWAL
HOBBS, LEA COUNTY, NEW MEXICO
ConocoPhillips

048258-00(001)GN-BR001 JUN 19/2007

2.0 Development and Assessment of Abatement Options

The development of a corrective action plan for the NM-1-1 site is based on experience with various remedial technologies, experience with projects associated with the Ogalalla Aquifer, and knowledge of the regulatory compliance and cleanup goals of the OCD. The following conclusions were also influential during the development of the abatement options under consideration.

- The migration of crude oil appears to have limited shallow, lateral migration prior to reaching the water table. Concentrations of adsorbed phase hydrocarbons appear to be isolated to the water table interface outside of the excavated area. The analytical data shows soil impacts are defined to the north by boring MW-2, to the south and east by borings MW-3, MW-9, and MW-10, and to the south and west by borings MW-11 and MW-12.

- On January 12, 2000, liquid phase hydrocarbons (LPH) were detected in wells MW-1, MW-4, MW-5, MW-6, MW-7, MW-8, and SVE-2. The LPH plume appears to have been defined.

- In November 1999, aggressive crude oil product recovery continued. A "pothole" within the existing excavation was advanced to a depth of 35 feet to enhance crude oil recovery. A vacuum truck is removing crude oil periodically. As of March 27, 2000, approximately 21,042 gallons (501 barrels) of total fluids have been recovered using the vacuum truck. It is estimated that 12,625 gallons (60%) of the total fluids is crude oil.

- The lateral extent of the dissolved phase hydrocarbons has been defined to the north (MW-2), to the east (MW-3), to the south/southeast (MW-10), and to the south/southwest (MW-11 and MW-12). In October 1999, monitoring wells MW-1 and MW-4 through MW-8 were not sampled due to the presence of LPH.

- As of March 27, 2000, a total of approximately 14,874 gallons (354 barrels) of crude oil have been recovered by hand bailing, the product removal system, and the use of the vacuum truck.

A series of technological feasibility studies were completed to evaluate various abatement options.

2.1 Economic and Technical Feasibility of Remediation Technologies

2.1.1 Soil and Groundwater Remediation Goals

According to the OCD Guidance Document, remedial goals for the soil is 10 mg/kg benzene and 100 mg/kg TPH. Groundwater standards are 10 ug/L benzene, 750 ug/L toluene, 750 ug/L ethylbenzene, and 620 ug/L xylenes. Soils encountered at the NM-1-1 site may be remediated to concentrations of less than or equal to 10 mg/kg benzene and 100 mg/kg TPH. Groundwater encountered may be remediated to concentrations of 10 ug/L benzene, 750 ug/L toluene, 750 ug/L ethylbenzene, and 620 ug/L xylenes.

The presence of LPH should also be removed. Asymptotic remediation efforts may be reached and the above referenced standards may not be attainable due to the type of contaminant.

2.1.2 Evaluation of Remediation Techniques

Many technologies are available to facilitate the remediation of petroleum hydrocarbon-affected soils and groundwater. These range from traditional excavation and hauling of affected soils to aquifer air sparging and aerobic/anaerobic bioremediation. Most technologies are well suited to high permeability conditions, and only a few work well in low permeability conditions. The following technologies, alone or in combination, were considered for incorporation in the remedial action plan for this site:

- Excavation,
- Soil vapor extraction,
- Aerobic and anaerobic bioremediation,
- Aquifer sparging, and
- Groundwater pumping.

2.1.3 Excavation

Excavation may be considered for petroleum hydrocarbon-related remediation in three general circumstances: 1) when there are relatively small volumes of affected soils, 2) when the affected soils have a very low permeability, 3) if removal of relatively small quantities of soil will facilitate other remediation technologies by eliminating the concentrated source of petroleum hydrocarbons.

Excavation is not a practical solution at present, since soil contamination involves a large volume of affected soils. The site lithology of caliche would make excavation difficult. The depth of the petroleum impacts would result in numerous safety issues during excavation activities and the presence of LPH on the water table. Therefore, excavation activities are not applicable at this time.

2.1.4 Soil Vapor Extraction/Biovent System

Soil vapor extraction is a good mechanism for *in situ* reduction of petroleum hydrocarbon concentrations in the unsaturated zone through volatilization of petroleum hydrocarbon constituents and by increasing the oxygen content within the soil, thereby facilitating the natural biodegradation of petroleum hydrocarbons in the unsaturated zone.

Advantages for incorporation of a soil vapor extraction/biovent system at this site are:

- Disruption to the current use of the property as grazing land would be minimal. Excavation activities will be limited to trenches for installation of piping running from the vapor recovery wells to the equipment compound.

- Excavation of contaminated soil will be minimal. Remediation of contaminated soils will be accomplished *in situ*, reducing long term liabilities associated with off-site treatment and disposal of contaminated soil.

- The biodegradability of the petroleum hydrocarbon components are conducive to soil vapor extraction and bioventing, resulting in shorter remediation time frames than with most remediation technologies.

- A soil vapor extraction and biovent system can enhance contaminant recovery from preferential pathways such as fracturing within the caliche.

Disadvantages of soil vapor extraction/bioventing are:

- Off gas treatment cost, if required.

- This technology primarily addresses the vadose zone. It's effectiveness in the saturated zone is limited.

Soil vapor extraction/bioventing has practical applications at this site.

2.1.5 Aerobic and Anaerobic Bioremediation

In situ bioremediation is effective for saturated and unsaturated zone soils affected by petroleum hydrocarbons. Bioremediation technologies considered for this site enhance the populations of naturally occurring hydrocarbon utilizing bacteria. This process can be accomplished by simply increasing the oxygen content in the vadose zone by soil vapor extraction or by inducing nutrients and/or alternative electron acceptors into the subsurface to facilitate anerobic bioremediation. If anerobic bioremediation were implemented to address dissolved phase hydrocarbons, the process would consist of the addition of nitrate or sulfate and various nutrients to the subsurface through injection wells.

Advantages for bioremediation are:

- Bioremediation is an effective technology for addressing crude oil impacts.

- If necessary, nutrient addition may enhance biodegradation reducing remediation time frames.

Disadvantages to bioremediation are as follows:

- Permitting and additional monitoring requirements.

Bioremediation has practical application at this site. The *in situ* biremediation can be applied through the use of the soil vapor extraction/biovent system.

2.1.6 Aquifer Sparging

Aquifer sparging is a technology used to reduce concentrations of petroleum hydrocarbons in the saturated zone. Aquifer sparging is the injection of air, under pressure, at a point beneath the contamination within the saturated zone. This removes petroleum hydrocarbons directly from the saturated zone soils through volatilization and enhanced bioremediation. The air rises to the surface of the water table, where it is collected and removed by a soil vapor extraction system.

Advantages of aquifer sparging are:

- Removal rates of dissolved and adsorbed hydrocarbons are rapid.
- Equipment costs are low in comparison to groundwater pumping.
- Operation and maintenance of the remediation equipment is low.
- Removal efficiencies of volatile hydrocarbons from the saturated zone are high, resulting in reduced residual hydrocarbon concentrations at closure.

Disadvantages of aquifer sparging are as follows:

- Improper application of design of an aquifer sparge system can result in spreading of the contaminant (especially with the presence of LPH) instead of removal.
- Hydrocarbon vapors generated by the sparge system, if not captured by a vapor extraction system, can impact surrounding structures and utilities.

Aquifer sparging is not a practical application at this site because of the presence and amount of LPH.

2.1.7 Groundwater Pumping

Groundwater pumping is the removal of groundwater from the subsurface with either surface mounted or submersible electric pumps, or total fluid pneumatic pumps. Groundwater pumping provides hydraulic control of dissolved-phase and liquid-phase petroleum hydrocarbons, but often does not efficiently remove petroleum contamination when employed as the only remedial technology. Groundwater pumping is frequently combined with soil vapor extraction. The vapor extraction/biovent system works more efficiently when the water table is lowered and more contaminated soil is exposed to the vapor extraction process.

Advantages for groundwater pumping are:

- Migration of dissolved-phase and liquid-phase hydrocarbons are controlled.

- Soil vapor extraction/biovent system efficiency is increased due to control of groundwater fluctuations by the pumping system.

Disadvantages to groundwater pumping are as follows:

- Groundwater removed from the subsurface will require treatment prior to reinjection. The cost of the treatment system can be expensive.

- The high permeability of the saturated zone within the Ogalalla would result in high volumes of water to be treated.

Groundwater pumping is applicable for the site.

4.0 Monitoring Program

4.1 Groundwater Monitoring and Sampling

Groundwater samples will continue to be collected from all wells absent of LPH on a quarterly basis. The sampling scope of work will be as follows:

- All wells will be gauged for depth to water, depth to product (if any), and total depth.
- All wells absent of liquid phase hydrocarbons will be purged a minimum of three well volumes. Measurements of temperature, pH, and conductivity will be collected during well development to insure the water sampled is from the surrounding aquifer.
- Groundwater samples will be collected from all wells absent of liquid phase hydrocarbons. The groundwater samples will be analyzed for BTEX and TPH by EPA Method 8021/8015 Modified and chloride.
- Samples will be collected from the pump and treat system and analyzed for BTEX and TPH. Samples will also be analyzed for any other parameters according to future permit requirements. This may be on a separate schedule other than on quarterly basis.

4.2 Quality Assurance Plan

Industry accepted standard operating practices will be followed for all field activities to insure the quality of the data obtained. These procedures are summarized as follows:

- Well development and purging activities for the monitoring wells will be conducted from the cleanest well (based on past data and field observations) to the most contaminated well to minimize potential cross contamination between wells.
- All reusable groundwater sampling equipment will be decontaminated utilizing an alconox wash and distilled water rinse prior to sampling activities and between each well.
- Groundwater samples will be collected utilizing new disposable bailers. One duplicate sample will be collected during the sampling activities. In addition to the duplicate sample, one trip blank sample will be analyzed for the cooler containing the samples for BTEX analysis.
- The groundwater samples will be collected in the appropriate sample containers, labeled, sealed with custody seals, and placed on ice. The samples will be logged on a chain-of-custody form and submitted to the laboratory for analysis.
- New disposable gloves will be utilized for all sampling activities and will be discarded between samples.

5.0 Site Maintenance Activities

5.1 Biovent System Monitoring

Volatile organic compound emissions will be monitored using a PID at system activation. Air flow rates will be measured and used to calculate the mass of total hydrocarbons recovered and emitted. Once the biovent system is in place, monitoring will occur daily for one week and monthly thereafter. Oxygen, carbon dioxide, carbon monoxide, and nitrous oxide will also be monitored. The data gathered from the air monitoring will help track the progress of the biovent system. The progress of the biovent system will be included in the quarterly updates.

5.2 Groundwater Pumping/Product Skimming Monitoring

During each site visit, the groundwater pumping and product skimming system will be checked for proper operation. The groundwater from the treatment system will be sampled according to any discharge permit requirements. Point of compliance wells are proposed to be installed just down gradient of the groundwater injection wells. These wells are proposed to be sampled on a quarterly basis for BTEX and TPH to help monitor the effectiveness and integrity of the pumping system.

5.3 Equipment Maintenance

The remediation system will be monitored and maintained on a monthly schedule or on an as needed basis. This will ensure that the system is operating as designed. Checking control panel operation, fail safe alarms, and equipment cleaning will be an integral part of the routine maintenance. Emergency contact list with phone numbers will be posted outside of the equipment compound.

5.4 Closure Plan

The system will be operated until the criteria for closure are achieved or until dissolved hydrocarbon concentrations in the groundwater and/or the effluent from the soil vapor extraction system reach asymptotic concentrations. At this point in the project, a petition for system shut down will be prepared and submitted to the OCD for approval. This petition will contain system performance data and hydrocarbon removal results, and will outline the closure monitoring plan.

Confirmatory soil borings will be completed within the historical plume to track the remedial progress. The soil samples collected will be analyzed for BTEX and TPH.

The anticipated closure monitoring program will include collecting groundwater samples quarterly from the monitoring wells, for a total of four quarters. The groundwater samples will be analyzed for concentrations of BTEX and TPH. If the concentrations of dissolved BTEX exceed New Mexico Water Quality Standards in any compliance well, recommendations will be prepared. The proposed

compliance wells are MW-2, MW-9, MW-10, and MW-12.

When closure monitoring has been successfully completed, the closure monitoring data will be submitted to OCD and a request for official closure will be made. At this time the remediation equipment will be dismantled and the site wells will be properly abandoned.

SECTION 3

SPILL DETECTION & ON SCENE MITIGATION PROCEDURES

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SPILL DETECTION & ON SCENE MITIGATION PROCEDURES

This Section contains general core procedures for spill detection & on scene mitigation. For facility-specific information, refer to the RZ Appendix Section(s) titled Area Facility Information.

HAZARD EVALUATION

Hazard Identification

Company has identified the following activities that could potentially impact the operation of the pipeline system. Company has implemented preventative measures to avoid and minimize these risks:

Third Party Activities

Certain activities conducted near the pipeline could potentially impact the line or valves and cause a safety and or environmental incident. Examples of such activities may include excavation, vehicle and watercraft traffic, drilling, mowing, etc.

Corrosion (Internal and External)

Corrosion prevention measures are practiced within Company. However, corrosion could potentially cause a release of product to the environment.

Operator Error

All Company field personnel and control center operators receive extensive training in the operation of the pipeline. However human error could potentially cause a release of product to the environment.

Pipe Defects

New pipe is periodically installed along the pipeline system due to corrosion, reroutes, new pipelines, etc. The pipe quality and the number of bends along the pipe will impact the durability of the pipeline. Poor pipe quality or stress at a bend in the line could potentially cause a release of product to the environment.

DOT EMERGENCY RESPONSE PLAN ACTIONS

DOT Emergency Condition Procedure Cross Reference

This Emergency Response Plan provides procedures for safety when emergency conditions occur. The safety sections are Cross Referenced below:

DOT Safety	Emergency Response Plan
(1) Receiving, identifying, and classifying notices of events which need immediate response by the operator or notice to fire, police, or other appropriate public officials and communicating this information to appropriate operator personnel for corrective action.	• Volume 1, Section 2, Notifications • Volume 2, Response Zone Appendix, Notifications Section
(2) Prompt and effective response to a notice of each type emergency, including fire or explosion occurring near or directly involving a pipeline facility, accidental release of hazardous liquid or carbon dioxide from a pipeline facility, operational failure causing a hazardous condition, and natural disaster affecting pipeline facilities.	• Volume 1, Section 2, Notifications • Volume 1, Section 3, Spill Detection & On Scene Mitigation • Volume 1, Section 4, OSRO Information • Volume 1, Section 5, Response Activities • Volume 2, Response Zone Appendix, Notifications Section • Volume 2, Response Zone Appendix, Contractor Information
(3) Having personnel, equipment, instruments, tools, and material available as needed at the scene of an emergency.	• Volume 1, Section 2, Notification Procedures • Volume 1, Section 3, Spill Detection and On Scene Mitigation • Volume 1, Section 4, OSRO Information • Volume 1, Section 5, Response Activities • Volume 2, Response Zone Appendix, Notifications Section • Volume 2, Response Zone Appendix, Contractor Information
(4) Taking necessary action, such as emergency shutdown or pressure reduction, to minimize the volume of hazardous liquid or carbon dioxide that is released from any section of a pipeline system in the event of a failure.	• Volume 1, Section 2, Notification Sequence • Volume 1, Section 3, Spill Detection and On Scene Mitigation • Volume 1, Section 5, Response Activities • Volume 2, Response Zone Appendix, Notifications Section

(5) Control of released hazardous liquid or carbon dioxide at an accident scene to minimize the hazards, including possible intentional ignition in the cases of flammable highly volatile liquid.	• Volume 1, Section 2, Notification sequence • Volume 1, Section 3-Spill Detection and On Scene Mitigation • Volume 1, Section 5, Response Activities • Volume 2, Response Zone Appendix, Notifications Section
(6) Minimization of public exposure to injury and probability of accidental ignition by assisting with evacuation of residents and assisting with halting traffic on roads and railroads in the affected area, or taking other appropriate action.	• Volume 1, Section 2, Notification sequence • Volume 1, Section 3, Spill Detection and On Scene Mitigation • Volume 1, Section 5, Response Activities • Volume 2, Response Zone Appendix, Notifications Section
(7) Notifying fire, police, and other appropriate public officials of hazardous liquid or carbon dioxide pipeline emergencies and coordinating with them preplanned and actual responses during an emergency, including additional precautions necessary for an emergency involving a pipeline system transporting a highly volatile liquid.	• Volume 1, Section 2, Notification sequence • Volume 1, Section 3, Spill Detection and On Scene Mitigation • Volume 1, Section 5, Response Activities • Volume 2, Response Zone Appendix, Notifications Section
(8) In the case of failure of a pipeline system transporting a highly volatile liquid, use of appropriate instruments to assess the extent and coverage of the vapor cloud and determine the hazardous areas.	• Volume 1, Section 2, Notification sequence • Volume 1, Section 3, Spill Detection and On Scene Mitigation • Volume 1, Section 5, Response Activities • Volume 2, Response Zone Appendix, Notifications Section
(9) Providing for a post accident review of employee activities to determine whether the procedures were effective in each emergency and taking corrective action where deficiencies are found.	• Volume 1, Section 5, Response Activities
Safety-related condition reports. The manual required by paragraph (a) of this section must include instructions enabling personnel who perform operation and maintenance activities to recognize conditions that potentially may be safety-related conditions that are subject to the reporting requirements of Sec. 195.55.	• Volume 1, Section 2, Notifications • Volume 2, Response Zone Appendix, Notifications Section

OSHA EMERGENCY RESPONSE PLAN ACTIONS

OSHA Emergency Response Plan Cross Reference for Caverns

This Emergency Response Plan for caverns provides procedures for safety when emergency conditions occur. The elements of the Cavern Emergency Response Plan is cross referenced with OSHA's 29 CFR 1910.120(p)(8)(ii) below:

OSHA Emergency Response Plan Elements	Emergency Response Plan
Pre-emergency planning and coordination with outside parties	• Volume 1, Section 5, Response Activities • Volume 1, Section 9, Training & Exercise Program
Personnel roles, lines of authority and communication	• Volume 1, Section 5, Response Activities • Volume 1, Section 2, Notifications • Volume 1, Section 3, Spill Detection and Mitigation
Emergency recognition and prevention	• Volume 1, Section 3, Spill Detection and Mitigation • Volume 1, Section 5, Response Activities
Safe distances and places of refuge	• Volume 1, Section 5, Response Activities • Volume 1, Section 3, Spill Detection and Mitigation
Site security and control	• Volume 1, Section 5, Response Activities • Volume 1, Section 6A and 6B, Site Safety and Health Plan
Evacuation routes and procedures	• Volume 1, Section 5, Response Activities • Posted Facility Evacuation Plan at Facility
Decontamination procedures	• Volume 1, Section 5, Response Activities • Volume 1, Section 6A and 6B, Site Safety and Health Plan
Emergency medical treatment and first aid	• Volume 1, Section 5, Response Activities
Emergency alerting and response procedures	• Volume 1, Section 5, Response Activities • Volume 1, Section 3, Spill Detection and Mitigation
Critique of response and follow-up	• Volume 1, Section 9, Training & Exercise Program
PPE and emergency equipment	• Volume 1, Section 5, Response Activities • Volume 1, Section 6A and 6B, Site Safety and Health Plan

WATER QUALITY AND SEDIMENT QUALITY ANALYSIS

If the situations requires, following a release of oil to a waterway, Company will attempt to gather background data to determine the current conditions of the impacted waterway and sediments. An attempt will be made to collect samples ahead of the plume to determine current background conditions. Water quality data and sediment quality data will also be collected from within the impacted area to determine the changes in conditions. Following cleanup efforts, additional sampling will be conducted to demonstrate the effectiveness of the cleanup operations.

The sampling protocol will be determined by the volume and type of material spilled. In general, near surface water samples will be obtained along with sediment samples. In some cases, depending on spill-specific conditions, stratified sampling may be required. The following EPA analytical methods may be utilized to determine if oil from the Company release exists on the bottom sediments or within the water column. This is not intended to be an exhaustive list, but may be used as a guideline when deciding which methods to use.

EPA Analytical Methods

**

Product	Constituent	Possible EPA Methods
GASOLINE	Benzene	8020, 8240
	Toluene	8020, 8240
	Ethylbenzene	8020,8240
	Xylenes	8020, 8240
DIESEL	Polynuclear Aromatic Hydrocarbons	8100, 8270, 8310
	BTEX	8020, 8240
OILS	Total Petroleum Hydrocarbons	418.1, Modified 8015

** Contact your Environmental Representative for assistance in selecting the proper analytical methods.

HAZARDOUS WASTE CONTINGENCY PLAN

Introduction

The following wastes may be generated and could be determined to be "hazardous":

- paint chips
- avgas filters
- petroleum contaminated materials that are not considered "off-spec product"

Most of the wastes are "hazardous" due to the benzene concentrations in the wastes (>0.5 mg/l) or ignitability. The avgas filters are frequently determined to be "hazardous" due to the lead concentrations (>5.0 mg/l) in the filters. The paint chips are typically hazardous for lead, chromium or both (>5.0 mg/l).

The following materials are more frequently generated and are not considered a solid waste or a "hazardous waste". These materials are exempt from the definition of a solid waste because they are classified as an "off-spec product" destined for product reclamation.

- tank bottom water
- loading rack runoff
- tank bottom sludge
- oil/water separator sludge

Purpose

RCRA requires each facility generating and/or managing hazardous waste have a contingency plan in the event of a fire, explosion, or release of hazardous waste that could threaten human health or the environment.

To reduce the confusion which would be generated by having a separate "contingency plan", the RCRA contingency plan is being incorporated into the comprehensive Spill Response Plan, which also includes the facility's SPCC Plan and Emergency Procedures Manual. Where a section does not specifically reference "hazardous waste", the guidance provided in that section should be followed taking into account the fact the products managed at the terminal present significantly greater hazards than those presented by the hazardous waste stream being managed.

It is the purpose of the Terminal's hazardous waste contingency plan to minimize hazards to human health and the environment in the event of an emergency. This plan is designed to address emergencies that may occur during operations at this facility involving hazardous wastes.

Applicability

The plan must be carried out immediately whenever there is a fire, explosion or release of **hazardous waste** that could threaten human health or the environment.

Amendments to Plan

The contingency plan must be reviewed and immediately amended whenever:

- Applicable regulations are revised
- Plan fails in an emergency
- Facility changes in design, construction, operation, maintenance, or any way increasing the potential for fires, explosions, or releases of hazardous waste, or changes the response necessary in an emergency
- List of emergency coordinators changes
- List of emergency equipment changes

Emergency Coordinator Information

Identification of Emergency Coordinator

The names, addresses and phone numbers (office and home) of all persons qualified to act as emergency coordinator are located in the Front of Book and Notifications Section of this plan.

Emergency Actions

Emergency Procedures

Whenever there is an imminent or actual emergency situation the emergency coordinator or alternate must immediately activate the facility alarm systems or communications system. The actions that must be taken in the event of a release of hazardous waste to the air, soil or surface water at the facility are located in this FRP.

Evacuation Plan

Due to the characteristics of the hazardous wastes generated, evacuation of a facility should not be necessary. In the event evacuation is necessary, the facility evacuation plan should be followed. A description of the signal(s) to be used and evacuation routes is provided. The facility drainage plan can be located at the end of this section.

Notification Requirements

The only emergency that may occur with regard to the management of hazardous waste at the facility is a sudden or non-sudden release of hazardous waste. The reportable quantity (RQ) for spills of D018 waste is 10 pounds (1.2 gallons). Any spill equal to or greater than the RQ must be reported to the National Response Center. Reporting procedures should follow the guidelines provided in this FRP.

Arrangements with Agencies and Contractors

As required by 40 CFR 264.53, any Terminals have provided the police department, fire department, hospital and the county sheriff's offices with a copy of the contingency plan and relevant chapters of the Spill Response Plan. In addition, annual emergency drills are held at the facilities. Invitations have been given to each agency, as appropriate, to participate.

Emergency Equipment

A. A list of all spill response equipment available in the event of a release is listed in this FRP. A list of spill response contractors to be used by the facility in the event of a release that could surpass the response capabilities of the facility is also located in this FRP.

B. A list of emergency fire equipment at the facility is located in the Emergency Procedures Plan.

C. A description of the facility's communication equipment and plan is provided in this FRP.

D. A description of the facility's alarm systems is provided in this FRP.

WASTE HANDLING AND DISPOSAL PROCEDURES

With waste disposal sites becoming fewer, the issue of waste disposal can present unforeseen difficulties and expense. The importance of developing and updating good waste handling and disposal procedures and implementing them immediately during a spill response cannot be overemphasized. Disposal or recovery of waste will be handled at a Company-approved facility only.

This section outlines procedures for waste handling. The management of oil and waste material, including recycling, treatment, storage and disposal, must comply with the standards set forth in 40 CFR Parts 261 and 265 as mandated by RCRA and other relevant state regulations.

Oil and oiled materials recovered from land and water spills require proper handling. Spill response and cleanup procedures often produce materials that become wastes and require proper management. These materials may be residue, impacted soil or water, rinsate, sorbents, etc. The waste materials must be characterized for proper handling.

Waste handling procedures should be preceded by several steps with an overall objective of worker safety, waste minimization, cost effectiveness, minimization of impact on unaffected areas or already cleaned areas, regulatory compliance and proper disposal. The responsible Company person is the waste management specialist. All guidelines and organizational structures described in this section shall be followed when handling any recovered waste material.

See the flow chart that identifies the decision elements resulting from the response to be evaluated for the collection, characterization, temporary storage and segregation, transportation, handling, recycling, treatment and disposal of wastes.

Procedures

The waste management specialist should follow the following procedures:

A. Report to the Incident Commander.

B. Contact the operations section chief for his assessment of the magnitude of material to be handled.

C. Arrange with the operations section chief to scientifically collect representative samples of oil and oiled waste materials to be characterized.

D. Deliver representative samples to a laboratory for characterization.

E. Make preliminary contacts with listed recyclers and waste disposal sites to determine their acceptance criteria and availability.

F. Assist in completion of the Uniform Hazardous Waste Manifest.

G. Recovery of Spilled Oil

Collection methods and activities are under the immediate control of the operations section chief. The waste management specialist is responsible for handling wastes and will be in constant communication with the Operations Section Chief to understand the requirements.

Recovered oil should be placed in sealable containers such as five-gallon cans with lids or caps, 55-gallon drums, portable tanks, tank trucks, or any other container that can be sealed to prevent spillage. If the spill is from a storage facility, the recovered oil may be pumped back into sound tanks of compatible material. Oiled solid wastes should be placed in leak-proof containers to prevent leakage during handling and transportation. Double-walled plastic bags are for this purpose. For larger materials or those that could penetrate the bags, debris boxes or similar containers could be used as long as they are lined with plastic or by some other means to prevent leakage. Hazardous waste bins and lined dump truck beds may also be used for collection of oiled solid wastes.

Characterization

The objective of characterizing the waste is to ensure it is handled, stored and disposed of properly, in accordance with federal, state and local regulatory criteria. For waste materials containing products handled at the facility, assume the material is an RCRA-characteristic hazardous waste until indicated otherwise by testing or knowledge of the material. When characterizing these materials, consider the guidelines presented in 40 CFR Part 261, *Identification and Listing of Hazardous Waste*.

State and local guidelines for characterizing the waste may differ from the RCRA guidelines. Hence, the federal, state and local criteria should be checked when characterizing a waste. State and local guidelines may contain different criteria for toxicity, ignitability, reactivity and corrosivity. Particular attention should be directed toward any differences between the federal and state toxicity criteria. It may be possible that a spill residue could be classified as a state hazardous waste, but not an RCRA-listed or characteristic waste and be subject to state treatment, storage and disposal standards.

The following tests may be made by the laboratory in an effort to characterize the oiled waste:

- TPH
- pH
- Toxicity criteria
- Flashpoint

Temporary Storage and Segregation

In spill situations where relatively large quantities of oil and waste materials are recovered, temporary storage may be required until an effective means of disposal can be determined. A temporary storage site provides a location to store oil and waste material collected during cleanup. The storage site(s) should be segregated into free oil and/or on solid waste sections. Through proper waste segregation and identification, the amounts of wastes requiring disposal are reduced and the opportunities for recycling and treatment increase.

Temporary storage site(s) or transfer stations outside the facility should be located in areas with good access to cleanup operations and to nearby streets and highways. Good storage sites are paved flat areas such as parking lots.

Temporary storage sites should be selected and prepared to avoid contamination of surrounding areas. Therefore, storage sites should not be located on or adjacent to ravines, gullies, streams, or the sides of hills or other sensitive areas.

Once a site is located, certain site preparations are usually necessary to minimize contamination of the native soil. An earthen berm should be constructed around the perimeter of the storage site. If a paved parking lot is used, soil would have to be imported from nearby areas. Entrance and exit ramps should be constructed over the berm to allow cleanup equipment access to the site. If the substrate of berm material is permeable, several layers of plastic sheeting should be spread over the berms and across the floor of the storage site in order to contain liquid residue. A front-end loader should be stationed at each storage site to evenly distribute the oiled solid waste and to load the trucks that will transport the material to recovery facilities.

Free oil can be stored in tank trucks, 55-gallon drums, portable tanks or empty fuel storage tanks, if available.

Transportation

Waste materials recovered from the water should be loaded at a convenient location. Recovered waste materials from land should be loaded at designated transfer locations.

Carriers should be arranged to transport waste. Drums can be used for loading materials that are flammable (flashpoint less than 100EF).

United States Department of Transportation (DOT) specification 17E or 17H drums can be used for liquids having a flashpoint between 20EF and 73EF and a vapor pressure less than 18 psi absolute, at 100EF (49 CFR 119(1)).

For loading materials that have a flashpoint from 100EF to 200EF, rolloff bin trucks can be used. Vacuum trucks can be used for loading liquid waste materials.

Waste materials should always be covered during transportation. All truck rolloff bins should be lined with precut plastic sheets before loading to prevent oil from leaking onto the streets.

Tarpaulin covers may be used to minimize blowing or spilling of loads. Obtain proper permits and labels/placards for transportation per Hazardous Waste Manifest and Transport guidelines.

Waste Handling

Spilled free oil and waste materials recovered from land and water spills require responsible handling. Handling can pose initial and long-range problems including the storage and transportation of the material to a disposal or processing site, as well as the proper recycling, treatment and disposal methods. The EPA and various state authorities establish legal requirements for waste handling.

A primary concern in handling recovered oil and associated solid wastes is to prevent impacting previously unaffected areas or areas already cleaned. This can be accomplished by using correct handling techniques. All workers associated with the handling portion of waste should be briefed with respect to existing health and safety plans for spill response.

Disposal of waste must be minimized. This is accomplished by proper identification, waste segregation, recycling and treatment. Only the residue from these steps must be disposed of by an approved method.

Recycling

Recycling is the preferred method of handling recovered oil. The relative salvageability of the recovered oil should be determined.

Oil recovered from aquatic areas will typically contain substantial amounts of water, oil and debris. An oil/water separator can be constructed under field conditions using a 55-gallon drum or large welded sheet metal box fitted with a valved, bottom-draining pipe. The oil/water mixture is pumped into the container and allowed to stand long enough for the oil and water to separate. The water is then drained off the bottom through the valved pipe and the oil is pumped into a storage tank or truck. A tank or vacuum truck can also be used as an effective oil/water separator by following the same procedure. Any water drained off by separation techniques should be discharged into an aboveground tank, or the facility effluent treatment system, as it may still contain minor amounts of oil. The waste management specialist should determine the discharge requirements or restrictions for separated water.

Material reclaimed from the spill can either be returned to a product storage tank or shipped offsite for recycling. This recycling activity may be exempt from hazardous waste transport regulations, depending on the characterization of the material.

Treatment

Federal and state land disposal restrictions prohibit the land disposal of certain hazardous wastes without prior treatment to strict standards. These standards vary depending upon whether the waste is classified as RCRA or state hazardous waste. Contact Company Environmental Services for applicable requirements.

Disposal

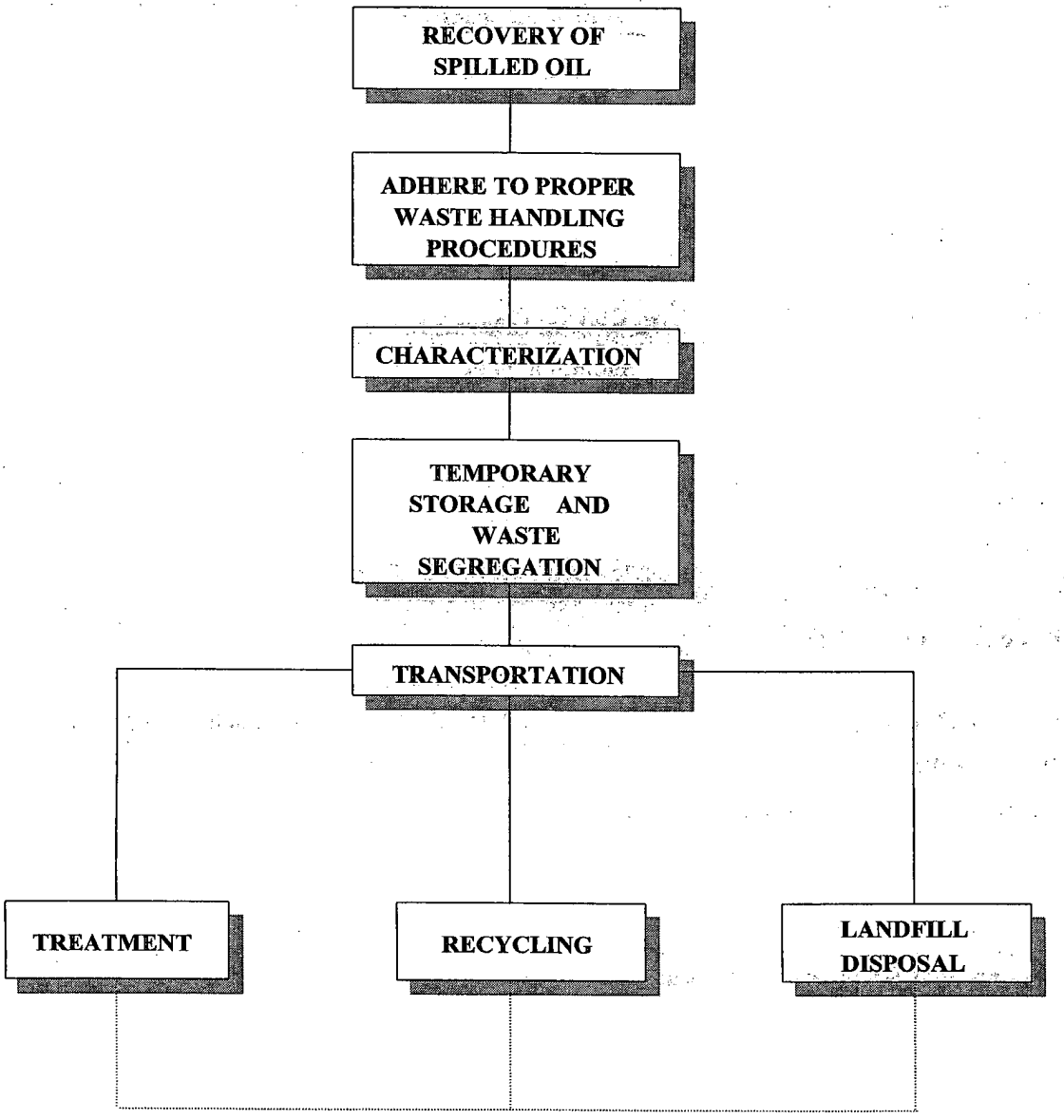
Non-recyclable waste or treatment residue may need to be disposed of at a state authorized landfill. Provisions should be made in advance by the waste management specialist with identified landfills so that their acceptance requirements are factored into any proposed disposal activities.

Disposal Facilities

Disposal or recovery of waste subject to the Company Hazardous Waste Contractor Review Program will be handled at a Company-approved facility only. The Company has developed a nationwide list of approved facilities. The facility will be selected based on the circumstances of the incident and the product involved. The waste management specialist will coordinate activities and obtain permits necessary to ensure proper disposal or recycling of recovered oil and associated debris.

FLOWCHART OF DECISION ELEMENTS - HANDLING OIL & OILY WASTES

Waste Handling and Disposal Procedures



WASTE HANDLING FORMS

Waste Management & Disposal Plan (Page 1 of 6)

General Information		
Incident Name:		
Location:		
Released Material(s):		
Amount(s) Released:		
Release Date and Time:		
Generator I.D. No.:		
Submittal Information		
Plan Update No:	Submittal Time:	Date:
Submitted By:		Date:
State OSC:		Date:
Federal OSC:		Date:
Company:		Date:
Waste Designation and Management		
Waste Stream No. 1 (WS-1)		
Type:	Est. Quantity	
Hazardous?: yes/no	Analytical?: yes/no (attach lab reports)	
EPA/State Waste Code:	Storage Location/Tank No:	
Special Handling/Transfer Requirements:		
Description of Segregation Procedures:		
Description of Recovered Oil Accounting Procedures:		

Waste Management & Disposal Plan Continued (Page 2 of 6)

Waste Designation and Management (Continued)	
Waste Stream No. 2 (WS-2)	
Type:	Est. Quantity
Hazardous?: yes/no	Analytical?: yes/no (attach lab reports)
EPA/State Waste Code:	Storage Location/Tank No:
Special Handling/Transfer Requirements:	
Description of Segregation Procedures:	
Description of Recovered Oil Accounting Procedures:	
Waste Stream No. 3 (WS-3)	
Type:	Est. Quantity
Hazardous?: yes/no	Analytical?: yes/no (attach lab reports)
EPA/State Waste Code:	Storage Location/Tank No:
Special Handling/Transfer Requirements:	
Description of Segregation Procedures:	
Description of Recovered Oil Accounting Procedures:	

Waste Management & Disposal Plan Continued (Page 3 of 6)

Waste Designation and Management (Continued)	
Waste Stream No. 4 (WS-4)	
Type:	Est. Quantity
Hazardous?: yes/no	Analytical?: yes/no (attach lab reports)
EPA/State Waste Code:	Storage Location/Tank No:
Special Handling/Transfer Requirements:	
Description of Segregation Procedures:	
Description of Recovered Oil Accounting Procedures:	
Interim Waste Storage Sites	
Interim Storage Site No. 1	
Location/Site Description:	
Site Capacity:	
Permit Requirements:	
Containers (roll-off boxes, tanks, drums, pits, etc.):	
Site Construction (berms, liners, coverings, leachate/rainwater collection):	
Decontamination Area (location, set up, pollution prevention measures):	

Waste Management & Disposal Plan Continued (Page 4 of 6)

Interim Waste Storage Sites (Continued)
Interim Storage Site No. 2
Location/Site Description:
Site Capacity:
Permit Requirements:
Containers (roll-off boxes, tanks, drums, pits, etc.):
Site Construction (berms, liners, coverings, leachate/rainwater collection):
Decontamination Area (location, set up, pollution prevention measures):
Interim Storage Site No. 3
Location/Site Description:
Site Capacity:
Permit Requirements:
Containers (roll-off boxes, tanks, drums, pits, etc.):
Site Construction (berms, liners, coverings, leachate/rainwater collection):
Decontamination Area (location, set up, pollution prevention measures):

Waste Management & Disposal Plan Continued (Page 5 of 6)

Decanting Request (If Applicable)
Description of Proposed Decanting Procedures:

Treatment/Disposal		
Waste Stream	**Treatment/Disposal Method**	**Treatment/Disposal Facility**
WS-1		
WS-2		
WS-3		
WS-4		

Waste Tracking
Description of Waste Tracking Procedures:

Waste Transportation	
WS-1	
Proposed Method:	
Contractor:	Certification No.
Spill Prevention Measures:	

Waste Management & Disposal Plan Continued (Page 6 of 6)

Waste Transportation (Continued)	
WS-2	
Proposed Method:	
Contractor:	Certification No.
Spill Prevention Measures:	
WS-3	
Proposed Method:	
Contractor:	Certification No.
Spill Prevention Measures:	
WS-4	
Proposed Method:	
Contractor:	Certification No.
Spill Prevention Measures:	

Waste Status Summary			
TYPE	**RECOVERED**	**STORED**	**DISPOSED OF**
Oil (bbls)			
Oily Liquids (bbls)			
Oily Solids (tons)			
Solids (tons)			

PPE
PPE Required for Waste Handling:

OTHER
Additional Information:

Interim Storage Tracking Form

Interim Storage Location(s)	Location(s) Received From:	Time/Date Received:	Volume: (Gals/Yds)	Type of Waste
Totals				

FACILITY SELF INSPECTION

Visual Tank Inspection

The visual tank inspection checklist presented below has been included as guidance for inspections and monitoring. Also included in the visual tank inspection will be an inspection of the tank foundation and associated piping. All tankage, pumping equipment, piping and related terminal equipment are inspected every working day for leakage, malfunctions of seals, etc. Storage tanks are inspected monthly and annually and findings are recorded on forms GPL-199 and form 3120, respectively. These forms are included in this plan. These records shall be maintained for a minimum of five years.

1. Check tanks for leaks, specifically looking for:
   - drip marks
   - discoloration of tanks
   - puddles containing stored materials
   - corrosion
   - cracks
   - localized dead vegetation

2. Check foundation for:
   - cracks
   - discoloration
   - puddles containing stored material
   - settling
   - gaps between tank and foundation
   - damage caused by vegetation roots

3. Check piping for:
   - droplets of stored material
   - discoloration
   - corrosion
   - bowing of pipe between supports
   - evidence of stored material seepage on valves and seals
   - localized dead vegetation

Secondary Containment Inspection

The secondary containment areas shown on the site plans will be inspected on an annual basis. The inspections will include checking for the following:

1. Dike or berm system
   - Level of precipitation in dike/available capacity
   - Operational status of drainage valves
   - Debris
   - Erosion
   - Location/status of pipes, inlets, drainage beneath tanks, etc.

2. Secondary containment
   - Cracks
   - Discoloration
   - Presence of stored materials (standing liquid)
   - Corrosion
   - Valve conditions

3. Retention and drainage ponds
   - Erosion
   - Available capacity
   - Presence of stored material
   - Debris
   - Stressed vegetation

Pipeline Inspection

All pipelines within Company System are monitored on a regular and routine basis. All product pipelines and many crude lines are connected to the SCADA (Supervisory Control and Data Acquisition) System. Company personnel monitor and control line pressures and product flow rate, operate remotely controlled valves, operate pumps and engines, and monitor the type of product currently in the line at any given point. These control centers are operated on a 24-hour basis. Should a leak occur, the operators monitoring the lines can have the line shut down within minutes. The operators can then dispatch field personnel to physically inspect the line in the area of the suspected leak.

Other lines that are not connected to the SCADA System are generally smaller crude gathering pipelines. These lines are observed regularly by tank gaugers, pumpers or members of the gathering system maintenance crew. In addition to these inspections, aircraft that fly the pipeline on a scheduled weekly basis inspects the lines.

MONTHLY ROUTINE IN-SERVICE INSPECTION

Transportation - Pipelines and Terminals

Doc. No.: GPL-199
Rev.: 1

PI Form - GPL-199 - Aboveground Storage Tanks (Atmospheric)
Monthly Routine In-Service Inspection
49CFR195.432 or 40 CFR112.1.8.1(f)(FRP), 112.7(e)(SPCC) and API-653

Also Use this Form for Annual Inspection of Small Storage Tanks Sized 10,000 gallons or less

Name of Employee Performing Inspection: _____

Date of Monthly Inspection: _____

Location: _____

OK = Condition satisafactory/no action required. **NO = Adverse condition noted and corrective action is required.**

NOTE: Access onto a floating roof is not required by this form

(1) Tank No.	(2) Employee Initials and Date	(3) Breakout Tank Yes/No	(4) NO Visible Leaks Yes/No	(5) Shell Distortion	(6) Pressure/Vacuum Relief Valves Overfill Protection Device	(7) Corrosion (Stairs, Handrails, Sketchplates, Attachments, etc.)	(8) Tank Foundation Tank Pipe Supports Tank Dikes	(9) Coating Insulation Condition	(10) Nozzles, Tank Valves, Roof Drains & Tank Piping

Additional Comments:

Tank #:	

NOTE: Any deficiencies receiving a "NO" shall be reported to immediate Company Supervision, Authorized Inspector, or Corrosion Technician.

ANY LEAKS DISCOVERED DURING INSPECTION NEED TO BE REPORTED IMMEDIATELY.

Retain inspection report for 2-year period if required by DOT 49CFR 195.404
Retain inspection report for 3-year period if required by EPA 40CFR 112.7(e) (SPCC Plan)
Retain inspection report for 5-year period if required by EPA 40CFR Part 112, Appendix F, section 1.8.1 (Facility Emergency Response Plan)

Distribution: Orig. -
Ref. Copy -

ANNUAL TANK INSPECTION REPORT

Doc. No.: GPL-205
Rev.: 1

Transportation - Pipelines and Terminals

PI Form - GPL-205 - Annual Tank Inspection Report

1. TERMINAL/FACILITY: _____ TANK TYPE: ____ External ____ Internal ____ Cone Roof ____ Spheroid ____ Sphere ____ Other
2. TANK #: _____
3. INSPECTOR: _____ DATE: _____
4. SERVICE: _____ 5. CAPACITY: _____

(CHECK APPROPRIATE ANSWER OR MARK THROUGH THE QUESTION IF IT DOES NOT APPLY.)

TANK APPURTENANCES (ATMOSPHERIC STORAGE)

	YES	NO
6. Are the relief valve vent screens clean?	☐	☐
7. Do the combination pressure/vacuum pallets move freely to an open or closed position?	☐	☐
8. Are the liquid thermal relief valves on tank piping properly mounted to prevent piping overpressure?	☐	☐
9. Is a flame arrestor on the tank (see Std. 26.01-18)?	☐	☐
A. Do state regulations or local ordinance require it?	☐	☐
B. Can it be removed by applying a design hazard review or a Management of Change (MOC)?	☐	☐
10. Is tank gauge in satisfactory condition?	☐	☐
11. Is water drain valve in satisfactory condition?	☐	☐
12. Is roof drain apparently in satisfactory condition? (i.e., no staining at the base exit of the roof drain piping)	☐	☐

13. Additional comments:

FILL IN ITEMS 14 THRU 27 FOR FIXED OR EXTERNAL FLOATING ROOFS

	YES	NO
14. Is gauge hatch in satisfactory condition?	☐	☐
15. Is roof paint in satisfactory condition?	☐	☐
16. Is check valve mounted in roof sump, is it free of debris, and does the internal "clapper" operate freely?	☐	☐
17. Is roof leak-free? Any patches or epoxy-type repairs noted?	☐	☐
18. Are pontoon compartments free of hydrocarbon liquids?	☐	☐
19. Does floating roof deck area drain accumulated water well?	☐	☐
20. Is roof travel apparently free at all shell height positions?	☐	☐
21. Are roof drain sump(s) clear of debris?	☐	☐
22. Does roof have large quantities of accumulated dirt on deck area?	☐	☐
23. Is primary/secondary seal in satisfactory condition?	☐	☐
If not, how much is bad (in linear footage)?	____ ft	
24. Is seal fabric compatible for intended product service?	☐	☐
25. Are "grounding" shunts installed and spaced accordingly?	☐	☐
26. Are "pinholes" spotted on floating decks area? Accumulated liquid?	☐	☐

27. Additional comments:

FILL IN ITEM 28 FOR INTERNAL FLOATING ROOFS

28. Through manholes or roof hatches on the fixed roof, visually inspect the internal floating roof and primary seal or the secondary seal (if one is in service) for the following:

	YES	NO
(A) Is the internal floating roof not resting on the surface of the liquid inside the storage tank?	☐	☐
(B) Is there any liquid accumulated on top of the roof?	☐	☐
(C) Is the seal detached?	☐	☐
(D) Are there holes or tears in the seal fabric?	☐	☐
(E) Are there any defects in the floating roof?	☐	☐
(F) IFR to shell bonding issues (cables or shunts, etc)?	☐	☐

*If the answer to any of the above questions is yes, note corrective actions and date taken.

NOTE: Documentation is required to ensure that repairs are made within 45 days of identifying a defect. If a defect is found that cannot be repaired in 45 days, notify the area environmental coordinator.

FILL IN ITEMS 29 THRU 31 FOR LIFTER ROOF TANKS ONLY

A "Lifter Roof" is a fixed roof that moves and collects vapors.

	YES	NO
29. Is the relief valve opening mechanism in satisfactory condition?	☐	☐
30. Are the fixed roof stops in satisfactory condition?	☐	☐
31. Is roof travel apparently free at all positions?	☐	☐
32. For liquid seal, is the Launder apparently leak free?	☐	☐
33. Is liquid seal (i.e., diesel fuel) retaining specific gravity over time?	☐	☐

34 Additional comments:

SHELL

	YES	NO
35. Is the shell free of leaks?	☐	☐
36. Any flat or visible dents on tank shell?	☐	☐
37. Full appearance of girth welds/rivet joints on the vertical/horizontal weld/rivet seams?	☐	☐
38. Is external "sketchplate or chime" experiencing corrosion?	☐	☐
39. Is the wind girder satisfactorily guarded from corrosion or water accumulation?	☐	☐
40. Is the general condition of paint satisfactory?	☐	☐

41. Additional comments:

TANK BOTTOM/FOUNDATION AREA

	YES	NO
42. Is the edge tank bottom perimeter free of visible leaks?	☐	☐
43. Is tank berm properly sloped to divert storm water?	☐	☐
44. Are there any physical deformities caused by severe edge settlement?	☐	☐
45. Does the tank have a concrete ringwall?	☐	☐
If YES, please answer the following subparts:		
A. Are any sections of ringwall missing?	☐	☐
B. Are cracks wider than 1/8" in diameter visible around the tank perimeter?	☐	☐
C. Is there evidence of water migration into ringwall cracks?	☐	☐
46. If tank is on earthen foundation, are there any locations where tank is unsupported from soil?	☐	☐
47. If tank has leak detection system, checked & no leaks found?*	☐	☐

48. Additional comments:

* Be sure to seal tank double containment area after checking leak detection ports

FIRE PROTECTION - If Applicable to Storage Tank

	YES	NO
49. Are foam line(s) and connections braced satisfactorily?	☐	☐
50. Do foam chambers appear clean and unobstructed?	☐	☐
51. Does tank dike area drain satisfactorily?	☐	☐
52. Is the foam bladder vessel filled to 95% capacity?	☐	☐
53. Are adequate portable fire extinguishers located at the base of the tank stairway or inside the tank farm?	☐	☐
54. Have the internal glass membrane plates remained unbroken in the side-mounted enclosed-shell foam chambers?	☐	☐
55. Is dike capacity maintained to original design capacity?	☐	☐
56. Are adequate "No Smoking" and "Hot Work Permit" signs posted at tank dike entranceway?	☐	☐

57. Additional comments:

SPILL RESPONSE EQUIPMENT INSPECTION

If the facility lists response equipment in this plan, then the equipment shall be inspected on an annual basis. Equipment found to be defective would be repaired or replaced. A response equipment inspection log has been included.

FACILITY-OWNED EQUIPMENT INSPECTION LOG				
Equipment Location:				
Inspected By:				
Inspection Date:				
Recovery Capacity:	Ex: 7,645 bpd = 20% daily recovery rate of 1,529 bpd (bpd capacity based on 20% efficiency)			
Equipment Type	**Description - Model, Style, Size, Capacity**	**Qty**	**Operational Status**	**Last Deployment Date**
EXAMPLE: Boom	50' Acme 6x6 booms	100'	Good	7/01/04

Retention: 5 years
Frequency: Annual

SECTION 4

OIL SPILL REMOVAL ORGANIZATIONS

SECTION 4 OIL SPILL REMOVAL ORGANIZATIONS

OSRO INFORMATION

Primary Oil Spill Response Organizations (OSRO'S)

In addition to Company primary spill response organizations listed below, a complete list of Response Zone-specific OSRO's and Spill Response Contractors and their emergency telephone numbers are listed in the Response Zone Appendix Oil Spill Removal Organizations Section.

Note: Maintenance of OSRO equipment is a condition of contract for OSRO's.

- Advanced Cleanup Technologies (ACTI)
- Eagle Construction & Environmental Services
- Foss Environmental
- Garner Environmental Services
- Heritage Environmental Services
- Marine Environmental Group, Incorporated
- Marine Spill Response Corporation (MSRC)

MARINE SPILL RESPONSE CORPORATION (MSRC)

Marine Environment

Nationwide spill response and clean-up services for marine and threatened marine environment can be arranged through Marine Spill Response Corporation (MSRC).

A copy of MSRC's Service Agreement and their 24-hour Emergency telephone numbers are listed on the next page of this Section.

OSRO EQUIPMENT MAINTENANCE

Maintenance of OSRO equipment is a Company requirement and a pre-requisite to becoming a Company OSRO. This applies to both USCG approved and non-USCG approved OSROs.

MSRC Contract

MARINE SPILL RESPONSE CORPORATION
SERVICE AGREEMENT

EXECUTION INSTRUMENT

The MSRC SERVICE AGREEEMENT attached hereto (together with this execution instrument, the "Agreement"), a standard form of agreement amended and restated as of September 27, 1996, is hereby entered into by and between

Conocophillips
[Name of COMPANY]

a _____
[Type of entity and place of organization]

with its principal offices located at 600 North Dairy, Ashford, Houston TX 77079 (the "COMPANY"), and MARINE SPILL RESPONSE CORPORATION, a nonprofit corporation organized under the laws of Tennessee ("MSRC"), and shall be identified as

SERVICE AGREEMENT No. 1e1PA-139 [This is to be provided by MSRC]

IN WITNESS WHEREOF, the parties hereto each have caused this Agreement to be duly executed and effective as of Feb. 1st, 2005

ConocoPhillips Co. [COMPANY]

By: _____ [signature]

_____ [print name]

Title: _____

Address: 600 North Dairy
Ashford, Houston TX 77079

Telephone: 281-293-6000 Fax: _____

MARINE SPILL RESPONSE CORPORATION:

By: _____
Judith R. Norell
Marketing & Customer Service Manager
220 Spring Street, Suite 500
Herndon, VA 20170
(703) 326-5617; Fax: (703) 326-5660

MSRC 24 Hour Emergency Telephone Numbers

MSRC
Marine Spill Response Corporation

MSRC 24-HOUR EMERGENCY NUMBERS

TELEPHONE:

1-800-OIL SPIL (1-800-645-7745)

1-800-259-6772

1-732-417-0175 (COMMERCIAL)

FACSIMILE:

1-800-635-6772

1-732-417-0097 (COMMERCIAL)

ALTERNATE NUMBER:

1-703-326-5609

SECTION 5

RESPONSE ACTIVITIES

SECTION 5 RESPONSE ACTIVITIES

INCIDENT COMMANDER DUTIES

The duties of the Incident Commander may be delegated as appropriate to members of the Emergency Response Team, however, ultimately the IC is responsible to ensure that these items have been carried out.

1. Carry out QI duties below.
2. Activate internal alarms and hazard communication systems to notify all facility personnel.
3. Notify all response personnel, as needed.
4. Identify character, exact source, amount and extent of release.
5. Notify and provide necessary information to the appropriate authorities with designated response roles (NRC, State Emergency Response Commission and LEPC).
6. Assess the interaction of the spilled substance with water and/or other substances stored at the facility and notify response personnel at the scene of that assessment.
7. Assess the possible hazards of the release (direct and indirect) to human health and the environment.
8. Assess the implementation of prompt removal actions to contain and remove the substance released.
9. Coordinate rescue and response actions as previously arranged with all response personnel.
10. Use authority to immediately access company funding to initiate cleanup activities.
11. Direct cleanup activities until properly relieved of this responsibility.

Qualified Individual (QI)

The Qualified Individual (QI) is the Incident Commander. Requirements state that a QI must be located in the United States and meet the requirements identified in the respective Federal regulations (USCG, EPA, RSPA, MMS); and who is authorized to:

1. Activate and engage in contracting with oil spill removal organizations.
2. Act as a liaison with the pre-designated Federal On-Scene Coordinator.
3. Obligate funds required to carry out response activities. The QI will be the individual or a designee, as identified in the response plan.

IMMEDIATE ACTION CHECKLIST

Spill Observer / Dispatcher

1. ___ If a pressure drop is noticed or a leak is suspected, notify the Terminal Supervisor and/or the maintenance supervisor immediately and stop all product transfers.
2. ___ To minimize damage, close all automatic isolation valves, if available.
3. ___ Assist with initial response actions as directed.

Line Flyer

1. ___ Report all abnormal activity and dead vegetation in the vicinity of a pipeline to Company Management.
2. ___ If action requires immediate attention, report via radio.
3. ___ In the event radio contact cannot be made; the line flyer will land and report to Company management by telephone.

Terminal Supervisor / Maintenance Supervisor

1. ___ Determine level of response needed, hazards of product(s) involved and proper response guidelines to be followed. (For additional information refer to Company Maintenance Manual (MPR) - MPR-4005.
2. ___ Work with local law enforcement to make sure all personnel/citizens are a safe distance away from the hazard area.
3. ___ Notify Fire Department as appropriate.
4. ___ Notify Company management as appropriate.
5. ___ Dispatch response team to the site of the suspected leak and assume the position of Incident Commander. Implement ICS and establish a workable ICP and Communications Center. Determine the extent of spill or release, verify product type(s), identify material(s), estimate quantity spilled or released, approximate rate of discharge, estimate movement of the spill/vapor cloud, estimate the wind direction.
6. ___ Instruct response team to eliminate sources of vapor cloud ignition. Shut down all engines and motors. (Refer to MPR-3001 and MPR-4003).
7. ___ Review pipeline alignment sheets to become familiar with the location of mainline valves and elevation characteristics. Review environmentally sensitive area maps for the location of any sensitive area that may be impacted.
8. ___ Advise response team on location of manual valves and order them to be closed if appropriate.
9. ___ Note time of spill or time of first detection, location of spill, source of spill, and cause of spill.
10. ___ Make a note of response actions taken and by whom.
11. ___ Instruct response team to attend to injured personnel.
12. ___ Call out cleanup or general contractors, as necessary.
13. ___ Collect information necessary to complete the Release Report Form.
14. ___ Make appropriate notifications to local and state governmental agencies of the spill and proposed actions. Document names of agencies called, person who received the calls, and the times the calls were made.
15. ___ Complete the Release Report Form and notify members of Company Corporate staff groups.
16. ___ Advise neighboring property owners and operators of any threat to their property or personnel.
17. ___ Direct initial response actions.
18. ___ Call additional cleanup contractors as necessary.

GENERAL INITIAL RESPONSE PROCEDURES

This checklist is generic to all Company Plans and is included as an additional checklist to supplement facility specific checklists contained in this Plan.

Terminals

1. Any employee observing a spill should take emergency action to stop the release at the source in a safe manner and immediately notify the Terminal or Maintenance Supervisor.

2. Upon becoming aware of a spill, the Facility Supervisor will assess the spill in terms of the location and volume and determine if the Incident Command System should be activated.

3. Once it has been determined to activate the Incident Command System, the Facility Supervisor will assume the role of Incident Commander and initiate the following actions:

   A. Confirm that injured personnel have been attended to and arrange for medical assistance and transportation to hospitals, if necessary, and ensure the safety of all response personnel.

   B. Confirm that personnel have been assigned to stop the release and flow of oil, and secure leaks.

   C. Assess the spill; determine parameters such as spill volume, extent, speed, and direction of movement.

   D. Integrate local evacuation plans into the Unified Command decision-making process.

   E. Confirm that containment equipment and oil spill contractors have been deployed.

   F. Notify the appropriate Company management.

   G. Notify appropriate federal, state and local government agencies, including local utilities and Company HSE personnel.

   H. Begin completion of an ICS Form 201 and Company Site Safety Plan.

   I. Work with Company HSE in conducting a natural resource damage assessment, if required.

4. Once oil is spilled on water, action should be taken as rapidly as possible to control and recover it to minimize damage to the environment. Physical removal of the oil is the preferred action in almost all cases. However, from a practical standpoint, much of the oil spilled during a minor spill will be dispersed by wind and wave action. Effective physical removal will be dependent upon relatively calm weather and water conditions and the speed with which the slick can be corralled and removed.

Pipeline Maintenance Crews

These procedures have been designed to 1) to provide safety to the public and company personnel when threatened by the release of hydrocarbons from a pipeline to the environment, and 2) to coordinate activities for prompt and safe repair of the pipeline and the return to normal operating condition.

Events that require immediate response include:

1. Extreme pressure reduction on the line
2. Extreme flow rate changes
3. Extreme measurement losses or gains
4. Receiving notices of an emergency nature such as:
   A. Release of hazardous liquids from a pipeline facility
   B. Operational malfunction causing a hazardous condition
   C. Fire, explosion, or natural disaster involving pipeline facilities
   D. Notification of a potential leak or hazard

Whenever any of the above conditions occur, the following emergency shutdown procedures should be initiated:

1. Shutting in the line at the nearest block valves.
2. Notifying the nearest pump station and/or the appropriate control center.
3. Maintenance crewmembers should notify their immediate supervisor who will in turn notify appropriate Company contacts.
4. If the exact location of the leak is unknown, the Area office will request a line flyer, or if it is at night, manpower might be used to walk the line.
5. Once a leak site has been located, the following information should be obtained.
   A. Have all ignition sources been eliminated.
   B. Are any schools, homes or commercial properties at risk and should they be evacuated.
   C. Should access to the area be restricted (roads blocked). If so, assistance should be requested from law enforcement agencies.

D. Have local response agencies been advised of the product's characteristics and handling precautions which are described in the Material Safety Data Sheets kept at each facility.

E. Are railroads or utility companies in the area and have they been notified.

F. Will product flow into any waterways or roadways.

G. Work with Company Environmental Services in conducting a natural resource damage assessment.

6. The Maintenance Supervisor will fax the Release Report Form to the Control Center.

7. Federal and/or state agencies may need to be contacted if a spill or release meets the criteria outlined in this manual.

8. Following an assessment of the release site, an evaluation should be made concerning what effect downtime will have on product scheduling. Notification should be made to:

   A. Pump stations and terminals of estimated downtime and of any change in pumping schedules and pumping rates.

   B. Plants and refineries if they will be affected.

The distribution section should be informed if the emergency will result in the failure to supply any terminal with product or delay any planned activity with other pipelines.

Communications

This paragraph is intended to clarify communications resources and is applicable to all Company Response Zone Appendices, which together with this Core Plan, make up the Company Emergency Response Plan.

Primary communications for Company response activities will consist of the following:

- Primary communications will consist of Company mobile phones, hard line phones, faxes, and Company intranet devices.
- Company Response Team mobile and office telephone numbers are located in the Notifications Section of each Response Zone Appendix.
- Communications needs beyond primary communications devices will be supplied by Company contracted OSRO's.
- OSRO telephone numbers are located in the Notifications and OSRO Section of each Response Zone Appendix.

IN CASE OF PIPELINE STATION OR MANIFOLD FIRE

Do this:

A. Bear in mind it is better to take plenty of time in an emergency than to rush in and sustain personal injury.

B. Personnel should immediately evacuate hazardous area.

C. Extinguish fire at once, if possible, with the equipment at hand.

1. If product cannot be shut off, it is better to let a controlled fire burn than to extinguish it as the fuel may spread and flashback occur.

D. **If telephone is not in hazardous area,** notify Supervisor and Local Control Center and proceed to shut down as outlined in Section E below.

E. **IF TELEPHONE IS IN HAZARDOUS AREA,** do not attempt to use it.

1. **Trip emergency shutdown control.**
2. Close fuel supply valve if the emergency shutdown control fails.
3. Get information to Supervisor and fire department as quickly as possible by any available means.

F. Reduce fuel supply by:

1. Closing valves where possible.
2. Close tank valves immediately.
3. Close mainline fire gates valves on Supervisor's orders if not in the fire area. If in the fire area, the nearest upstream and downstream valves are to be closed.

G. Notify Terminal Superintendent or Operations Supervisor. Notify all off-duty personnel.

H. If foam is needed, contact necessary resources for assistance.

I. Post guards at gates or roadways. Call for any help deemed necessary: ambulance, sheriff (to barricade roads, etc.).

J. Isolate the fire as much as possible and control spreading to other properties by wetting with water.

K. After the fire has been extinguished or controlled, permit only authorized personnel to go near the location.

L. Public Relations

1. Follow public relations procedures as outlined in the Public Relations poster.

Good judgment is important!

IN CASE OF FIRE - TRUCK LOADING RACK

Do this:

Your immediate thought and action may prevent a small fire from becoming a major disaster.)

A. Be calm – Think first and act with care. Equipment can be replaced – lives cannot.

B. Immediate Action

1. Stop all loading on rack. **Trip emergency shutdown switch – close valves on loading riser.**
2. Attempt to put out or control fire with dry chemical extinguisher. Prompt action can extinguish a small fire.
3. Notify Fire Department

C. If immediate action does not extinguish the fire, then:

1. Clear rack of all truck not on fire and shut off fuel supply by closing all valves on loading lines.
2. Advise Supervisor and/or other employees on duty of the fire.
3. If anyone is injured or burned, remove from area.
4. Summon help as needed: ambulance, sheriff, etc.
5. In some cases it may be better to isolate the fire and permit it to exhaust the fuel, rather than to extinguish and risk an explosion.
6. Water should be applied to lines, equipment and tanks in the fire and surrounding area.
7. Good judgment is essential as to position of personnel because of potential hazard of heat-induced failure of piping and tanks.
8. Turn off switches on electrical service in fire area.
9. Close gates, post guards to keep spectators away, use sheriff or police to assist.

D. Public relations - Follow directions on public relations.

INSTRUCTIONS FOR ACTION SHOULD RIOT OCCUR

1. Notify Supervisor and shut down operations per his instructions. Notify law enforcement agency and armed guard service of action being taken.
2. Close and lock gates in perimeter fencing and office doors.
3. Shut down all product movement both external and internal transfers.
4. Close and lock all doors to all buildings if possible.
5. Chain and lock all valves on suction and fill lines in storage area.
6. Turn on all perimeter and outside lighting.
7. Position vehicle with two-way radio in the pre-selected area to afford maximum protection for operation and equipment should it become necessary to use this means of communications during the emergency. Be sure a supply of fuel is available.
8. Close and lock electrical lockout switches with exception of lighting circuits. These should be locked on.
9. Lock all fuel dispensing pumps.
10. Determine which drivers and trucks are out and contact them or leave message at next stop with instructions as to where to park the vehicle.
11. Parked trucks in the yard are to be moved by driver or garage personnel to the pre-selected area within the terminal for maximum protection.
12. Should normal exit ways be blocked or extremely hazardous, all personnel that are to leave proceed to the prearranged area for evacuation instructions.
13. The Terminal Superintendent will decide whether any Company personnel will remain on a live-in basis.
14. If sent home, do not return to work until so advised by the Supervisor.

BOMB THREAT PROCEDURE

1. Notify Controller at once and shut down operations per his instructions.
2. Notify the Station Supervisor or alternate.
3. Advise all non-employees of condition and tell them to leave premises.
4. Alert all on-duty personnel of threat.
5. Carry out instructions from **Supervisor.**
6. All personnel will evacuate to **Station Entrance.**
7. After everyone is accounted for, go on to **a place designated by Supervisor.**
8. Senior Employee on duty will maintain a log of events.
9. Duties of Supervisors:

   A. Notify law enforcement officials:

   B. Notify fire department to standby.

   C. Notify bomb disposal unit.

   D. Start immediate search of:

   - Pumps & Motors
   - Manifold Area
   - Control Building
   - Block Valves

   E. Gather other supervisors as available to assist in search.

   F. Follow instructions given for Public Relations.

BOMB THREAT CALL

_____ _____

Department Location

Time Call Received _____ Date _____

Exact Words of Caller _____

_____

_____

Questions to Ask:

1. When is bomb going to explode? _____
2. Where is bomb right now? _____
3. What kind of bomb is it? _____
4. What does it look like? _____
5. Why did you place the bomb? _____

Description of Caller's Voice:

Male ___ Female ____ Young ___ Middle Age ___ Old ___ Accent Tone of Voice _____

Background Noise _____

Is Voice Familiar? ____. If so, who did it sound like? _____

Time Caller Hung Up _____.

Remarks _____

_____

Name, Address, Telephone of Recipient of Call _____

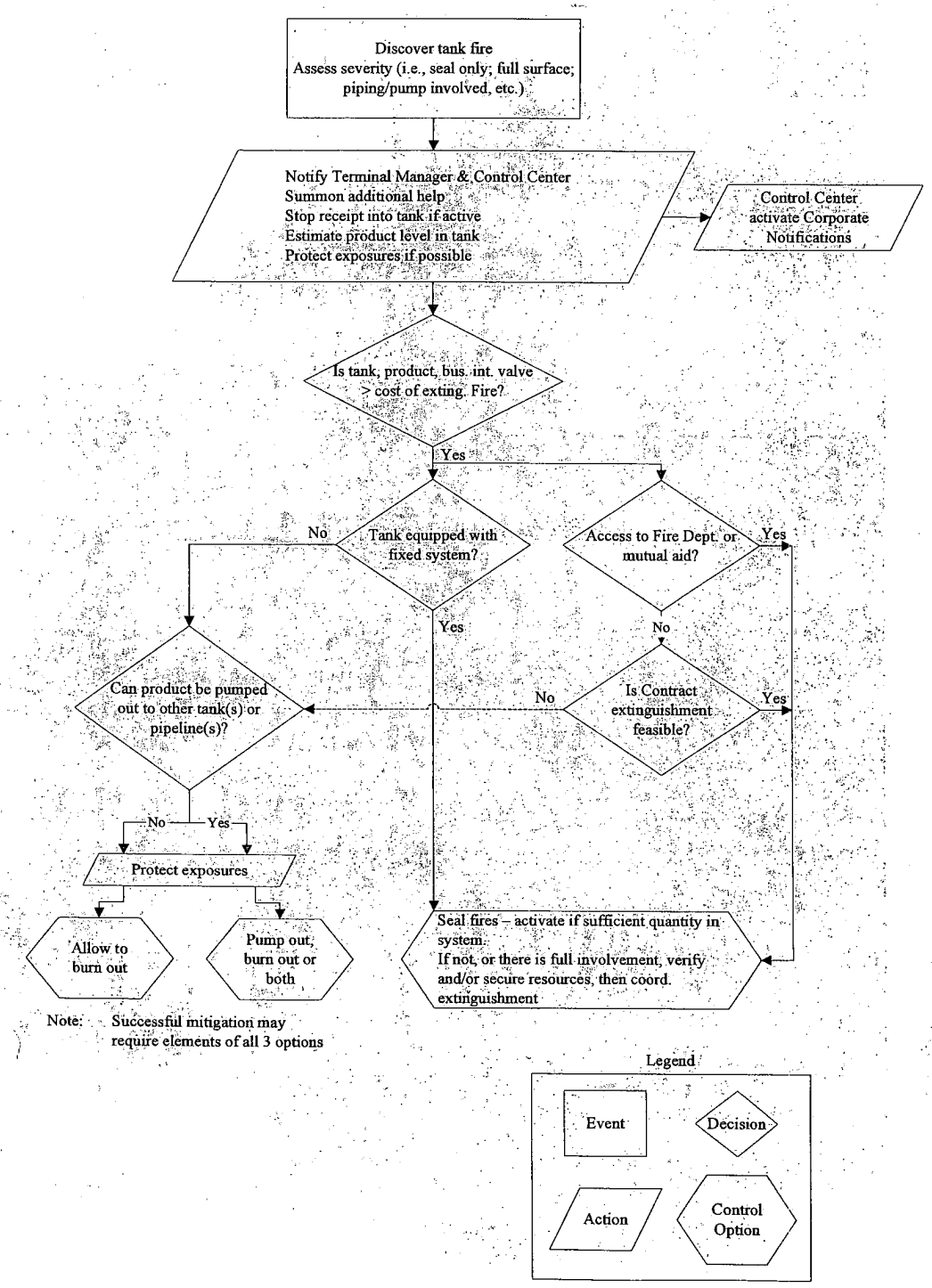
_____

Persons Receiving and Monitoring Call _____

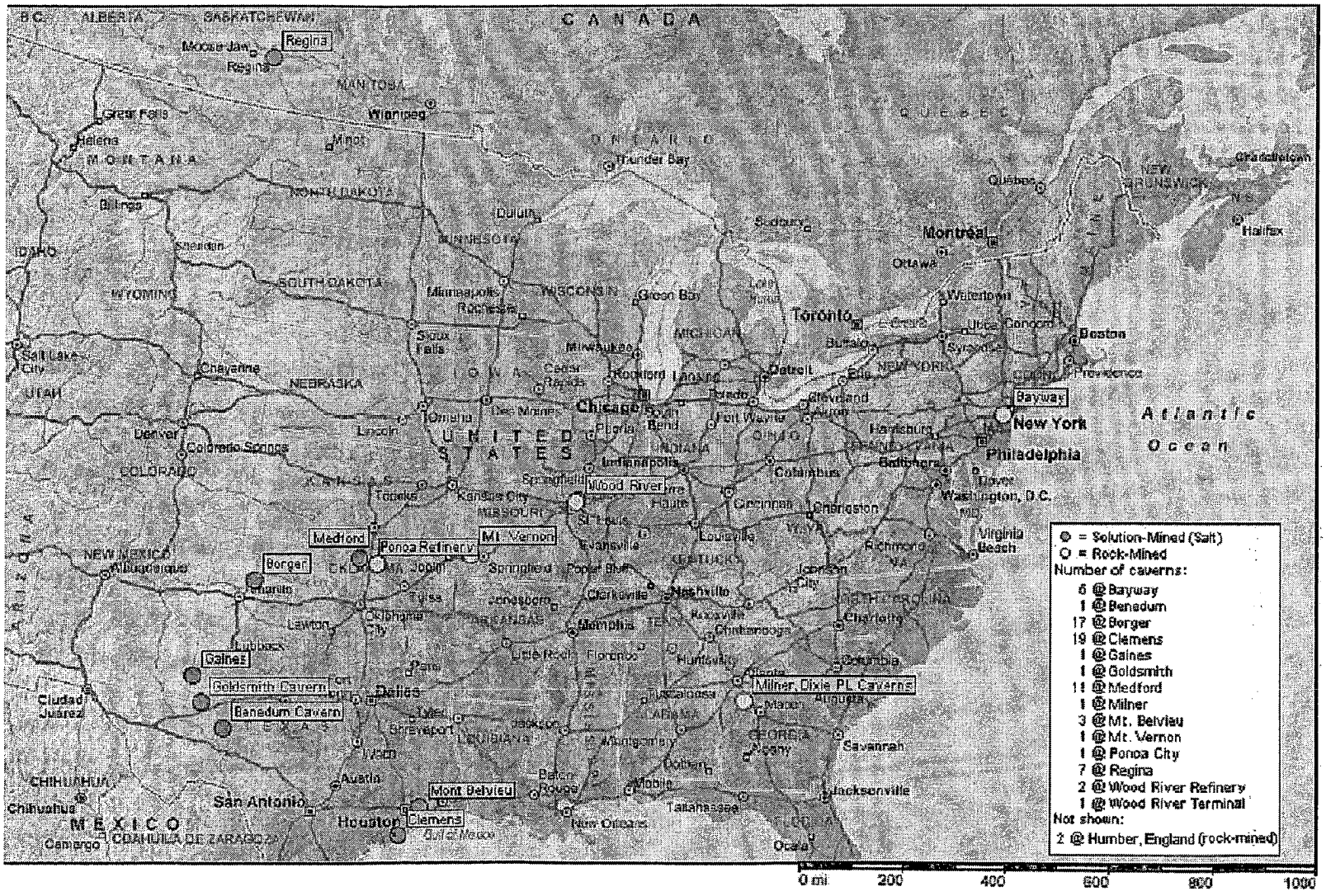
TANK FIRE PREPLAN/FLOWCHART

Note: Refer to Company Emergency Response web site for a link to the Tank Fire Pre-Plans.

Tank Fire Flowchart



CAVERN LOCATION MAP



CAVERN EMERGENCY SHUTDOWN AND INITIAL RESPONSE

This procedure provides a guideline to assist operating personnel in:

- Securing the unit in the event of a wellhead fire at a facility
- Providing a guidelines for initial safe distance site security and decon
- Minimizing the effects of the immediate emergency
- Limiting the possibility of additional occurrences which could present a hazard to personnel, equipment, community or the environment
- Directing the operator to the proper procedures based on the location of the emergency event

Note: Reference Section 3, Plan Implementation, page 4 for the Cavern Emergency Response Plan cross reference, based on OSHA's 29 CFR 1910.120(p)(8)(ii).

1. In the event of a hydrocarbon release that creates an emergency situation, follow the facility and ERP notification procedures.

2. Follow the posted facility evacuation procedure and/or evacuation route drawing and consult appropriate MSDS.

3. Observe the following public safety measures:

   - As an immediate precautionary measure establish a hot zone and isolate spill or leak area for at least 100 meters (330 feet) in all directions and increase the size of the Hot Zone as necessary (refer to pages 15 and 16 of this Section for a control zone diagram)
   - Keep unauthorized personnel away
   - Stay upwind
   - Keep out of low areas
   - Establish a warm and cold zone (refer to pages 15 and 16 of this Section for a control zone diagram example)

4. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate areas)

5. The Cavern Operator will under no circumstances enter a vapor cloud due to the possibility of flash fire. Contact local law enforcement personnel by calling 911 to block traffic on highways and evacuate local residences as deemed necessary.

6. Notify all units transferring products to underground storage to immediately stop transfers to the caverns and block in and secure the transfer line at the units.

7. Block in all cavern transfers using the near remote switches, far remote switches at the gates or in the control room.

8. Flood the -area with fresh water as determined necessary and appropriate by the On Scene Command.

9. When emergency personnel arrive on the scene, the Cavern Operator will advise these personnel of the nature of the release and give information pertinent to the emergency.

10. If necessary, block in emergency block valves. Do not to enter the vapor cloud.

11. If they can be safely reached, shut down brine transfer pumps or pump breakers.

12. Establish a decontamination area in the warm zone. Immediate decontamination may include flushing with lukewarm water. If long term decontamination is needed, arrange for a contractor to set up a formal decon area and/or coordinate with the local or regional fire department HazMat team.

13. Complete a Site Safety Plan per Section 6A of this Core ERP.

14. For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant.

Note: Additional First Responder information can be located on pages 15 and 16 of this Section (i.e., gas leaks and gas leaks inside a building)

BASIC FIRST AID

- Move victim to fresh air.
- Call 911 or emergency medical service.
- Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, qualified personnel should administer oxygen. Seek immediate medical attention.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, that frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Respiratory: Wear a positive pressure air supplied respirator in situations where there may be potential for airborne exposure above exposure limits. If exposure concentration is unknown or if conditions immediately dangerous to life or health (IDLH) exist, use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode. A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Skin: The use of thermally resistant gloves is recommended.

Eye/Face: Approved eye protection to safeguard against potential eye contact, irritation or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.
Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.

Emergency Response Guide First Responder

Gas Leaks

SAFETY
- Your safety first and then the safety of others
- Stay out of the hazard area
- If performing Recon approach up wind, up hill, up stream
- Determine the immediate hot zone

ISOLATE AND DENY ENTRY
- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help evaluate and deny entry into immediate area

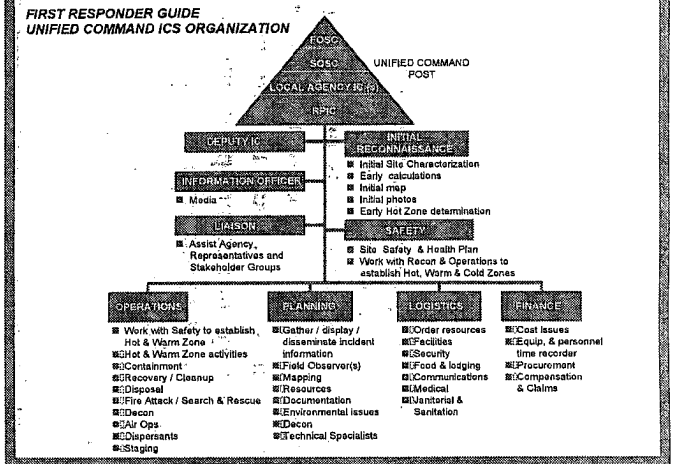
NOTIFICATIONS
- Contact your Supervisor
- Contact Control Center
- Dial 911 if ambulance, police or fire department assistance is needed
- Contact local OSRO (Notifications Section of this Plan)
- Follow Notifications Procedures (Notifications Section of this Plan)

COMMAND MANAGEMENT
- Assume the role of Incident Commander
- Make an announcement to all on the scene that you have assumed Command
- Establish a Unified Command Post up wind, up hill and up stream of the incident in the cold zone
- Establish a Unified Staging Area up wind, up hill and up stream of the incident in the cold zone
- Begin assigning ICS positions as necessary
- Meet, greet & brief responding Agencies as they arrive at the Unified Command Post
- Ensure Safety Officer begins and completes a Site Safety Plan

IDENTIFICATION AND ASSESSMENT
- Continue to evaluate the hot zone and adjust accordingly
- Continue to monitor evacuation activities
- Ensure safe Recon to determine extent of impact on water, air, soil, plant life & wildlife

ACTION PLANNING
- Create an Initial Action Plan (ICS Form 201)

FIRST RESPONDER GUIDE
UNIFIED COMMAND ICS ORGANIZATION



PROTECTIVE EQUIPMENT
- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety Health Plan

CONTAINMENT & CONTROL
- Containment & control strategies should be developed within the Unified IAP process/follow ACP
- Operations Section Chief oversees containment & control tactical deployment
- OSROs work under the Operations Section and should not freelance

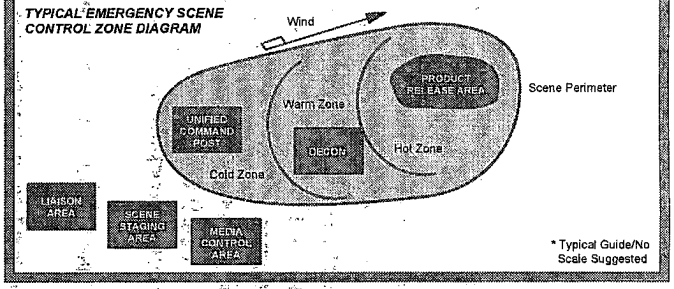
PROTECTIVE ACTIONS
- Ensure safe Recon to assess impact on water intakes, adjoining properties, public recreation sites & sensitive sites
- Protective action tactical deployment should be part of the Unified IAP

DECONTAMINATION / CLEANUP
- Decon activities take place under the ICS Ops Section
- Decon capabilities in place before entering Hot Zone
- Ensure proper PPE for Decon Team

DISPOSAL
- Minimal disposal issues

DOCUMENTATION
- Ensure early completion of ICS Form 201 & SSHP
- Ensure proper retention of all incident-related documents
- Ensure timely incident critique & record lessons learned

TYPICAL EMERGENCY SCENE CONTROL ZONE DIAGRAM



EMERGENCY RESPONSE PLAN QUICK REFERENCE

Sec 1	Information Summary	Sec 8	Site Sensitive Response Strategies
Sec 2	Notifications	Sec 9	Training & Exercise Program
Sec 3	Spill Detection & Mitigation Procedures	Sec 10	Plan Implementation
Sec 4	OSRO Information	Sec 11	Public Relations
Sec 5	Response Activities	Sec 12	Documentation
Sec 6A	SSHP Introduction	Sec 13	MSDS
Sec 6B	SSHP Template	Sec 14	Definitions, Terms & Acronyms
Sec 7	Spill Containment, Protection & Recovery		

FACILITY MITIGATION/PROTECTION ACTIONS
- Shut down and isolate flow
- Evacuate the area
- Eliminate sources of ignition
- All equipment used when handling product must be grounded
- Water spray may reduce vapors or divert vapor cloud
- If exposed, make sure exposed clothing is removed and decon occurs

INITIAL ICS/NOTIFICATION FORMS THAT MAY BE UTILIZED
- Notification Fax
- ICS Form 201 (Incident Briefing)
- ICS Form 202
- Site Safety Plan
- ICS Form 215

DOT EMERGENCY RESPONSE GUIDEBOOK QUICK REFERENCE PAGES

Product	Guide #
Gasoline	128
Diesel	128
LPG	119
Natural Gas	115
Crude Oil	128

ConocoPhillips

Emergency Response Guide First Responder

Gas Leak In or Near a Building

SAFETY
- Your safety first and then the safety of others
- Stay out of the hazard area.
- If performing Recon approach up wind, up hill, up stream
- Determine the immediate hot zone

ISOLATE AND DENY ENTRY
- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help evaluate and deny entry into immediate area

NOTIFICATIONS
- Contact your Supervisor
- Contact Control Center
- Dial 911 if ambulance, police or fire department assistance is needed
- Contact local OSRO (Notifications Section of this Plan)
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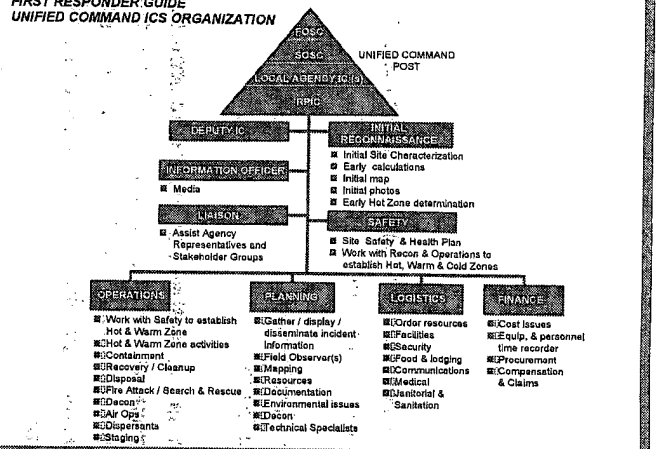
- Ensure Safety Officer begins and completes a Site Safety Plan

IDENTIFICATION AND ASSESSMENT
- Continue to evaluate the hot zone and adjust accordingly
- Continue to monitor evacuation activities
- Ensure safe Recon to determine extent of potential impact on the area

ACTION PLANNING
- Create an Initial Action Plan (ICS Form 201)

FIRST RESPONDER GUIDE UNIFIED COMMAND ICS ORGANIZATION



PROTECTIVE EQUIPMENT
- Ensure proper levels of PPE
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CONTAINMENT & CONTROL
- Containment & control strategies should be developed within the Unified IAP process/follow ACP
- Operations Section Chief oversees containment & control tactical deployment

PROTECTIVE ACTIONS
- Ensure safe Recon to assess impact on area
- Protective action tactical deployment should be part of the Unified IAP

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- Decon activities take place under the ICS Ops Section
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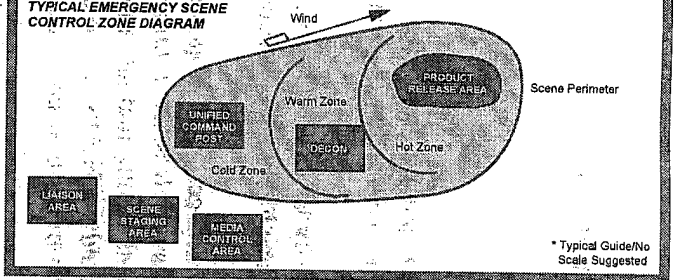
TYPICAL EMERGENCY SCENE CONTROL ZONE DIAGRAM



GENERAL PROCEDURES
- Protect public first, then facilities
- Safely evacuate building if gas is detected inside building
- Always look and listen for any signs of escaped gas
- Do not open a building door if escaped gas is detected
- All open flames are to be extinguished
- Determine leak severity
- Do not enter building with audible leaking gas
- Test the environment to determine safe entry
- Evacuate people from adjacent buildings

GENERAL PROCEDURES (CONTINUED)
- Shut off electrical power to building
- Eliminate all other potential sources of ignition
- Isolate the building from gas sources if possible
- Close necessary inlet and outlet block valves and open blowdown valves
- After gas sources are shut off, utilize portable combustible gas indicator/detector to determine safe environment

INITIAL ICS/NOTIFICATION FORMS THAT MAY BE UTILIZED
- Notification Fax
- ICS Form 201 (Incident Briefing)
- ICS Form 202
- Site Safety Plan
- ICS Form 215

DOT EMERGENCY RESPONSE GUIDEBOOK QUICK REFERENCE PAGES

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ConocoPhillips

ICS ORGANIZATION

ConocoPhillips (COP) and ConocoPhillips Pipeline Company (CPPL) have adopted the National Incident Management System (NIMS) ICS organization as outlined in:

- Homeland Security Presidential Directive Five (HSPD-5)
- National Response Plan (NRP), December 2005

All Federal, State, tribal, and local levels of government, as well as many private sector and non-governmental organizations use ICS for a broad spectrum of emergencies. These range from small to complex incidents, both natural and manmade, and include acts of catastrophic terrorism. CPPL has adopted the NIMS ICS to allow the partnership of Unified Command to be developed when required in training, exercises or responses.

Functional Areas

ICS is usually organized around five major functional areas:

- Command
- Operations
- Planning
- Logistics
- Finance/administration.

The IC will establish the sixth functional area, intelligence, based on the requirement of the situation at hand.

Transitional Steps

Some of the more important transitional steps that are necessary to apply ICS in a field incident environment include the following:

- Recognize and anticipate the requirement that organizational elements will be activated and take the necessary steps to delegate authority as appropriate.
- Establish incident facilities as needed, strategically located, to support field operations.
- Establish the use of common terminology for organizational functional elements, position titles, facilities, and resources.
- Rapidly evolve from providing oral direction to the development of a written IAP.

Reference

The document, FEMA 501, National Incident Management System was referenced in the development of this document.

ICS Organization

The ICS is applicable across a spectrum of incidents that may differ in terms of size, scope, and complexity because of its:

- Functional unit management structure.
- Modular organizational structure that is extendable to incorporate all necessary elements.
- Responsibility and performance begin with the incident command element, the IC, and build from the top down.

Modular Extension

The modular concept is based upon the following considerations.

- Develop the form of the organization to match the function or task to be performed.
- Staff only those functional elements that are required to perform the task.
- Observe recommended span-of-control guidelines.
- Perform the function of any non-activated organizational element at the next highest level.
- Deactivate organizational elements no longer required.

Management Assignments

The IC's initial management assignments will normally be one or more section chiefs to manage the major ICS functional areas.

- Section chiefs will further delegate management authority for their areas as required.
- If needed, section chiefs may establish branches or units as appropriate for the section.
- Each functional unit leader will further assign individual tasks within the unit as needed.
- Section chiefs serve as the general staff for the IC.

Staffing

Use the separate sections to organize staff as the need arises.

- If one individual can simultaneously manage all major functional areas, no further organization is required.
- Assign an individual to be responsible for functions requiring independent management.

Leadership Titles

Incident Command; Incident Commander
Command Staff; Officer
Section; Section Chief
Branch; Branch Director
Divisions/Groups; Supervisor; Supervisor is only used within the operations section.
Unit; Unit Leader; Applies to the subunits of the planning, logistics, and finance/ administration sections.

Operations Section

The section manages tactical operations at the incident site that are directed toward:

- Reducing the immediate hazard.
- Saving lives and property.
- Establishing situation control.
- Restoring normal conditions.

Operations Section Chief

The section chief:

- Directly manages all incident tactical activities.
- Implements the IAP.
- Should be designated for each operational period.
- Will have direct involvement in the preparation of the IAP for the period of responsibility.
- May have one or more deputies, preferably from other agencies in multi-jurisdictional incidents.
- Deputies will be qualified to a similar level as the operations section chief.

Partners

Several types of agencies could be in the operations section, and work together or in combinations depending on the situation.

- Fire
- Law enforcement
- Public health
- Public works
- Emergency services
- Etc.

Other participants may include private individuals, companies, or nongovernmental organizations, some of which may be fully trained and qualified to participate as partners in the operations section.

Tactical Operations

The specific method selected for organizing and executing incident operations will depend on the:

- Type of incident.
- Agencies involved.
- Objectives and strategies of the incident management effort.

Organization

The organizational structure for incident tactical operations can vary and may be based on:

- A method to accommodate jurisdictional boundaries.
- An approach that is strictly functional in nature.
- A mix of functional and geographical approaches.

Branches

Establish branches for reasons such as:

- The numbers of divisions and/or groups exceed the recommended span of control for the operations section chief.
- The nature of the incident calls for a functional branch structure.
- The incident is multi-jurisdictional.

Span of Control

The section chief shall set up branches and allocate divisions and groups within them to stay within the recommended span of control.

Example: If one group and three divisions are reporting to the operations section chief, and one division and one group are to be added, a two-branch organization should be formed.

Planning Section

- Collects, evaluates, and disseminates tactical information pertaining to the incident.
- Maintains information and intelligence on the current and forecasted situation.
- Maintains the status of resources assigned to the incident.
- Prepares and documents IAPs and incident maps.
- Gathers and disseminates information and intelligence critical to the incident.

Organization

The planning section has four primary units, and may include a number of technical specialists to assist in evaluating the situation and forecasting requirements for additional personnel and equipment. CPPL and COP have added a defined fifth unit, the Environmental Unit.

Section Chief

- Oversees all incident-related data gathering and analysis regarding incident operations and assigned resources.
- Develops alternatives for tactical operations.
- Conducts planning meetings.
- Prepares the IAP for each operational period.
- Is normally from the jurisdiction with primary incident responsibility.
- May have one or more deputies from other participating jurisdictions.

Resources Unit

- Makes certain that all assigned personnel and other resources have checked in at the incident.
- Has a system for keeping track of the current location and status of all assigned resources.
- Maintains a master list of all resources committed to incident operations.
- Categorizes resources by capability and capacity across disciplines.
- Continuously tracks resource status to effectively manage their employment.

Situation Unit

- Collects, processes, and organizes on-going situation information.
- Prepares situation summaries.
- Develops projections and forecasts of future events related to the incident.
- Prepares maps and gathers and disseminates information and intelligence for use in the IAP.
- May also require the expertise of technical specialists, and operations and information security specialists.

Documentation Unit

- Maintains accurate and complete incident files, to include a complete record of the major steps taken to resolve the incident.
- Provides duplication services to incident personnel.
- Files, maintains, and stores incident files for legal, analytical, and historical purposes.
- Prepares the IAP.
- Maintains many of the files and records that are developed as part of the overall IAP and planning function.

Demobilization Unit

- Develops an Incident Demobilization Plan that includes specific instructions for all personnel and resources that will require demobilization.
- Ensures the approved plan is distributed at the incident, and elsewhere as necessary.
- Should begin its work early in the incident in order to create rosters of personnel and resources, and obtain any missing information as check-in proceeds.

Environmental Unit

The Environmental unit would be established within the planning section to facilitate interagency environmental data management, monitoring, sampling, analysis, and assessment. The environmental unit would prepare environmental data for the situation unit and work in close coordination with other units and sections within the ICS structure to enable effective decision support to the IC/Unified Commander.

Technical specialists assigned to the environmental unit might include a scientific support coordinator, and sampling, response technologies, weather forecast, resources at risk, cleanup assessment, and disposal specialists.

Example: Tasks accomplished by the environmental unit would include the following:
- Identifying sensitive areas and recommend response priorities.
- Developing a plan for collecting, transporting, and analyzing samples.
- Providing input on wildlife protection strategies.
- Determining the extent and effects of site contamination.
- Developing site cleanup and hazardous material disposal plans.
- Identifying the need for and obtain permits and other authorizations.

Technical Specialists

The ICS functions in a wide variety of incident scenarios that may require the use of technical specialists with special skills that are activated only when needed. Specialists may serve anywhere within the organization, to include the command staff. No minimum qualifications are prescribed as technical specialists:

- Normally perform the same duties during an incident that they perform in their everyday jobs.
- Are typically certified in their field or profession.

Assignments

Technical specialists assigned to the planning section may:

- Report directly to its chief.
- Report to any function in an existing unit.
- Form a separate unit within the planning section.
- Depending upon the requirements of the incident and the needs of the section chief.
- When the expertise will be required on a long-term basis and may require several personnel.
- If, it is advisable to establish a separate technical unit.
- Also be assigned to other parts of the organization (e.g., to the operations section to assist with tactical matters or to the finance/administration section to assist with fiscal matters).

Example: A legal specialist or legal counsel may be assigned directly to the command staff to advise the IC on legal matters such as emergency proclamations, legality of evacuation orders, and legal rights and restrictions pertaining to media access.

Types

The incident itself will primarily dictate the needs for technical specialists.
Below are representative examples of the kinds of specialists that may be required.

- Meteorologist
- Environmental impact specialist
- Resource use and cost specialists
- Flood control specialist
- Water use specialist
- Explosives specialist
- Structural engineering specialist
- Firefighter specialist
- Medical/health care specialist
- Medical intelligence specialist
- Pharmaceutical specialist
- Veterinarian
- Agricultural specialist
- Toxic substance specialist
- Radiation health physicist
- Intelligence specialist
- Infectious disease specialist
- Chemical or radiological decontamination specialist
- Law enforcement specialist
- Attorney/legal counsel
- Industrial hygienist
- Transportation specialist
- Scientific support coordinator

Logistics Section

The Logistics Section Chief (LSC), a member of the General Staff, is responsible for providing facilities, services, and material in support of the incident. The LSC participates in the development and implementation of the IAP and activates and supervises the Branches and Units within the Logistics Section.

The Logistics Section typically can be divided into two branches, Service and Support. Logistics is responsible for:

- Meeting all support needs for the incident (except aircraft).
- Orders resources through appropriate procurement authorities from off-incident locations.
- Provides facilities, transportation, supplies, equipment maintenance and fueling, food service, communications, and medical services for incident personnel.

Support Branch

The Support Branch Director, when activated, is under the direction of the LSC, and is responsible for the development and implementation of logistics plans in support of the Incident Action Plan. The Support Branch Director supervises the operations of the Supply, Facilities and Ground Support Units.

Supply Unit:

- Orders all incident-related resources, personnel, and supplies.
- Provides the support required to receive, process, store, and distribute all supply orders.
- Handles tool operations, which include storing, disbursing, and servicing of all tools and portable, nonexpendable equipment.
- All tactical and support resources (including personnel).
- All expendable and non-expendable supplies required for incident support.

Facilities Unit

- Sets up, maintains, and demobilizes all facilities used in support of incident operations.
- Provides facility maintenance and security services required to support incident operations.
- Sets up the ICP, incident base, camps, and trailers or other forms of shelters for use in and around the incident area.
- Orders such additional support items as portable toilets, shower facilities, and lighting units through supply.
- Provides and sets up necessary incident personnel support facilities, including areas for:
    - o Food and water service.
    - o Sleeping.
    - o Sanitation and showers.
    - o Staging.

Ground Support Unit

- Maintains and repairs primary tactical equipment, vehicles, and mobile ground support equipment.
- Records usage time for all ground equipment (including contract equipment) assigned to the incident.
- Supplies fuel for all mobile equipment.
- Provides transportation in support of incident operations (except aircraft).
- Develops and implements the Incident Traffic Plan.
- Maintains a transportation pool for major incidents, consisting of vehicles such as staff cars, buses, pick-ups, etc. that are suitable for transporting personnel.
- Provides up-to-date information on the location and status of transportation vehicles to the resources unit.

Service Branch

The Service Branch Director, when activated, is under the supervision of the LSC, and is responsible for the management of all service activities at the incident. The Branch Director supervises the operations of the Communications, Medical and Food Units.

Communications Unit

Use a common communications plan and an incident-based communications center, established solely for the use of tactical and support resources assigned to the incident, to manage incident communications.

The communications unit:

- Develops the Incident Communications Plan to make the most effective use of the communications equipment and facilities assigned to the incident.
- Installs and tests all communications equipment.
- Supervises and operates the incident communications center.
- Distributes and recovers communications equipment assigned to incident personnel.
- Maintains and repairs communications equipment on site.

Communications Plan

Most complex incidents will require an Incident Communications Plan.

- Plans the use of radio frequencies.
- Establishes networks for command, tactical, support, and air units.
- Sets up on-site telephone and public address equipment.
- Provides any required off-incident communication links.

Food Unit

The unit must:

- Be able to anticipate incident needs, both in terms of the number of people who will need fed, and whether the type, location, or complexity of the incident indicates that there may be special food requirements.
- Supply food needs for the entire incident, including all remote locations (i.e., camps and staging areas).
- Supply food service to operations personnel unable to leave operational assignments.

Medical Unit

The unit is responsible for the effective and efficient provision of medical services to incident personnel. The primary responsibilities of the unit include:

- Develop the Incident Medical Plan.
- Develop procedures for handling any major medical emergency.
- Provide continuity of medical care, including vaccinations, vector control, occupational health, prophylaxis, and mental health services.
- Provide transportation for injured incident personnel.
- Ensure tracking of patient movement from origin, to care facility, to final disposition.
- Assist in processing all paperwork related to injuries or deaths of assigned personnel.
- Coordinate personnel and mortuary affairs for fatalities.

Finance Section

The section is established when there is a specific need for:

- Financial reimbursement for individual and agency/department.
- Administrative services to support incident management activities.

Under the ICS, not all agencies will require such assistance. In large, complex scenarios involving significant funding originating from multiple sources, the finance/administrative section is an essential part of the ICS. The Finance Section may include the Cost, Compensation and Claims, Procurement and Time Units.

Section Chief

Because of the specialized nature of finance functions, the section chief should come from the agency that has the greatest requirement for this support. The section chief:

- May have a deputy.
- Monitors multiple sources of funds.
- May need to monitor cost expenditures to ensure that statutory rules that apply are met.
- Must track and report the financial "burn rate" to the IC as the incident progresses. This allows the IC to forecast the need for additional funds before operations are affected negatively, which is particularly important if significant operational assets are under contract from the private sector.

Close coordination with the planning section and logistics section is essential so that operational records can be reconciled with financial documents.

Time Unit

The unit ensures:

- Proper daily recording of personnel time according to the policies of the relevant agencies.
  - o The unit leader may require the assistance of personnel familiar with the relevant policies of any affected agencies.
  - o Determine excess hours worked and maintain in separate logs.
- The logistics section records or captures equipment usage time.
  - o Through the ground support unit for ground equipment.
  - o Through the air operations support group for aircraft.

If applicable, depending on the agencies involved, personnel time records will be:

- Collected and processed for each operational period.
- Verified, checked for accuracy, and posted according to existing policies.

Procurement Unit

- Administers all financial matters pertaining to vendor contracts.
- Coordinates with local jurisdictions to identify sources for equipment.
- Prepares and signs equipment rental agreements.
- Processes all administrative requirements associated with equipment rental and supply contracts.
- Work closely with local cost authorities.

Note: In some agencies, the supply unit in the logistics section will be responsible for certain procurement activities.

Compensation and Claims Unit

A single unit handles injury compensation and claims.

- The specific activities are varied and may not always be accomplished by the same person.
- Close coordination with the medical unit is essential since they may also perform certain of these tasks.

The individual handling injury compensation:

- Ensures that all forms required by workers' compensation programs and local agencies are completed.
- Maintains files on injuries and illnesses associated with the incident and ensures that all witness statements are obtained in writing.

The claims function handles investigations of all civil tort claims involving property associated with or involved in the incident. The compensation and claims unit:

- Maintains logs on the claims.
- Obtains witness statements.
- Documents investigations and agency follow-up requirements.

Cost Unit

- Provides cost analysis data for the incident.
- Must ensure proper identification of equipment and personnel for which payment is required.
- Obtains and records all cost data.
- Analyzes and prepares estimates of incident costs.
- Provides input on cost estimates for resource use to the planning section.
- Must maintain accurate information on the actual costs of all assigned resources.

Business Interruptions Section

Business Interruption Section Chief ensures that a major incident will not cause undue disruption to any of the businesses from a personnel, business asset management or supply chain perspective.

- Must quickly assess the incident situation, it's short and long term impacts throughout the organization, including partners & customers. It must act to handle those issues and problems identified.

- Assess whether the incident will have an impact on the current management of the non-impacted businesses and if so, determine those needs and address.

The BI Section, should it be required, would allow the IC to continue focus on the emergency and Unified Command activities and provide a communication avenue to be utilized for UC updates.

SECTION 7

SPILL CONTAINMENT PROTECTION & RECOVERY

SECTION 7 SPILL CONTAINMENT PROTECTION & RECOVERY

INTRODUCTION

This section discusses the construction and/or deployment of physical barriers to limit the spreading of a spill and to protect sensitive areas. In an actual spill, the decisions to use specific containment and protection techniques will depend on the circumstances of the spill, its location and potential movement. This section is meant to be used as a reference guide.

Intrusive activities such as constructing berms and digging pits or other disturbance of shorelines, streambeds, or wetlands may require regulatory agency notification and/or approval. Operations on privately or publicly-owned lands may require issuance of a permit from the landowner or land manager (e.g., National Park Service, state department of natural resources). Landowners should be identified in advance along with managers of environmentally sensitive areas and resources.

This section contains marine, inland, waterway, and terrestrial spill containment and protection techniques. **All figures are located at the end of this section.**

In the event of a spill, the facility should include any combination of techniques that may be applicable to the specific circumstances, as well as any additional techniques not mentioned in this section but found in other reference books.

Maintenance: Periodically check the boom for leakage and adjust the deployment angle, if necessary. Also, check the boom for damaged, twisted, or submerged sections. Check anchors for security.

Cleanup: Remove booms and recover remaining sheens with sorbents. Clean shorelines using techniques described in this manual.

Variations: If booms are unavailable or if the water is too shallow, berms may be constructed using streambed or near-site materials arranged in a cascading configuration (see Figure A1-12). Cascade berming can also make use of existing streambed bars.

Dams

Blocking Dams

Use: Dams are constructed across streambeds, ditches, or other dry drainage courses to block and contain any flowing oil and to prevent oil migration during a rising tide.
Limitations: Accessibility, implementation time, adequate storage behind the dam, flowing water, and the availability of construction materials.

General Instructions: Dam locations should have high banks on the upstream side with the drain well-keyed into the banks.

Construct the dam using on- or near-site earthen materials, such as sandbags, plywood sheets, or any material that blocks the flow of oil (see Figure A1-18). Excavate earthen materials from the upstream side to increase storage capacity. Oil is recovered from behind the dam by pumping or using vacuum trucks. Plastic sheeting should be placed over the dam to prevent oil penetration and erosion.

Equipment Required: Bulldozer, front-end loader, backhoe, or hand tools.

Maintenance: Periodically check the dam for leaks, structural integrity, and excessive oil buildup.

Cleanup: Recover remaining oil concentrations or sheen with sorbents. Remove or treat oiled sediments. Dismantle the dam or replace earthen materials in excavation site.

Variations: Containment area behind the dam can be water flooded to limit oil penetration into sediments.

Flowing Water Dams

Use: Dams are constructed across culverts, ditches, shallow streams, etc., to contain floating oil while not obstructing the water flow.

Limitations: Accessibility, implementation time, availability of dam materials, water depth, and high current velocities.

General Instructions: Dam locations should have high banks on the upstream side with the dam well-keyed into the banks. Construct dam with on- or near-site earthen materials, such as sandbags, plywood sheets, etc. Use heavy equipment or manual labor to excavate materials from the upstream

side to increase dam storage capacity. Make the upstream side impermeable with plastic sheeting, if required. Underflow dams utilize inclined or valved pipes that have a flow capacity greater than the stream flowrate. Place valved pipe(s) on the streambed and build a dam on top. Adjust the valve opening(s) until a constant water/oil level is achieved behind the dam. Inclined pipes are placed in the dam at the lower end of the upstream side. The height of the raised end determines the water level behind the dam. Both techniques are illustrated in Figure A1-19A.

For overflow dams, water flows over the top of the dam, and booms positioned behind the dam contain the floating oil. Construct the dam as described above and cover it with plastic sheeting to prevent erosion. Anchor the boom several feet behind the dam (see Figure A1-19B). Pumps or siphons can also be used to pass water over the dam. To be effective, the pumping rate should be greater than the stream flowrate. These techniques are depicted in Figures A1-19C and A1-19D.

Equipment Required: Front-end loader, bulldozer, backhoe, pipes, pumps, hoses, and hand tools.

Maintenance: Check dam periodically for leakage and integrity, replace eroded materials, and continually monitor water/oil levels. Valved pipes, pumps, or a number of siphons may require periodic adjustment to compensate for changes in the stream flowrate.

Cleanup: Remaining sheens are recovered with sorbents and dam materials are returned to borrow sites.

Variations: None.

Sorbent Booms/Barriers

Use: Sorbent booms or barriers constructed with fencing and sorbent materials are used to contain and recover oil floating on creeks, streams, or tidal channels. They are also effective when deployed behind skimmers to pickup oil which escapes skimmers.

Limitations: Implementation time, large quantities of oil, high current velocities, and excessive water depth for barriers.

General Instructions: Deploy sorbent booms across the waterway with each end anchored to the shore. Position each successive boom a few feet downstream from the previous boom.

Construct single-sided barriers by driving a line of posts into the stream bottom with wire mesh screen fastened to the upstream side. Place oil snare squares or strips in front of the screens and the current will hold them in place. In tidal channels with reversing currents, construct a double-sided barrier. As depicted in Figure A1-20, erect two parallel lines of posts across the channel and attach screen along each line of posts. Place oil snare in the area beneath the screens to trap floating oil and oiled debris.

Screen height for both types of barriers must be sufficient to prevent the scattering of loose sorbent from above or beneath the barrier as tidal flow levels change. The screen mesh must be compatible with the type and size of filler sorbent and able to withstand prevailing currents.

Equipment Required: Hand tools, rope.

Marine Diversion Booming

Use: Booms are positioned along low-energy shorelines to divert oil away from sensitive shoreline areas to less sensitive onshore or offshore areas for subsequent recovery. This has proven to be an effective booming technique in currents greater than one knot.

Limitations: Accessibility, implementation time, availability of deployment equipment, and heavy surf conditions.

General Instructions: Anchor one end of the boom to the shoreline and, using a vessel, position the boom's free end at an angle to the current. If oil is being diverted to the shore, angle the boom's free end towards the oncoming oil, as shown in Figure A1-5. Oil diverted towards the shore can be recovered by skimming or pumping. If oil is being diverted away from the shore, angle the free end away from the approaching oil. If the spill is large or continuing, the free end of the boom should also be anchored in place.

As depicted in Figure A1-6, two booms can be deployed to divert an approaching slick from a shoreline and into a floating skimmer. Secure one end of each boom to opposite sides of the skimmer and tow one free end along or parallel to the threatened shore. By towing the other free end toward open waters, the booms form a "V" configuration to trap the encroaching oil while the skimmer recovers the contained oil before it reaches the shore.

The optimum angle of boom deployment is dependent upon the type and length of boom used, the current velocity, and the shape and position of the approaching slick. Generally, the free end of the boom must be angled toward the shoreline as current velocity increases. To avoid boom failure in strong currents, the deployment angle must be smaller than in weak currents. The same correlation is true with regard to boom length. The optimum deployment angle decreases as boom length increases unless the boom is anchored at several places along its length. Refer to Figure A1-7 for optimum boom deployment angles as a function of current velocity.

Equipment Required: Boom deployment boat, anchor(s), and hand tools.

Maintenance: Check the boom periodically for leakage and broken, twisted, or submerged sections. The deployment angle may require periodic adjustment in the event of significant wind or current changes, oil entrainment beneath the boom, or excessive oil buildup behind the boom. The shoreline anchor point may require occasional repositioning due to tidal fluctuations.

Cleanup: Recover residual off sheens using sorbents. See Section V for specific shoreline cleanup techniques.

Variations: For very low-energy shorelines, a secondary boom can be anchored parallel to the shore just beyond the surf line with the down current end connected to the diversion boom. As the oil is diverted towards the shore, the secondary boom prevents contamination of the shoreline.

Marine Diversion Booming

Use: Booms are positioned along low-energy shorelines to divert oil away from sensitive shoreline areas to less sensitive onshore or offshore areas for subsequent recovery. This has proven to be an effective booming technique in currents greater than one knot.

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Cleanup: Recover residual off sheens using sorbents. See Section V for specific shoreline cleanup techniques.

Variations: For very low-energy shorelines, a secondary boom can be anchored parallel to the shore just beyond the surf line with the down current end connected to the diversion boom. As the oil is diverted towards the shore, the secondary boom prevents contamination of the shoreline.

Exclusion Booming

Use: Booms are used to exclude oil from sensitive shorelines by deploying them along the area's periphery.

Limitations: Accessibility, implementation time, adequate water depth for effective boom placement, wave action, and current velocities.

General Instructions: Place booms across the area to be protected and anchor both ends to the shore. For inlets or harbor entrances, booms should be placed inside the openings where current velocities and wave action are lowest. To allow vessel passage through harbor waters, one boom end may be attached to a small, manned boat. Booms may also be deployed in a cascading configuration. This provides vessel passage and the exclusion of oil. To maintain boom integrity, anchors should be placed at 100-foot intervals if substantial boom lengths are required. Wind and wave conditions may necessitate more frequent intervals or heavier anchors.

Several exclusion techniques are shown in Figures A1-8 through A1-10.

Equipment Required: Anchors, boom deployment equipment (boats, tow lines, etc.), and hand tools.

Maintenance: Check boom periodically for integrity, leakage, and twisted, broken, or submerged sections. In tidal waters or areas with fluctuating water levels, reposition the boom and/or its anchor points as water levels change.

Cleanup: Recover contained oil by skimming or pumping. Adjacent shorelines can be cleaned using techniques described in this manual.

Variations: Double or triple booming may be employed in areas with high currents. Position a primary boom in the area of strongest currents and deploy secondary or tertiary booms several hundred yards behind the first as a backup safety measure.

Cascading Booms

Use: A series of booms deployed in a cascading formation are used on rivers or coastal areas where currents are too strong for standard containment booming. Cascading booms direct oil to the shore for recovery.

Limitations: Accessibility, implementation time, currents over 2.5 knots, and soft stream bottoms.

General Instructions: Tow the lead boom to the opposite shore or to some point midstream and anchor it at an angle to the current. Deploy a second boom angled toward the shoreline and anchor the free end 25 to 30 feet downstream from the first so that it overlaps the trailing end of the lead boom. Deploy successive booms in the same manner until the shoreline is reached. Diverted oil is recovered by skimming, pumping, or using vacuum trucks. A containment pit can be dug into the riverbank or shoreline to assist oil recovery. This technique is illustrated in Figure A1-11. The optimum boom deployment angle decreases as current velocity and boom length increase, unless several anchor points are set along the length of the boom.

Equipment Required: Deployment boat, anchors, backhoe (to dig containment pit), and hand tools.

INLAND WATERWAY SPILL CONTAINMENT, PROTECTION & RECOVERY TECHNIQUES

Boom Placement

Calm Water Containment Booms

Use: Booms are deployed to encircle and contain oil in calm waters where wind, wave, and current effects are minimal.

Limitations: Accessibility and implementation time.

General Instructions: Contain oil flowing into a body of water at its entry point. Anchor one end of the boom to the shoreline. Using a boat, pull the other end out around the leading edge of the slick and back to the shore on the other side of the slick, as illustrated in Figure A1-15.

Small slicks or patches of oil can be contained by completely circling them with the boom. Anchor one boom end near the edge of the slick. Pull the other end around the perimeter of the floating oil and attach it to the anchored end.

Equipment Required: Boat(s) with adequate power to tow the boom, anchors and hand tools.

Maintenance: Check booms periodically for leakage and broken, twisted, or submerged sections.

Cleanup: Oil contained within the boom is recovered by skimming. Remaining sheens are removed with sorbents.

Variations: If a spill in an estuary is too large for containment, oil may eventually migrate to the estuary outlet. Booms can be placed across the outlet to contain and concentrate the oil for recovery.

Flowing Water Containment Booms

Use: Booms are deployed at an angle across a waterway to contain oil floating downstream for subsequent recovery.

Limitations: Accessibility, implementation time, current in excess of two knots, and water depths less than one foot below the boom skirt.

General Instructions: Use the currents to assist streaming and placing the boom. For example, anchor one boom end to the shoreline. Use a boat or winch to pull the free end across the river and anchor it slightly upstream. The optimum deployment angle depends on current velocity, boom length, and boom stability. In general, boom length should be four times the width of the waterway. As current velocity and boom length increase, the deployment angle relative to the shoreline decreases. To improve boom stability, anchor it in several places. Figure A1-7 presents nine boom deployment angles as a function of various current speeds.

Remove oil from the downstream end of the boom by skimming, pumping, or using vacuum trucks. A containment pit dug into the shoreline can expedite the containment and recovery process (see Figure A1-16).

Equipment Required: Boat or winch, anchors, backhoe (to dig containment pit), and hand tools.

Maintenance: Periodically check the boom for leakage and adjust its placement angle, if necessary. Also check the boom for twisted, damaged, or submerged sections. Check anchors for security.

Cleanup: Remaining sheens are recovered with sorbents. Booms are removed.

Variations: For wide rivers, deploy two or more booms from each bank with one positioned slightly downstream from the other. Anchor the free ends so that they overlap slightly past the midstream point. If not enough boom is available, deploy a single boom from the side of the river with the heaviest concentration of oil or from the outside shore of a bend in the river where oil concentrates naturally. Both variations are shown in Figure A1-17.

Open Water Containment Booms

Use: Booms deployed in front of open water slicks or streamers are used to contain floating oil. Allow winds and currents to concentrate the oil at the boom's closed end for recovery.

Limitations: Excessive spill size, implementation time, heavy seas, adverse weather, and availability of recovery equipment.

General Instructions: Position the deployment boat along one side of the slick's leading edge. Deploy the boom using an assist boat or attach a drogue to one end. Tow the free end around the slick's leading edge and hold it in place with the assist boat or drogue, as shown in Figure A1-1. Wind and water currents will concentrate the oil in the boom's apex where a boat or barge can be positioned to begin skimming operations. Under strong wind and sea conditions, it may be advantageous to deploy upwind and chase the slick downwind in order to reduce the relative forces between the boom and the seas.

Equipment Required: Deployment boat(s), drogues, open water boom, portable or self-propelled skimmers, and barge mounted skimmers or vacuum trucks.

Maintenance: Continually reposition the skimmer to the area of heaviest oil concentration. Check the boom periodically for leakage and broken, twisted, or submerged sections. The boom may require repositioning or re-deployment if the water current or wind direction changes appreciably.

Cleanup: After skimming, remove oil sheens using sorbents.

Variations: Boom may be deployed to completely or partially encircle the slick as shown in Figure A1-2. Two boats or two sea anchors can be used to deploy the boom in a catenary configuration as shown in Figure A1-1. Tow the boom ends up either side of a slick until the oil is contained within the boom. Two additional boom configurations are depicted in Figures A1-3 and A1-4.

Maintenance: Turn booms or sorbents regularly for maximum absorbency and replace them when they are completely saturated with oil. Check booms and barriers periodically for leakage or damage.

Cleanup: Store used sorbents in leak-proof containers.

Variations: If significant quantities of oil are to be encountered, construct multiple barriers. Recover oil pooling behind the barrier by skimming, pumping, or using sorbents.

Beach Berming

Use: Berms constructed along the mid-intertidal zone of a beach are used to prevent the spread of oil to backshore areas.

Limitations: Implementation time, generally only effective for one to two tidal cycles, and not applicable on high-energy shorelines or during heavy storms.

General Instructions: Operate a motor grader parallel to the surf line to cast a windrow along the mid-intertidal area. Several passes are usually required to produce an adequate berm height. A bulldozer is usually required to assist the motor grader when it gets stuck. Bulldozers can also be used to build sand berms. If heavy equipment is unavailable, shovels may be used to construct berms.

Equipment Required: Motor grader, bulldozer, and/or hand tools.

Maintenance: Continually check berm for adequate height. Maintain or increase berm height as necessary.

Cleanup: Remove or treat oiled beach material.

Variations: A trench may be dug on the seaward side of the berm to assist in collecting incoming oil for subsequent removal (see Figure A1-13). This could, however, allow deeper product penetration into the sediments.

Berms with trenches on the backshore side can aid in containing product runoff when flushing contaminated backshore and upper intertidal areas.

Beach Sumps

Use: Sumps excavated on beaches are used to contain oil migration down beaches.

Limitations: Accessibility, shoreline must have some longshore drift, wave action cannot be extreme, and tidal range should be small.

General Instructions: Dig a sump across the intertidal zone of the beach with a trench extending towards the surf at decreasing depths. Pile excavated material on the down current side of the trench and sump. As oil moves down the beach, it is intercepted by the berm and trench which then channel the oil into the sump. Recover the oil by skimming, vacuuming, or pumping. Figure A1-14 illustrates this technique. Several strategically located sumps may be required on long stretches of beach.

Equipment Required: Backhoe and/or hand tools.

Maintenance: Berm materials must be continually replaced as they are eroded away by waves. Oil may have to be pushed into the sump with boards or squeegees to increase cleanup efficiency.

Cleanup: Remove or treat oiled beach materials and fill in the sump.

Variation: None.

SELECTION OF APPROPRIATE TECHNIQUES FOR INLAND WATERWAYS

The following section discusses the selection of the appropriate spill containment, protection, and recovery techniques for different types of inland waterways. Individual techniques are discussed at the beginning of this section.

Small Creeks, Ponds, and Bogs

Containment

Small creeks can be blocked entirely by damming if there is sufficient storage area upstream. However, a means of stopping the oil and letting the water continue downstream will generally be required, such as an underflow dam, an overflow berm, or a dam in conjunction with a pump or siphon. These barriers should be located so that a pond will form upstream from the barrier, allowing the use of sorbents, booms, and skimmers for cleanup. In addition, pools may exist behind log or debris jams where containment could be achieved. Trees existing along the banks could be cut and used for booming across the stream in an emergency situation. On fast-flowing creeks, a series of containment barriers such as chicken wire (with sorbents) structures should be used. It may be necessary to remove log jams and other debris in creeks and streams to allow effective deployment and maintenance of booms. During periods of high flow, it may be necessary to install steel nets, chicken wire, or similar devices upstream of containment devices and areas in order to protect both equipment and personnel. To facilitate cleanup and removal, spills should be diverted to an area with adequate storage.

On ponds, the outlet should be boomed to let the oil collect on the surface of the pond; additional booms should be deployed around the slick to prevent it from contaminating the shoreline. Sorbent booms and conventional booms deployed in tandem can be effective, with both booms across the pond outlet. The sorbent booms should be farther downstream; they will collect portions of the spill that may have passed beneath or around the conventional boom.

Sensitive areas on important fish streams and along creek banks and shorelines, such as waterfowl breeding sites, can be protected by deploying booms to exclude oil.

Containment in bogs will most likely be limited to interception with barriers and sorbent materials. Bogs will not generally support mechanized equipment, so actions must be by hand.

Cleanup

Most of the preliminary cleanup in these regimes will take place in conjunction with containment actions.

Bogs and marshes will be the most difficult to clean. The soils in these areas are highly porous and will absorb large quantities of oil. In addition, they will not support light or heavy equipment, except selectively during the winter. Cleanup operations will thus be limited, generally, to the use of sorbents, hand-operated pumps with skimming heads, and small tools. Water flooding may be useful if large amounts of oil have reached a depression and lie beneath the vegetative cover. Contaminated vegetative cover can be removed by hand.

Shorelines of ponds can be cleaned by hand or with sorbents and hand-operated pumps with skimming heads. Contaminated grasses (except where there are soil erosion constraints) and debris will have to be removed by hand. The banks of creeks can be treated in much the same way. In addition, if the creek bed is wide enough, front-end loaders and draglines can remove large quantities of oiled sand and gravel. Small slicks can be removed from the water surfaces with sorbents, small skimmers, booms, and hand-operated pumps with skimming heads.

With the appropriate permit or pre-approval, small pools of oil along the banks of creeks and ponds can be burned if no threat is posed to the surrounding vegetation.

Large Rivers and Floodplains

Containment

There are two general spill situations covered here: a spill on the floodplain and a spill in the main river channel.

Oil approaching the floodplain should be blocked at the point of entry (contained within the drainage course). Berms should be constructed between the spill and the main river channel. Underflow devices may be used if there is water flow. Diversion berms can be built to direct the spill to a floodplain feature (side channel, abandoned meander or channel, oxbow lake, or excavated diversion pit). Flood plains debris can be used as containment barriers. Log jams on sand or gravel bars and side channels create pools where oil can be contained. Oil will cling to the material forming the jam. A helm should be constructed downstream from the debris to act as a backup containment barrier.

Spills on the main river channel are difficult to contain, and can be treated in several ways. During periods of high stream flow and velocity, a series of diversion berms and booms should be used, diverting the spill to a containment pit or floodplain feature. Digging a pit across the main river channel will create eddies and pools of quieter water. This is practical only on smaller rivers where equipment can be used. This technique is more effective when used with an overflow dam directly downstream. The pit should be located where rapid removal of the oil is possible. The usefulness of booms on fast flowing, large rivers is limited; however, they can be deployed in containment pits, upstream from natural or created pools, and near sandbars. Oil should be removed from behind the boom as rapidly as possible to prevent loss of oil and to keep the strain on the booms parallel to the river bank downstream from the point of entry. Under some circumstances, side channels could be converted to containment ponds if the following procedures are utilized: 1) berm or dike the downstream end of the side channel; 2) construct a suitable channel for diversion skimmer in

conjunction with an overflow berm such that the flowing oil is diverted into the mouth of the side channel, but allows the majority of water to flow down the main channel.

Under most circumstances, containment barriers will have to be continually maintained. Their resistance to erosive forces can be increased if the upstream portion of the earthen barrier is covered with large pieces of heavy material (rip-rap).

Cleanup

Cleanup activities on floodplains and large rivers may be initiated simultaneously with containment actions.

Booms and berms are used to divert and contain spills on large rivers. The use of one or more skimming devices is part of the containment and cleanup actions associated with booms and berms. Rocks, boulders, and sand and gravel bars may be covered with a film of oil as the spill flows downstream. Rocks and boulders can be cleaned by hand-scraping or with pressurized equipment. A hand-operated skimmer with a floating head may be used in conjunction with the sorbents. Gravel bars can be cleaned simply by removing the contaminated gravel and debris. Replacement with clean materials may be necessary if the quantity removed is significant and can be accomplished with front-end loaders, draglines, and backhoes. In order to prevent the removed upstream material from flowing downstream, sorbent booms and pads should be deployed or dispersed around the object being cleaned.

Spills that have migrated to a considerable depth in floodplain gravels can be treated several ways. The gravel can be removed, the area can be water flooded and the oil skimmed off, or the oily water can be pumped out through a drilled hole or an excavated trench. It is likely that oil penetrating to significant depths cannot be entirely removed.

In the case of a large spill, there will probably be large amounts of oiled debris in the floodplain. This will have to be removed either mechanically or by hand. Large pieces in midstream can be removed with a crane or similar piece of equipment. Care should be taken to ensure that the material being removed is not dragged across the water surface, causing further oiling. Small pieces can be collected by hand. Oiled vegetation growing on the floodplain can be clipped if there is danger of oil being transported to the water.

Large Lakes

Containment

Booms are the most useful means of containment on large lakes. The most effective technique is to encircle the spill with booms.

If oil is flowing into the lake, a boom should be secured to the shore on one side of the point of entry and deployed around the periphery of the slick by boat until the spill is encircled. As in containing oil on small lakes, sorbent booms and conventional booms deployed in tandem may be effective. Deploy both across the lake outlet with the sorbent boom downstream. Sorbent pads can be distributed between the two booms. This technique will pick up some of the oil that passes the conventional boom.

Cleanup

Cleanup activities on large lakes should coincide with containment activities.

The primary means of containing and cleaning up spills on large lakes and bays is the use of booms, sorbents, and skimmers. Booms are used for containing and concentrating the oil. Skimmers are used to remove the oil from the water surface, transferring it to storage for subsequent disposal. Sorbents should be used for spills of small volumes and for final cleanup of large volumes. Self-powered skimmers with on-board storage will be needed if the oil is not concentrated adjacent to the shoreline where smaller floating skimmers or vacuum pumps could be used.

Cleanup along the shoreline is done in much the same way as along a river. Oiled vegetation can be clipped and removed. Sands and gravels can be removed and replaced. Sorbents can be used to pick up small slicks and sorbent booms deployed to clean up continuing seeps of oil.

TERRESTRIAL SPILL CONTAINMENT, PROTECTION, & RECOVERY TECHNIQUES

Earth Containment Berms

Use: Low barriers constructed with available materials (e.g., earth, gravel, sandbags, etc.) are used to contain surface oil flow on relatively flat or low-sloped terrain or wetlands.

Limitations: Accessibility, implementation time, highly permeable soils and low viscosity oils, and environmental damage inflicted by excavation of berm materials.

General Instructions: Use earthmoving equipment or manual labor to construct berms by forming materials into windows or ridges in a "horseshoe" configuration. Width of containment opening should exceed that of the leading edge of the oncoming oil. Berm height and the size of the containment area are dependent upon the physical characteristics of the oil.

Equipment Required: Motor graders, bulldozers, front-end loaders, clam shells, and/or hand tools.

Maintenance: Check berms periodically for leakage and adequate height.

Cleanup: Use sorbents to recover residual oil pools. Remove or treat oiled sediments. Backfill excavated area upon completion of cleanup operations.

Variations: In areas with a high ground water table or high soil permeability, the containment area may be flooded and/or lined with plastic sheeting to inhibit soil penetration. Oil can be recovered from the water surface by skimming. This technique is shown in Figure A1-21 and may be useful in controlling oil movement through secondary wetland drainages or wetland fringes. Earth containment berms can minimize surface disruption and restore normal circulation when cleanup has been completed.

Street Containment

Use: Barriers constructed across streets can be used to contain oil flowing onto urban streets or highways.

Limitations: Storage behind barriers, implementation time, and the availability of recovery equipment

General Instructions: Construct barriers with sandbags, soil, or gravel. If coarse materials are used, the upslope side should be made impermeable with plastic sheeting or similar material. Barrier height should equal curb height. If no curb is present, construct the barrier in a "horseshoe" shape. Should a greater storage area be needed, a diversion barrier can be constructed at an angle across the stream to direct oil into a parking lot or open field where a larger containment barrier has been constructed (see Figure A1-22).

In constructing containment barriers, care must be exercised to minimize potential fire hazards. To avoid causing sparks, the blades of earthmoving equipment should not scrape the pavement, if present. The exhaust and ignition systems of onscene motorized equipment should be shielded. (Spark arresters and elevated exhaust will be required on all equipment; use diesel-powered equipment when available.)

Equipment Required: Front-end loader and/or hand tools.

Maintenance: Periodically check barrier for leakage and adequate height.

Cleanup: Oiled areas should be flushed with water. Direct the spray towards the containment site where the oil can be skimmed or pumped out. Oiled barrier materials must be removed for disposal. Remaining oil can be removed with sorbents.

Variations: The area behind the barrier may be flooded with water in order to float the oncoming oil. This makes recovery easier and prevents further surface oiling.

Culvert Blocking

Use: Boards, sandbags, inflammable plugs, or earthen materials are used to block culverts as a means of containing oil flowing into ditches, creeks, or other drainage courses that feed into culverts. Culvert blocking may also be used to prevent oil from entering tidal channels that are connected to the ocean through culverts.

Limitations: Accessibility, implementation time, storage area behind culvert, flowing water, and culvert size.

General Instructions: Block the culverts by piling dirt, sand, or similar material over the upstream end of the culvert thereby creating a containment dam. Sandbags or plywood sheets are also effective (see Figure A1-23). Inflatable plugs work best if available at the site.

Equipment Required: Front-end loader and/or hand tools.

Maintenance: Periodically check culvert for leakage.

Cleanup: Remove or treat oiled sediments using techniques described in Section V and remove the block from the culvert

Variations: If water is flowing into a drainage ditch, it can be removed by pumping or siphoning to the culvert outlet or a nearby drainage course.

If there is little or no storage area upslope from a culvert, it may be advantageous to permit the oil to pass through the culvert and to contain the spill at the culvert outfall. In areas where a culvert outfall discharges into a borrow ditch, the borrow ditch can be dammed to form a storage area for the spilled oil. If there is no borrow ditch or similar structure draining the culvert outfall, a storage area can be created by constructing a "horseshoe"-shaped dam around the outfall. Refer to Figure A1-24.

Storm Drain Blocking

Use: Sandbags, boards, and specially constructed mats are used to prevent oil spilled on roadways from entering urban storm drains.

Limitations: Implementation time.

General Instructions: For curb inlets, position a board over the curb inlet and hold it in place with a sandbag. Street inlets can be blocked similarly with a board or plastic sheeting. Both inlet-blocking techniques are illustrated in Figure A1-25. Specially constructed mats can be used expeditiously if they are kept on hand.

Equipment Required: None.

Maintenance: Periodically check for leakage.

Cleanup: Water flush streets to remove remaining oil. Remove blocking materials from storm drains.

Variations: Other materials may be used to block inlets.

Sorbent Booms/Barriers

See specific section.

Interception Barriers (Trenches and Sheet Barriers)

Use: Intercept subsurface flow of spilled oil.

Limitation: Unknown subsurface geology and/or direction of subsurface flow.

General Instructions: The use of trenches can be an effective technique for containing the flow of oil through a subsurface layer. Care should be exercised in selecting a site. The type of soils must be considered; excavating a trench in permanently frozen soils may cause more damage (by causing thermal erosion) than the subsurface migration of the oil.

The trench should be excavated at right angles to subsurface flow. Local terrain may dictate that the trench be angled upslope at either end. The depth of the trench depends upon the depth of the oil; the trench should extend about 18 inches below the oil level. The sides and bottom of the trench should be covered with visqueen or a similar impermeable material. The trench should be wide enough to accommodate the method of oil/water removal that is anticipated. If a floating skimmer is to be used, a portion of the trench will have to be wide enough for the skimmer. The trench need not be widened for sorbents and/or a pump with a floating skimming head.

The direction of subsurface flow must be determined before a barrier is installed. First, a surface reconnaissance of the area should be made. There may be pools of oil on the ground, dying or dead vegetation or a petroleum odor. If there are gullies that provide exposed banks, the banks should be examined closely for seeping oil. The entire area of suspected subsurface oil flow should be checked.

Like trenches, sheet barriers can be used where the flow is near the surface and/or where the ground will allow them to be driven deep enough to intercept the flow of oil. Ideally, they should extend down to about 18 inches below the oil level, and up from the ground surface to create a ponding area for the oil. They can be driven into the ground with an air hammer fitted with a shoe to spread impact over the entire edge of the sheet. The sheets should be installed so that they overlap. As with trenches, sheet barriers should be installed at right angles to the subsurface flow and they may bend upslope at the ends.

SELECTION OF APPROPRIATE TECHNIQUES FOR TERRESTRIAL SPILLS

The following section describes considerations for the selection of appropriate spill containment, protection, and recovery techniques for terrestrial spills.

Open Land and Forests

Containment

Naturally-occurring features such as tussocks, deadfalls, vegetation, and snow will retard or stop surface flow of oil and retain it. Additional on-site materials can be used to supplement these natural barriers. Visqueen and/or sorbent materials should be placed on the uphill side of naturally-occurring barriers, except snow.

Interception trenches can be excavated to divert or contain oil. They may have to be lined with an impermeable material. Trenches can be dug and barriers placed in the vegetative mat to limit subsurface oil migration; possibly in conjunction with sorbents and impermeable liners. Caution should be exercised; excessive trampling and heavy equipment can cause more damage to the vegetative cover by working oil in than if the spill were to be left alone.

The small drainage courses and rivulets have to be blocked using sandbags, earth, snow, sheets of plywood, metal, sorbents, or materials found on site, such as brush and logs. Courses with flowing water have to be dammed, either conventionally or with an underflow device. Oil flowing down a dry drainage course can be partially contained by placing a sorbent booth directly in the damage course and/or by damming; oil that collects in small pools should be removed rapidly to decrease subsurface spill migration.

Cleanup

Cleanup activities in open land and forest regimes will center on the use of light equipment and land-cleaning techniques unless the spill presents a threat to human life and must, therefore, be removed rapidly.

Presently, there are no known means for effectively cleaning vegetation. It is likely that a spill will kill low-lying shrubs, grasses, and any plants that absorb oil through its roots. Large trees with oil on their trunks should be left alone. Pools of oil can be removed with sorbents, small hand-operated pumps with skimming heads, and rakes and shovels. During the winter, oiled snow cover can be removed with heavy equipment or manual methods, taking care not to damage the vegetative layer. In general, excessive vehicle traffic and trampling can do more damage working oil into the plant/soil/active layer than leaving a spill untreated. It may be possible to "wash" some areas. A spill may be absorbed by the vegetative mat and flow beneath it. When this occurs, it may be feasible to flood the area with water, floating some of the oil to the surface where it can be removed with sorbents and small pumps and by hand. Small pools can be burned if there is no danger of the fire spreading.

Large, bare rocks and boulders that are covered with a film of oil can be cleaned with pressurized equipment. The ground area surrounding any surface to be cleaned should be covered with sorbents before actual cleaning begins. Isolated rocks can be hand-scraped.

Removal of oiled soil and replacement with mixed mineral-organic material has been used for some spills. Although this is a disruptive technique, this option may be required when conditions warrant and after consultation with the appropriate agencies.

Highways

Containment

Highways can serve as important containment barriers if the culverts passing beneath them are blocked. Most culverts are two feet or less in diameter and can be blocked with sand bags, sheets of plywood, and earth or snow. Large culverts and some small ones transporting large volumes of water will require an underflow device. Where there are large volumes of oil involved and/or inadequate storage capacity on the spill side of the highway, it may be advantageous to allow all or part of the spill to pass beneath the highway to an area downslope with sufficient storage capacity. Dams should be constructed across the borrow ditch to provide containment. Section plan aerial photos can be used to show appropriate highway culvert locations.

Where there is no borrow ditch or where the highway is not elevated, a spill may pass over the highway if it is not blocked. A windrow (berm) of materials taken from the road shoulder may block spill flow.

Cleanup

Cleanup activities on and along highways are most efficient if heavy equipment is used.

Oiled materials in the highway ditch can be removed with a motorized grader. If the ditch is somewhat inaccessible or narrow, a backhoe can be used. Front-end loaders could place the removed material into dump trucks to be hauled to a disposal area.

The choice of techniques for cleaning the road surface will depend on the nature of the surface. It is likely that most of the oil will flow off the surface of a paved road. Also, the oil and water could be removed by vacuum trucks or pumped into containers. If the road surface becomes slippery because of oil, sand can be spread over the oil to improve traction and later be swept up. Regardless of the methods used, care should be exercised to prevent the spill from oiling additional portions of the right-of-way, especially the borrow ditch.

SHORELINE AND TERRESTRIAL CLEANUP PROCEDURES

This section discusses actual cleanup techniques for shorelines and terrestrial spills. Cleanup plans shall be approved by the government agency prior to starting any cleanup operations.

The surface conditions and topography of oiled areas and the manner in which the oil has been deposited will dictate the choice of cleanup procedures to be followed. The cleanup of the affected areas should commence immediately after emergency control actions have been completed.

The basic cleanup techniques may be used singularly or in combination and include the use of:

A. Skimmers

B. Heavy Equipment

C. Pressurized Equipment

D. Water Flooding

E. Manual Labor

F. Sorbents

G. Natural Recovery

H. Bioremediation

I. Burning

Skimmers

Generally, skimming systems fall into three categories:

- Suction devices
- Rotating discs or belts
- Weir devices

Suction Devices

Oil can either be lifted or skimmed from land or the surface of water with a variety of vacuum or suction devices. These devices are only partially successful for several reasons. First, they are only effective on relatively thick slicks, and most require partial or total immersion of the nozzle in the product. If oil is floating on water, a considerable amount of water may be recovered with the oil, and the devices often require gravity separation or decanting tanks as a secondary operation. Second, heavier oils and debris tend to clog intake lines, rendering many suction devices inoperable.

Suction pumps or vacuum devices can be very useful for picking up oil pooled on land or which has collected in a thick layer on a pond. It is important to minimize the amount of water picked up.

The two primary vacuum/suction devices are described as follows:

Vacuum Truck. The vacuum tank truck uses atmospheric air pressure to force oil into a storage tank. An oil spill on water may be contained. by the vacuum truck with its enclosed body, high vacuum, high velocity pick-up through an intake tube can suck up the oil.

Any water picked up can be released through a sump drain on the tank.

Slickskim Manta Ray7. A "Ray"-shaped head floats on the surface of the water or can be immersed in oil pooled on land. Oil enters through ports along the perimeter and passes through suction hoses and pumps. Manta Ray heads can be used along shorelines and in shallow streams as they can operate in as little as three inches of water.

Hoses from the heads may be connected to a pump or a vacuum unit.

Rotating Discs or Belts

Number devices that employ some type of rotating disc or endless belt are either currently available or being developed. The oil is removed from the water surface by the natural oleophilic properties of the exposed surfaces of the belt or disc. The oil that adheres to the moving surfaces may then be removed by a squeeze roller or blade. Units employing hydrophobic, oleophilic, or other sorbent materials may require squeezing to recover the oil. Another type of unit has long rolls of sorbent material which retain the oil for later disposal, but has no capacity to separate this oil from the sorbent material. Most rotating discs and endless belt devices are adversely affected by waves, especially swells, although some belts are aided by surface chop. In favorable water surface conditions, the proportion of oil to water recovered may exceed 90% for some devices.

The primary disadvantage is that both the discs and belts become less efficient as oil becomes thick or viscous due to weathering.

Weir Devices

Weir devices are used in many places where oil is floating on water because they are relatively inexpensive and can be constructed quickly. Support equipment such as hoses, pumps, and storage tanks are required. The weir-oil skimmer operates on the gravity principle. The top of the weir is positioned as close as possible to the oil/water interface and the skimmer moves through the slick or is positioned in the current to intercept the oil. The oil and water flow across the weir into a sump or enclosed area, then a suction pump transfers the mixture to another tank for further separation.

Like most skimmers, this device works best in calm water on thick slicks. However, larger, heavily constructed models have been successful in up to six-foot waves. By carefully adjusting the weir, a maximum amount of oil and a minimum amount of water can be skimmed. Boom can be used effectively to increase the width skimmed and to concentrate the oil.

Heavy Equipment

Principles of operation, applicability, and operational procedures of heavy motorized equipment generally used for cleanup are described in Table A1-1 (following page). Figures A1-26 through A1-29 illustrate operation techniques, sequences, and set-ups for the use of heavy equipment.

Surface conditions at each work site will need to be evaluated for suitability to heavy equipment operation by knowledgeable operators before the appropriate equipment is selected and mobilized to the site.

Discing

For small spills of very light oil or for final cleanup, the most effective cleanup technique may be a simple "discing-in" of the oil. Before this procedure can be used, the appropriate officials must review and approve the discing-in method.

In this technique, the oil is not removed but buried into the top layer of sediments and left to degrade naturally. The oil is disced into the sediment using a tracked loader or tractor towing a discer. The following procedure shall be followed:

1) Begin discing along the shoreward edge of the oiled area.
2) Operate the tractor in second gear and continue to the end of the oiled area.
3) The tractor is turned around and a new pass is started adjacent to, and slightly overlapping the previous pass (Figure A1-30).

TABLE A1-1

SUMMARY OF CLEANUP TECHNIQUES – TABLE A1-1

	Equipment Techniques	Method of Operation
1.	Combination of motorized graders and scrapers	Motorized graders cut and remove surface layer of sediments and form large windrows. Motorized scrapers pick up windrowed material and haul it to disposal area or to unloading ramp-conveyer system for transfer to dump trucks. Screening system utilized to separate debris such as straw and vegetation from sediments when large amounts of debris are present.
2.	Motorized elevating scrapers	Motorized elevating scrapers, working singly, cut and pick up surface sediments and haul to disposal area or to unloading ramp-conveyer system for transfer to dump trucks. Screening system utilized to separate debris.
3.	Combination of motorized graders and front-end loaders	Motorized graders cut and remove surface layer sediments and form large windrows. Front-end loaders pick up windrowed material and load material into trucks. Trucks remove material to disposal area or to conveyor-screening system for separating large amounts of debris from sediments.
4.	Front-end loader	Front-end loaders, working singly, cut and pick up surface layer of sediments and load material into trucks. Trucks remove material to disposal area or to conveyer-screening system for separation of large amounts of debris from sediments.
5.	High pressure flushing	High pressure water jets remove oil from solid surfaces, and runoff oil/water is controlled and collected.
6.	Steam and hot water cleaning	High pressure steam or hot water heats oil, allowing it to flow off a surface for collection and treatment.
7.	Water flooding	High volume, low pressure water is used to move stranded oil to trenches for containment, concentration, and collection.
8.	Bioremediation	Nutrients or genetically-engineered microorganisms are applied to areas to accelerate the natural degradation of oil. Formal approval for use must be obtained.

Pressurized Equipment

High Pressure Flushing (Hydroblasting):

High pressure flushing is the most efficient method of removing oil from surfaces such as retaining walls, rocks, and man-made structures. Proper steps should be taken to contain the runoff water and oil in areas not protected by booms. Hydroblasting uses a high pressure water jet that removes oil from almost any surface. Agency approval may be required for use of high pressure flushing where intertidal organisms or sensitive species are located.

Caution: *Prior to the use of high pressure water or steam cleaning, qualified personnel should inspect oiled surfaces for biological activity. In many instances, cleaning these surfaces will remove attached plant and animal life. Several years may be required to recolonize areas with these forms.*

The water is often heated to nearly boiling for increased flushing and should be used only by trained personnel. The runoff oil/water must be controlled to avoid oiling other rocks or structures. Specific operating procedures for hydroblasting are:

1) Place plastic sheets over adjacent surfaces to prevent further oiling.
2) Construct berms or ditches or deploy sorbent booms to direct oil/water into collecting pools or into surf or waterways.
3) If the oil is to be directed into the water or there is a possibility of reentering the water, containment and sorbent booms should be anchored beyond the surf zone, or close to the shore when used on inland waterways.
4) Begin flushing at the highest point, working downslope. The lowest point should be cleaned at low-tide. The oil should be recovered before the tide rises.
5) Try to take advantage of shoreline characteristics, winds, and water currents as much as possible.

Steam and Hot Water Cleaning:

Steam and hot water cleaning is another efficient method of removing oil from almost any surface. Heated steam raises the temperature of the adhered oil, thereby, lowering its viscosity and allowing it to flow off a surface. Some operating procedures described for hydroblasting are applicable for steam and hot water cleaning. Agency approval may be required prior to use of steam and hot water.

Caution: *Prior to using high pressure water or steam cleaning, qualified personnel should inspect oiled surfaces for biological activity. In many instances, cleaning these surfaces will remove attached plant and animal life. Several years may be required to recolonize areas with these forms.*

Water Flooding

Water flooding is a cleanup and restoration technique that should be considered for use on shoreline areas that have limited access for heavy equipment. High volume, low pressure water has been successfully utilized to move oil stranded on beaches back into the water or into collection trenches where it can be contained, concentrated, and collected. Typically, this technique works most effectively on fine-grained sediment shorelines where the oil has not penetrated to appreciable depth or wetted sediment grains. When penetration or wetting of grains/rocks has occurred, significant amounts of oil can be recovered, although the process will not be complete and residual material will remain. Heating of the flood water has been successful in increasing the recovery effectiveness in some cases.

A test of the potential applicability of the technique can be quickly conducted on a small section using a portable 12-inch gasoline-powered pump. Pump discharge should be applied to the area above the oil using a hose with no nozzle and allowed to gently flood and float the product from the oiled area. Care should be taken to avoid mixing of oil and sediment. Visual inspection of the treated area should include assessment of the degree of removal and any changes in depth of penetration.

Full scale application may use the largest portable pumps available to supply water through flexible discharge hoses which have been perforated. A typical configuration is diagrammed in Figure A1-31. Recovery of the mobilized oil can be through collection trenches using portable pumps, vacuum equipment, or with booms and conventional skimmers. If collection trenches are used, care must be exercised to minimize burial of oil during tidal changes or trench closure.

For coarse-grained sediment, the flooding system has been supplemented with low to moderate spray hoses to accelerate removal. A typical spray configuration using a manifold to supply multiple hoses is also indicated in Figure A1-31.

Manual Labor

Certain site-specific and incident-specific conditions will determine the optimum use of motorized equipment during cleanup. Manual labor will be used to supplement motorized cleanup activities and, in some cases, may be the sole method of cleanup. Certain tasks may be defined for manual cleanup operations. Tasks to be performed by manual labor crews include:

- Sorbent application
- Removal of oiled materials
- Collection of oil using squeegee tools
- Sorbent and bagged waste collection
- Temporary storage area maintenance
- Cleaning of hauling vehicles
- High pressure flushing, steam cleaning, and water flooding

Sorbents

The proper use of sorbents is an integral part of the overall containment and cleanup plan. Sorbents should be used whenever mechanical skimming/suction devices cannot be used or are unavailable. Sorbents are also used frequently in conjunction with mechanical equipment

Sorbents should never be used on water unless there is a definite way to recover them. Sorbent material can be reused after squeezing the collected oil into a container.

Sorbents are a practical approach for handling small spills on water and for cleaning up light sheens on water from larger spills. Sorbents often provide the only environmentally acceptable means for cleanup of small terrestrial spills.

A sorbent is any material which absorbs oil or to which oil adheres (adsorbs). A sorbent should be oleophilic and hydrophobic. Oil sorbents may be divided into three general classes by origin:

- Naturally-occurring materials
- Modified or chemically-treated natural materials
- Synthetic or man-made products

The natural materials may be further subdivided into vegetable, mineral, and animal classes. Sorbents are also classified according to their composition or physical form as, for example, powdery, granular, and fibrous materials; preformed plastic slabs or sheets; and synthetic foams generated at the time and place of use.

Types of sorbent materials currently available are:

Natural Origin

Sorbents derived from vegetable sources are straw, hay, seaweed, kelp, ground corncobs, natural grasses, wood bar, ground bark, sawdust, reclaimed fibers from paper processing, and peat moss. Sorbents derived from mineral sources include the various clays - montmorillonite, kaolin, fuller's earth, diatomaceous earth, etc.; vermiculite and the other micas; many forms of silicates; perlite; pumice; and asbestos. Sorbents of animals origin include chrome shavings from leather processing, wool wastes, feathers, and textile wasters.

Snow has also proven to be a good sorbent, absorbing approximately its own volume in oil. The efficiency of snow absorption is much higher at snow temperatures below 0EF. A snow berm that has been constructed to contain a spill will also act as a cleanup mechanism. The berm will absorb the spilled oil and can be removed when saturated. Because snow can be continually supplied to a point downslope from a spill and act as a continuous sorbent material, it should be used whenever possible. In addition, snow is easily removed.

Peat and the vegetative mat will act as an in situ sorbent for spills traversing land; the amount of oil that is absorbed will depend upon its thickness and density. The vegetative mat will absorb more oil because it is less dense. Removal of oiled peat and vegetative mat should be done only with the consent of appropriate experts. Peat should not be removed when underlain by permafrost or other soils designated as sensitive.

Modified Natural Materials

Most of the above-mentioned sorbents can be treated to produce a more desirable result. Typical examples are expanded perlite, charcoal, stearate-coated talc, asbestos treated with surfactant, and sawdust and vermiculite coated with silicones.

Synthetic Products

These sorbents include a vast array of substances broadly categorized as plastics and rubber, but more specifically as the polyurethanes, polypropylenes, ethylenes, styrenes, resins, polymers, and co-polymers.

Sorbent materials are presently available in four distinct forms:

- Squares and strips (pads)
- Rolls
- Sorbent booms, mats, and pillows
- Loose material

In general, with the present best available technology in sorbent systems (dispersal, recovery, and disposal), sorbents are not recommended for use except to remove thin films or iridescence during the final cleanup phases and to prevent the spreading of oil spilled on land. Sorbents can also be used to prevent oiling of facilities (walkways, work areas, etc.) on which oil spill cleanup equipment and/or personnel are mobilized during the cleanup operations.

A discussion of the use and limitations of each sorbent form follows:

Squares and Strips (Pads)

Squares and strips of sorbent material can be used in small, contained areas to pick up small quantities of oil that are difficult to remove with mechanical equipment (skimmers, vacuum equipment, etc.). In such areas, they can be left for a period of time to increase their effectiveness.

Squares and strips, however, present a recovery problem. If they are placed in an area where tidal action, currents, or winds can act upon them, they will float or be blown away and be difficult to retrieve. A tether line attached to the sorbent material will assist in their recovery.

To increase the oil pickup efficiency of sorbent pads, continual moving and turning of the pads is necessary. Caution must be exercised when removing the pads from the contaminated area to minimize the dripping of oil onto clean surfaces. A 55-gallon drum or other suitable container must be readily available to receive the used pads.

Rolls

Rolls of sorbent materials can be used in the same manner as squares and strips and are usually made of similar materials. They generally are easier to use than squares or strips since they can be used in either short or long lengths. Like squares and strips, their absorption is limited unless they are continually turned or removed. Disposal of used rolls is easier since they can be rolled up and placed into a suitable container.

Rolls of sorbent materials are very effective in protecting walkways, boat decks, working areas, etc., from contamination. Areas onto which oil or oil-covered debris are to be placed should be covered with rolls of sorbent material. They can also be used as a protective barrier to keep oil from clean areas.

Sorbent Pillows

Sorbent pillows are generally open-mesh bags or sorbent material that can be easily placed on spill areas to absorb oil. Recommended for use in oil pickup from small, confined areas.

Sorbent Booms

Sorbent booms can be used to remove light and/or small slicks from ponds and lakes. The boom can be deployed between two boats or held by hand and dragged slowly through the slick. Oil entrained in ground water may seep for some time at spring lines. A sorbent boom can be deployed downslope from the seep to provide a means of continuous cleanup.

Sorbent Mats

Sorbent mats are made from sorbent squares or rolls, reinforced with canvas and nylon netting, and include metal grommets for easy handling. The sorbent mats can be used as flat booms on streams and in cleaning up pooled oil. Because of the nylon net reinforcement, the mats are stronger than sorbent rolls and, therefore, can be tied across streams to soak oil from the water surface. The flat surface of the mat offers a much greater surface area for sorbing oil than does the cylindrical sorbent boom.

Loose Materials

Loose-type sorbent materials should not be used for spills on large bodies of water because:

- Recovery of sorbents in the form of loose materials (straw, polyurethane foam, peat moss, etc.) on a large scale in open water has never been attempted and, at present, no commercial equipment is available for the harvesting of loose sorbents.
- Loose sorbents, particularly natural materials such as straw or peat moss, may sink.
- Without efficient means of recovering loose sorbents, tidal action, wind, and currents may disperse soaked sorbents over a large area, thus increasing the cleanup effort.

Some loose sorbent materials tend to clog skimmers and pumping equipment.

Loose sorbent materials may have limited use in the cleanup of oil from land areas where pools of oil have formed in depressions, etc. Snow is also considered a loose sorbent material and can be used to pick up pools of oil.

Natural Recovery

There are circumstances when a spill, in spite of all precautions, reaches an area which is either so sensitive or inaccessible that recovery or treatment of the spill can cause more damage than allowing the oil to degrade naturally. Therefore, natural recovery, when approved by the appropriate agencies, is an option.

Bioremediation

Bioremediation is a cleanup technique that should be considered for use on areas where other, more intrusive cleanup techniques are not appropriate. Degradation of oil by natural processes will occur in all cases, although the process is generally very slow. However, success has been demonstrated in accelerating this process using nutrients to stimulate the growth of natural organisms or by using genetically-engineered microorganisms which selectively metabolize petroleum.

Among recent applications (stimulation of natural populations) include a number of trials in eastern Canada and Alaska. The most common appears to have been the spray inoculation of oiled shorelines with a product called INIPOL EAP 22. The U.S. contact for INIPOL EAP 22 is Elf Aquitaine, Lafayette Center, Suite 400, 1155 21st Street, N.W., Washington, D.C., 20036 at (202) 872-9580. Ibis mazdal is a micro-emulsion containing a solution of urea in brine, encapsulated in oleic acid with lauryl-ether-phosphate as a lifting agent. The material is reported to be nontoxic and biodegradable. Claims of significantly accelerated bacterial growth are generally reported as visual reductions in oil level.

Application for permission to use these materials is similar to that for dispersants. The products must be listed with EPA and the state and formal application for use must be made.

Burning

Burning cannot occur without approval of state and federal agencies. Burning will be carried out in accordance with the ACP. Before a spill on water is ignited, several factors must be considered:

- Human safety
- Danger of fire spreading
- Presence of explosive vapors
- Damage done to nearby vegetative cover that may prolong natural recovery
- The facility must be outside the danger zone
- State and/or federal approval and permits must have been obtained

If the oil is fresh, it can be ignited using any appropriate technique. If the oil is somewhat weathered (i.e., the volatile constituents have evaporated), a propane weed burner or flamethrower may be used. Failure to maintain sufficient temperature or air supply may create large clouds of black smoke. At some point in time, the oil may be too weathered or emulsified to burn.

The propane weed burner should be played over a pool of oil until the oil is heated enough to vaporize and ignite. Individual fires should be started in a fine across the upwind side of the area to be burned. Once started, they could ignite adjacent areas, and the wind will assist the spread of the burn in the desired direction.

Ignition of an open spill is unlikely to result in an explosion; however, when there is no wind, explosive vapors may collect in a confined area to form an explosive mixture. Under these conditions, the potential secondary effects of a blast must be considered. Oil on ice with a little snow cover tends to pool in depressions and usually can be burned. Care should be exercised, as nearby frozen vegetative cover without snow cover can be damaged and hinder restoration.

Caution: *Tests have shown that oil pools burning on ice provide enough heat to form channels which drain water and burning oil to lower areas (water under the ice) compounds containment/recovery efforts). Enough heat can reach the water under the burning slick to cause boiling. In all test cases, after burning, the residue was a heavy, tar-like substance, ranging from 2-10% of the original volume. Removing the residue was possible and left a fairly clean area of ice, although this should be done before it sets in refrozen ice.*

Dispersants and Other Chemical Usage

Company is not considering the use of these technologies in inland areas at this time.

Final Cleanup

Laborers with rakes, shovels and barrels may be required for the final cleanup. Also, in some cases a final discing-in operation as final cleanup will be necessary.

The access roads constructed during cleanup operations must be removed when the cleanup is complete. The graders, scrapers, loaders and trucks can be used to pick up the crusher run base and transport it to an appropriate disposal site.

A repair crew of various skills may be needed for a considerable time period after cleanup is finished.

CONTAINMENT, PROTECTION & RECOVERY ILLUSTRATIONS

Figure A1-1 Open Water Containment: Boom In A Catenary Configuration

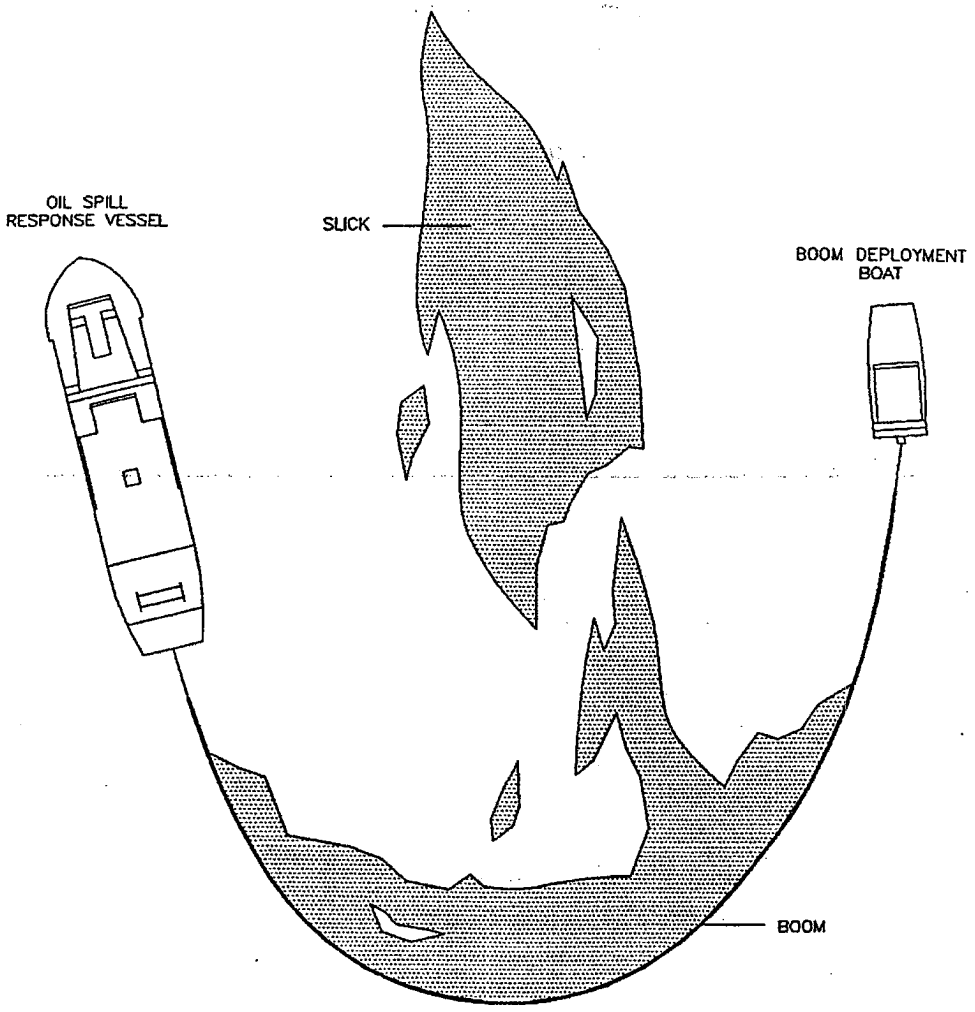


FIGURE A1–1
OPEN WATER CONTAINMENT:
BOOM IN A CATENARY CONFIGURATION

Figure A1-2 Open Water Containment: Boom in Encirclement Configurations

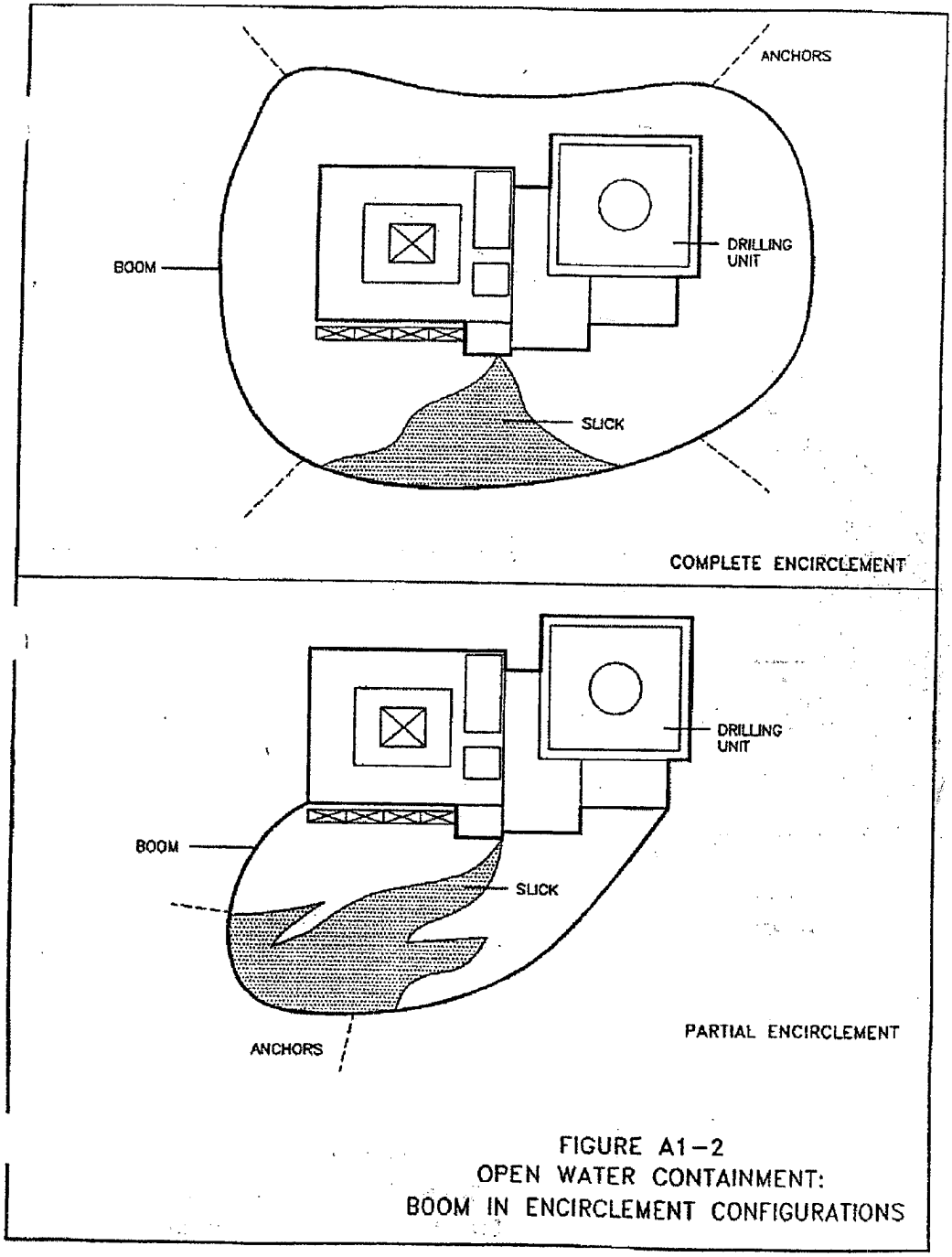


FIGURE A1–2
OPEN WATER CONTAINMENT:
BOOM IN ENCIRCLEMENT CONFIGURATIONS

Figure A1-3 Open Water Containment: Boom In "J" Configuration

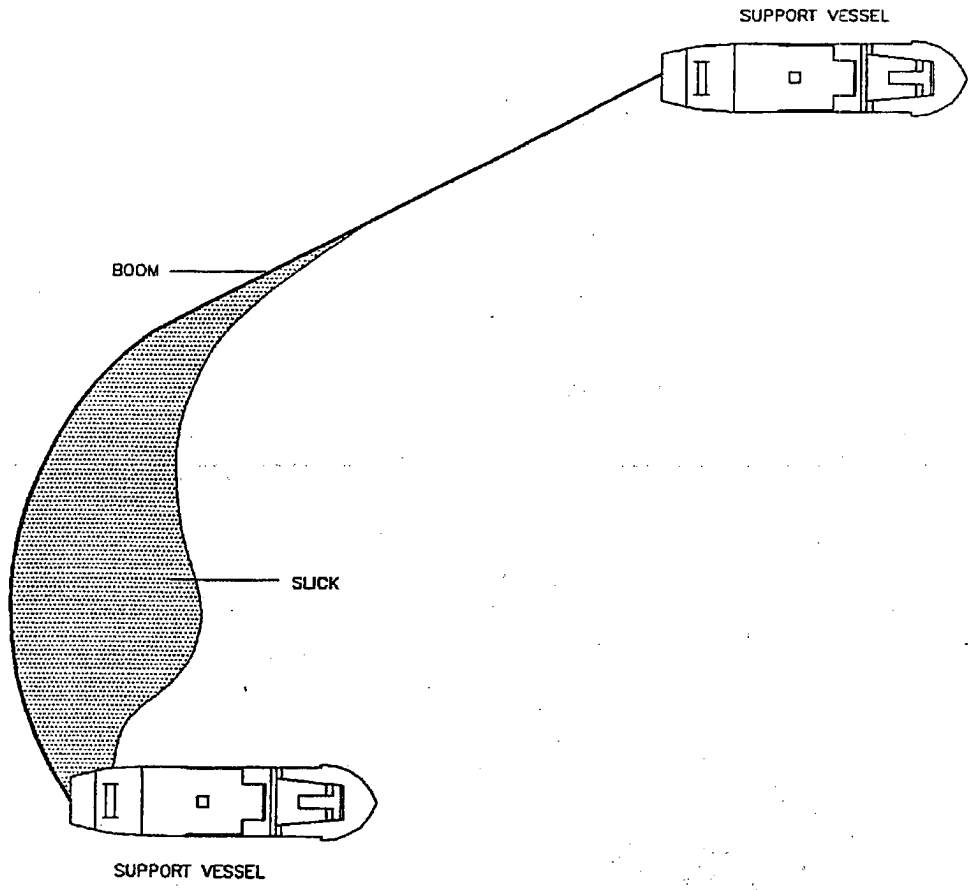


FIGURE A1-3
OPEN WATER CONTAINMENT:
BOOM IN "J" CONFIGURATION

Figure A1-4 Open Water Containment: Boom In "3" or "W" Configuration

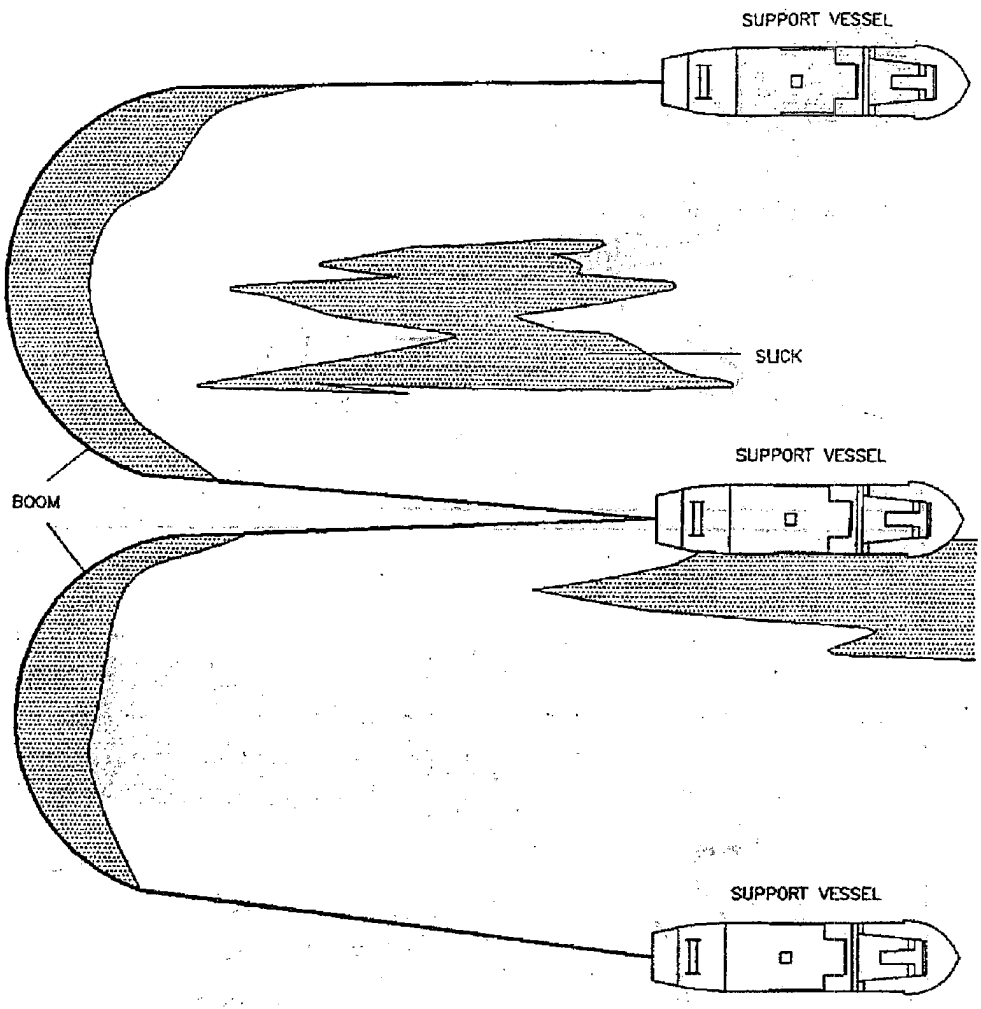


FIGURE A1–4
OPEN WATER CONTAINMENT:
BOOM IN "3" OR "W" CONFIGURATION

Figure A1-5 Marine Diversion Booming Techniques for Protecting Sensitive Areas

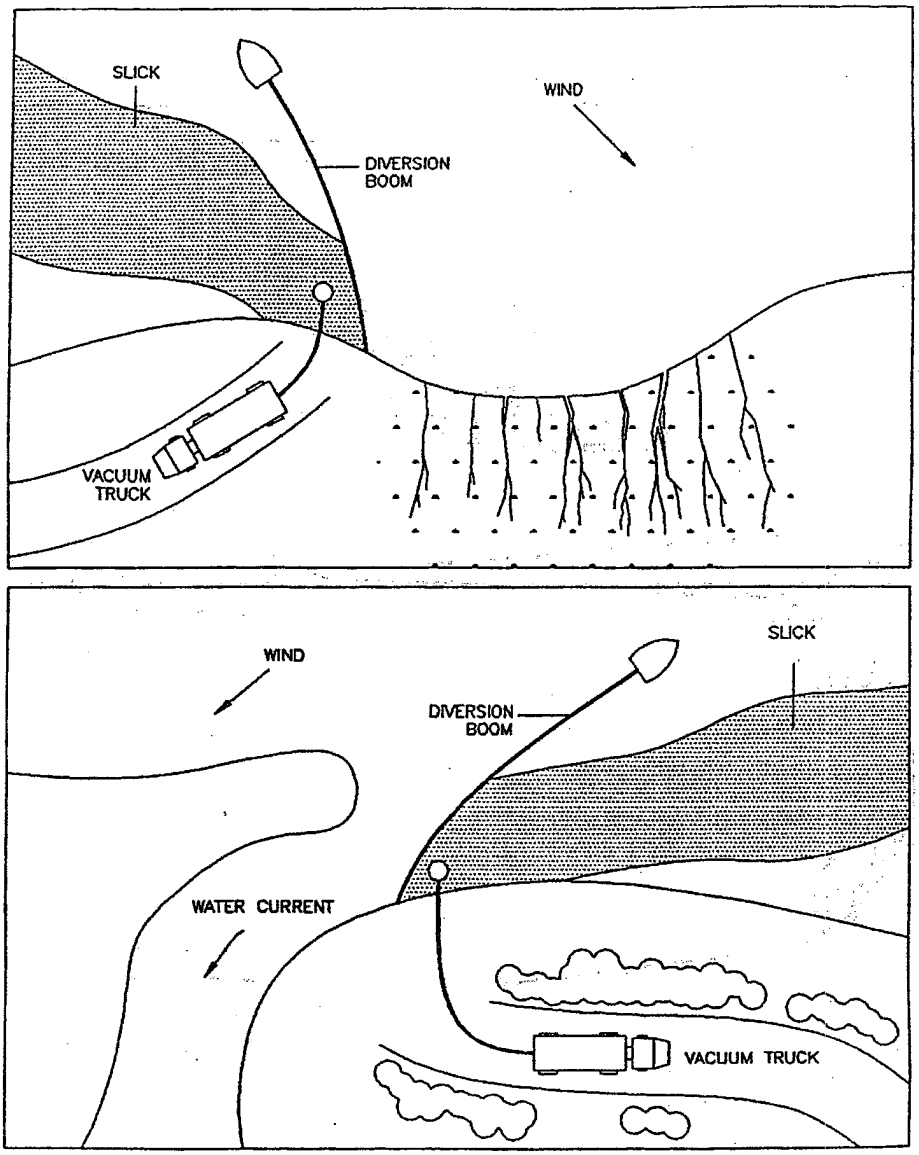


FIGURE A1–5
MARINE DIVERSION BOOMING TECHNIQUES
FOR PROTECTING SENSITIVE AREAS

Figure A1-6 Shoreline Containment: Diversion Booming to Skimmer

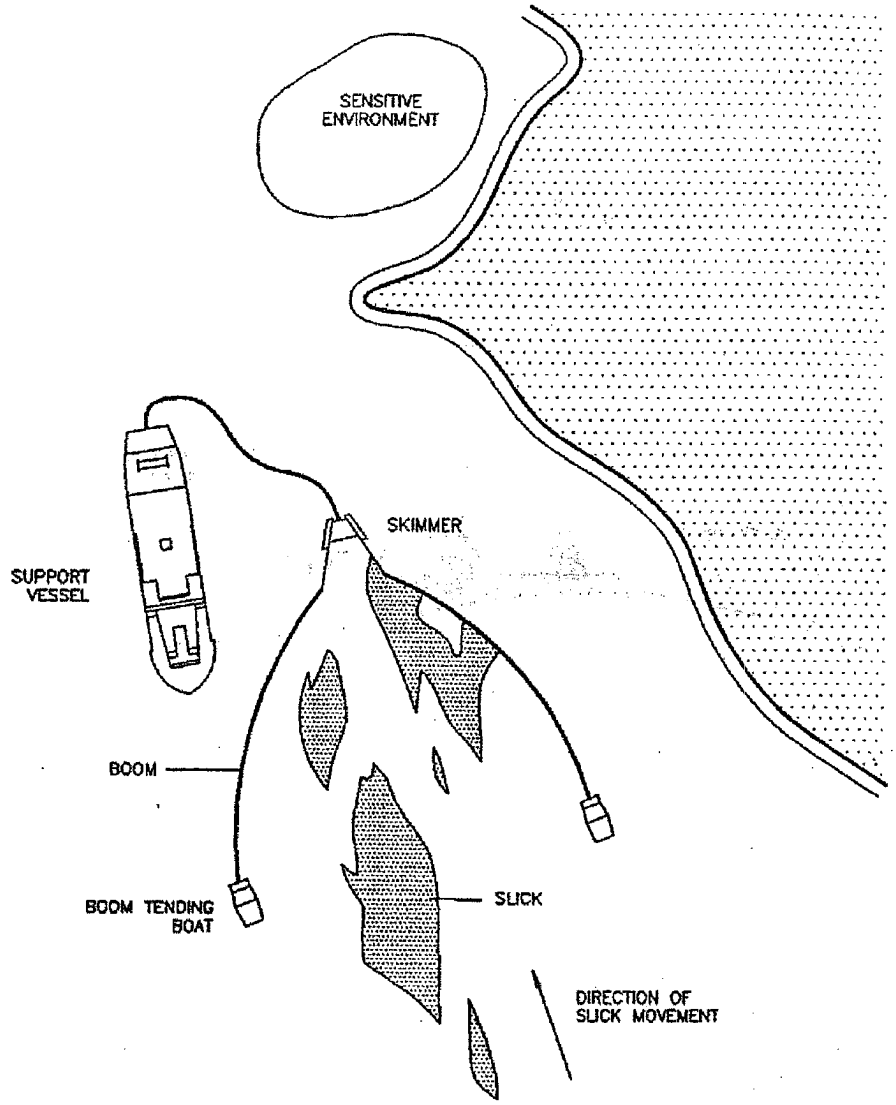


FIGURE A1–6
SHORELINE CONTAINMENT:
DIVERSION BOOMING TO SKIMMER

Figure A1-7 Shoreline Containment: Boom Deployment Angles

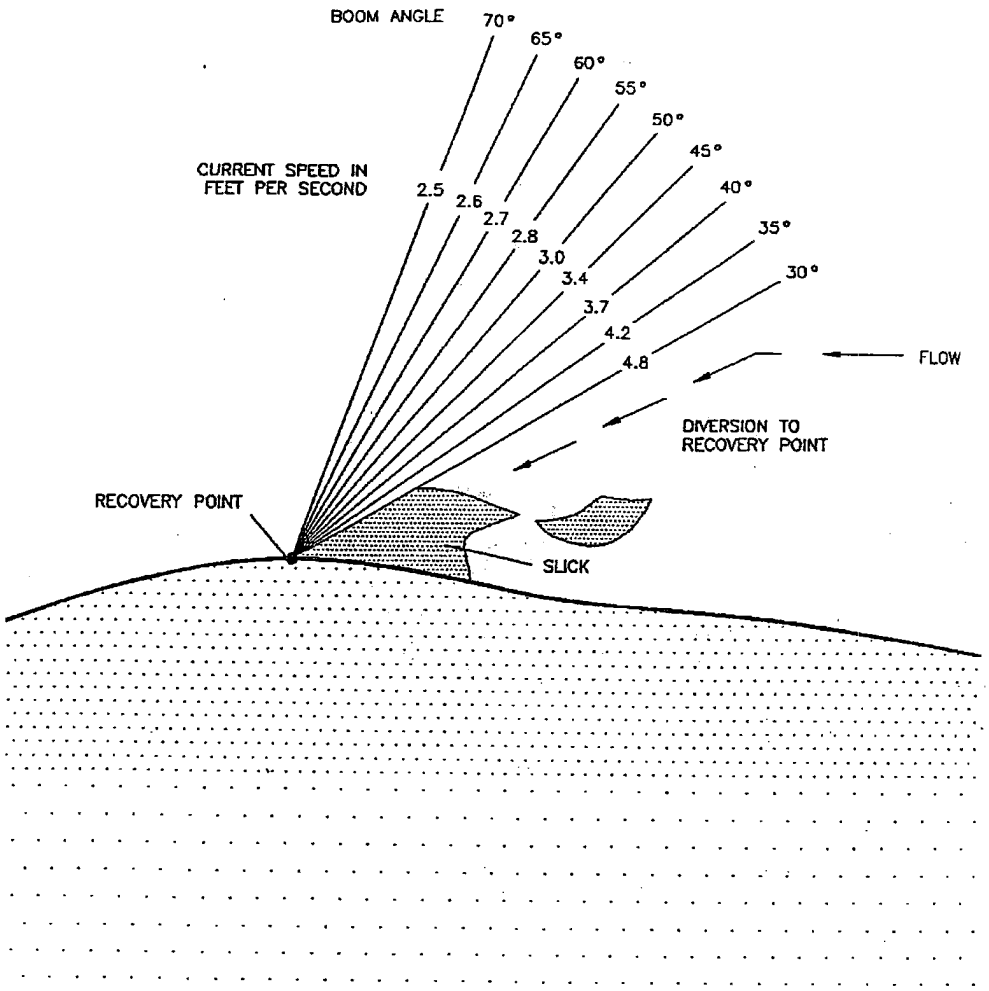


FIGURE A1–7
SHORELINE CONTAINMENT:
BOOM DEPLOYMENT ANGLES

Figure A1-8 Shoreline Containment: Exclusion Booming

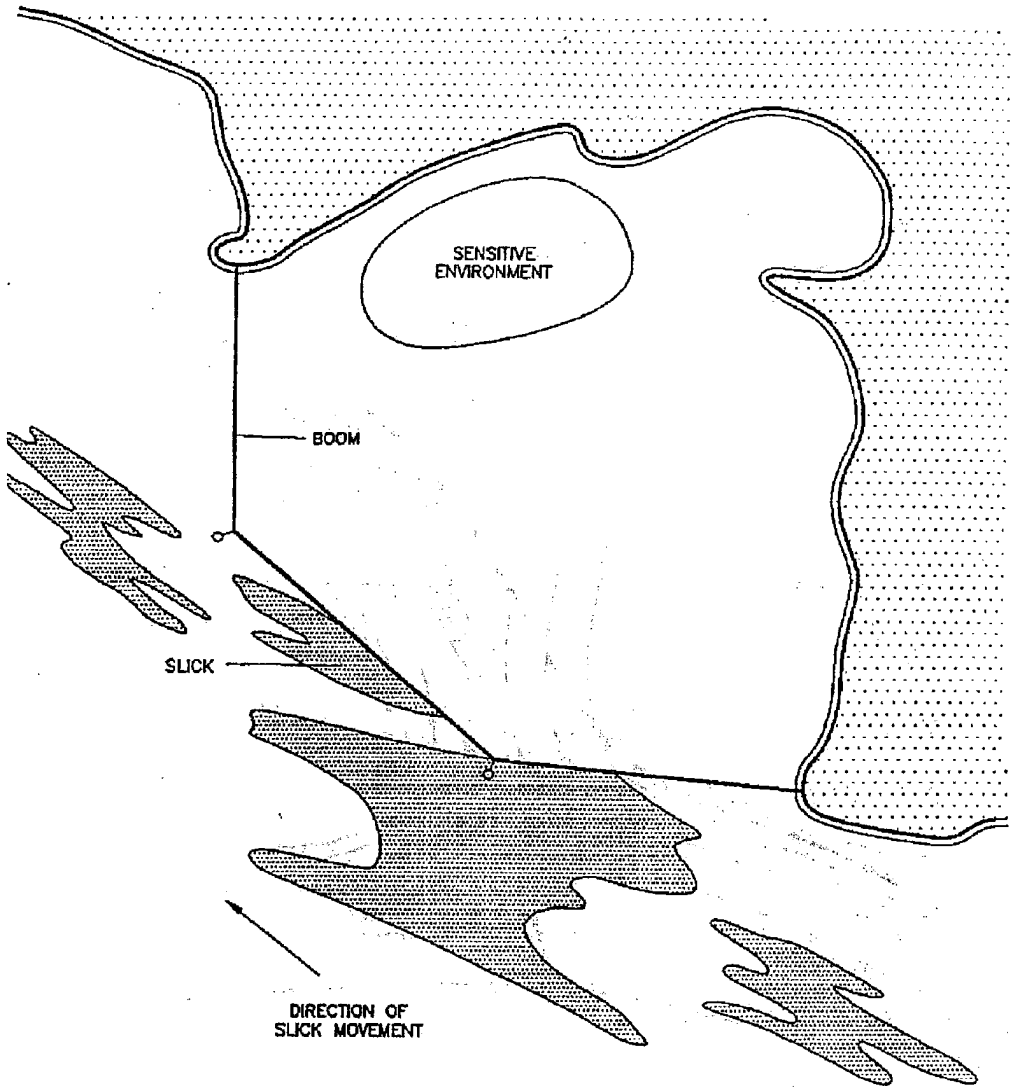


FIGURE A1–8
SHORELINE CONTAINMENT:
EXCLUSION BOOMING

Figure A1-9 Shoreline Containment: Exclusion Booming at Inlet with High Channel Currents

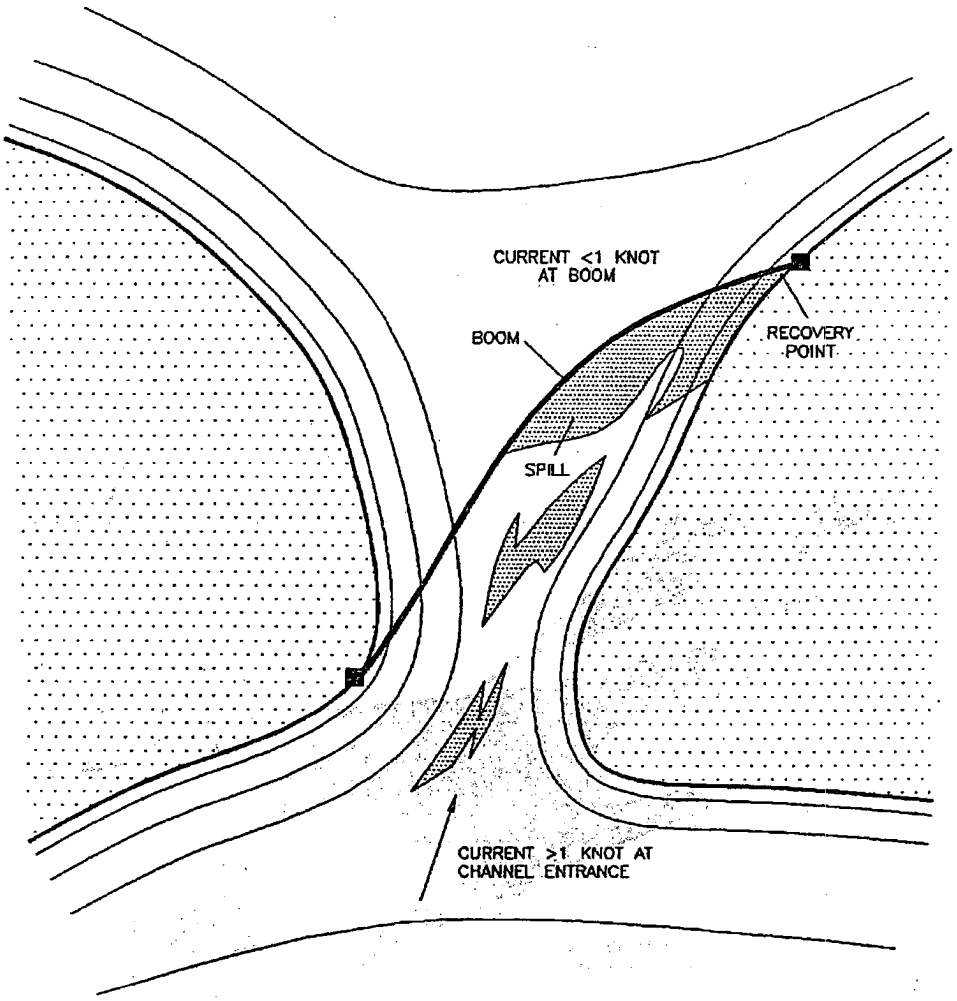


FIGURE A1-9
SHORELINE CONTAINMENT:
EXCLUSION BOOMING AT INLET
WITH HIGH CHANNEL CURRENTS

Figure A1-10 Shoreline Containment: Exclusion Booming at the Mouth of the Bay

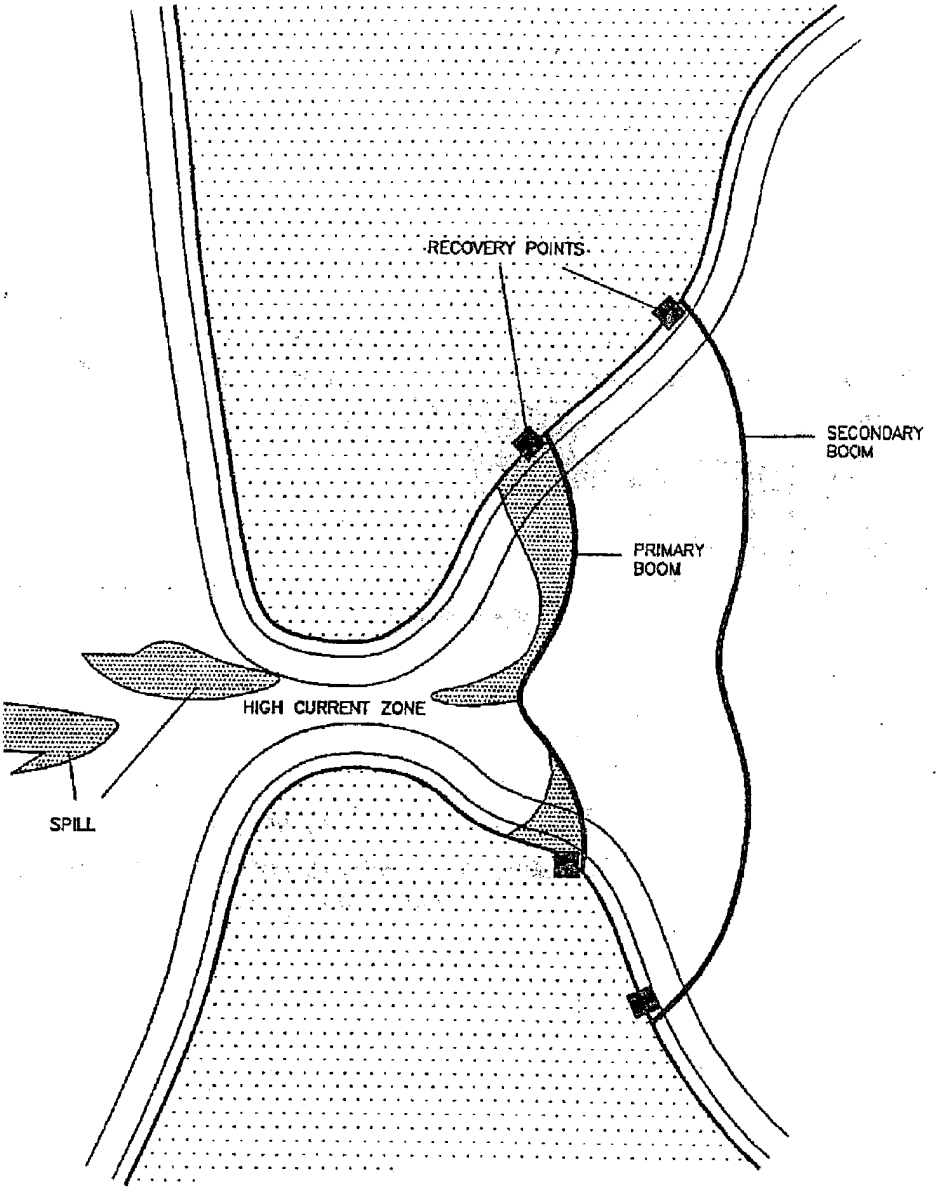


FIGURE A1–10
SHORELINE CONTAINMENT:
EXCLUSION BOOMING AT
THE MOUTH OF THE BAY

Figure A1-11 Placement Configuration of 3 Lengths of Boom

Cascading Deflection Booms

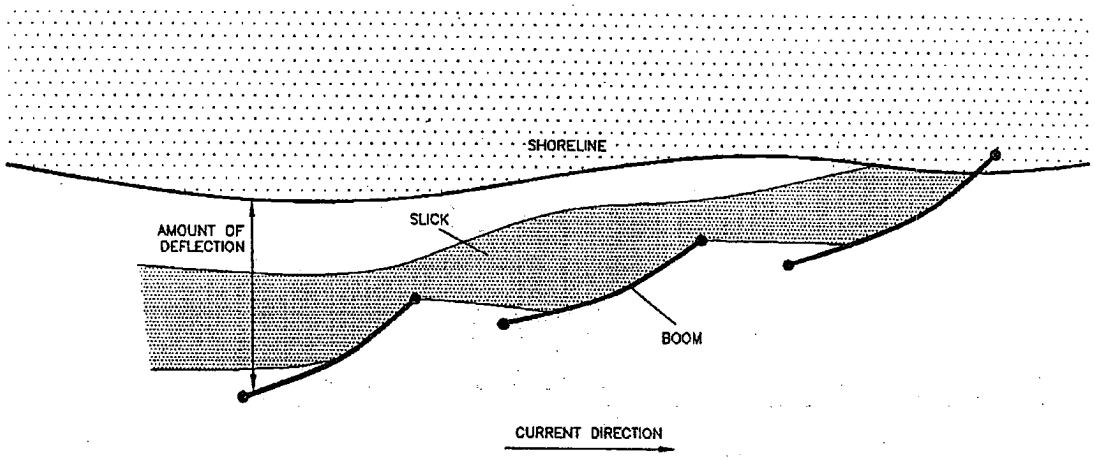


FIGURE A1–11
PLACEMENT CONFIGURATION OF 3 LENGTHS OF BOOM
(CASCADING DEFLECTION BOOMS)

Figure A1-12 Cascading Berming

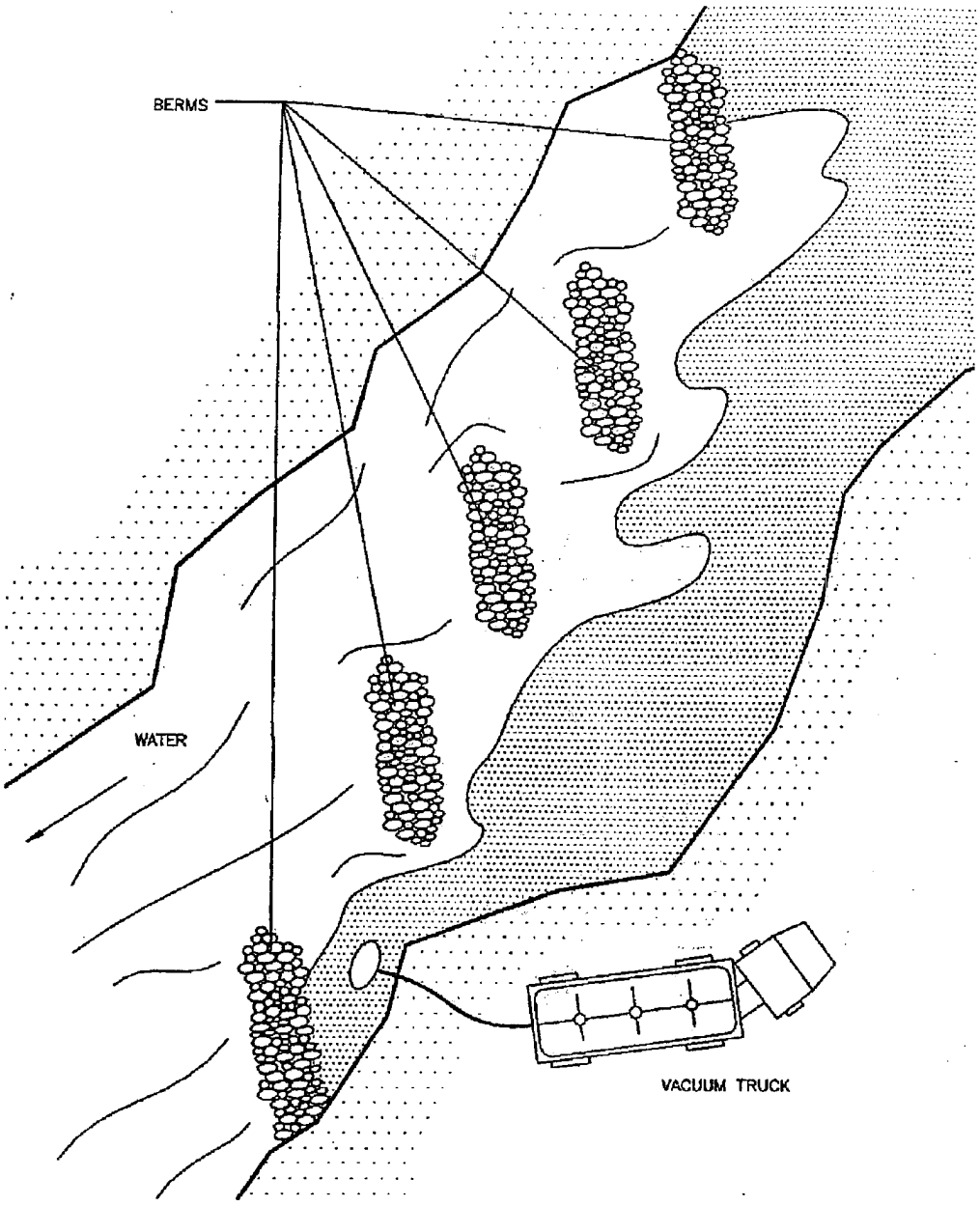


FIGURE A1–12
CASCADING BERMING

Figure A1-13 Beach Berm

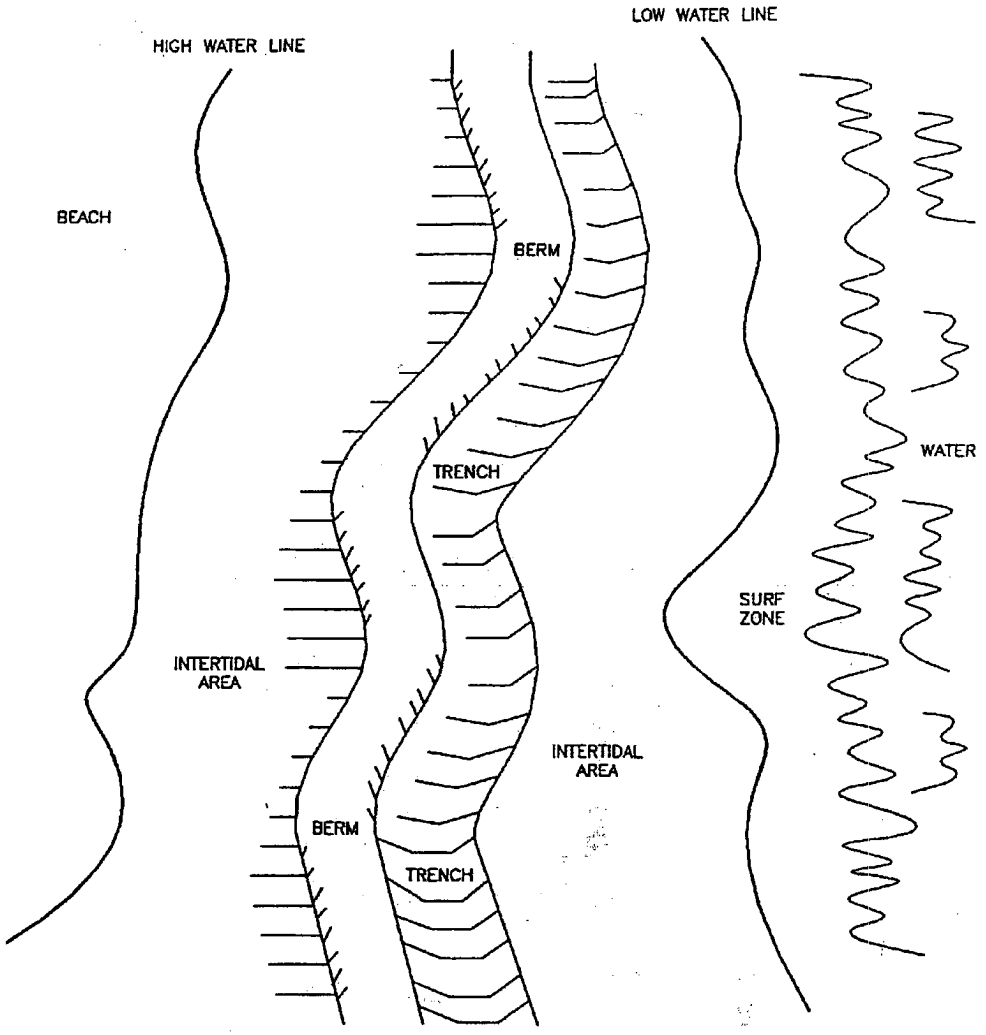


FIGURE A1–13
BEACH BERM

Figure A1-14 Collection of Oil on Beaches with Sumps

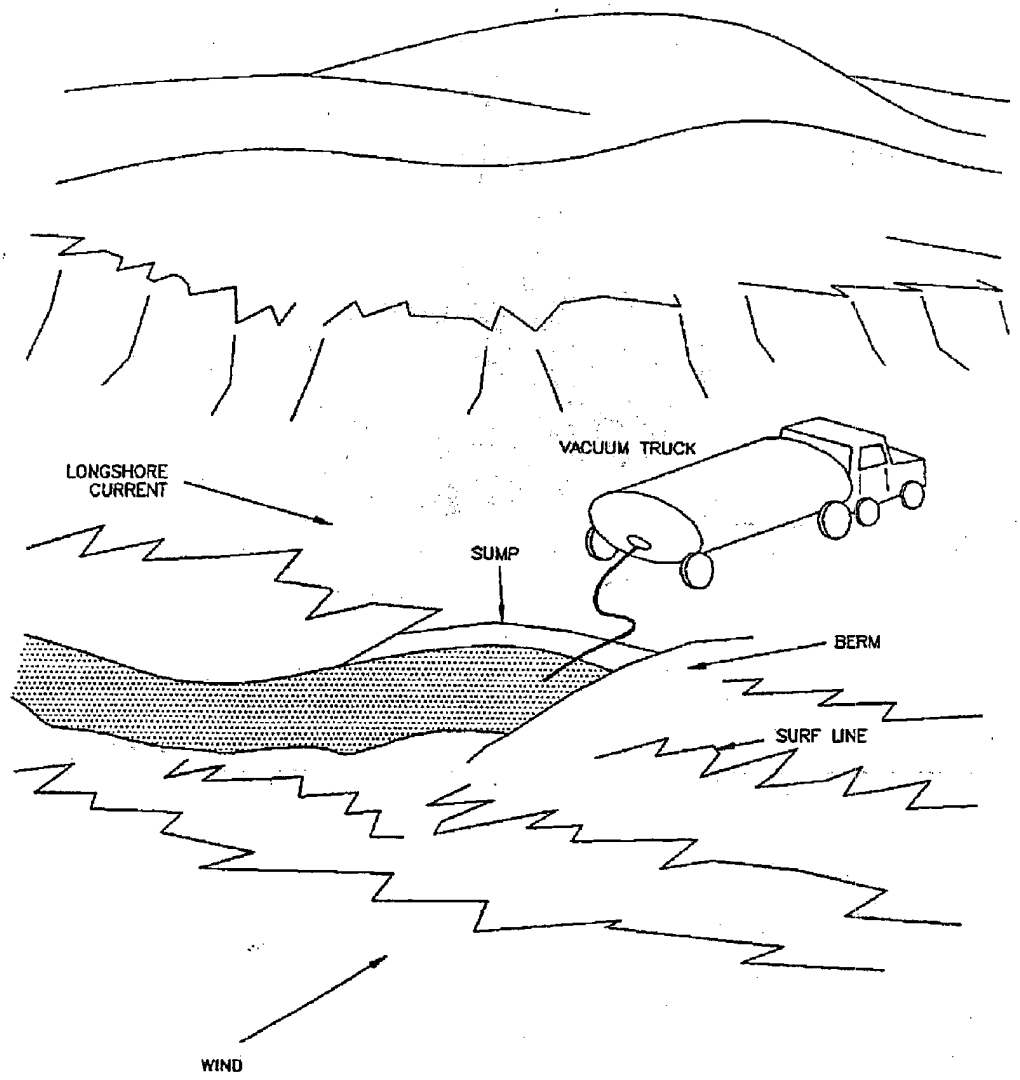


FIGURE A1–14
COLLECTION OF OIL ON BEACHES
WITH SUMPS

Figure A1-15 Quiet Water Containment to Point of Entry

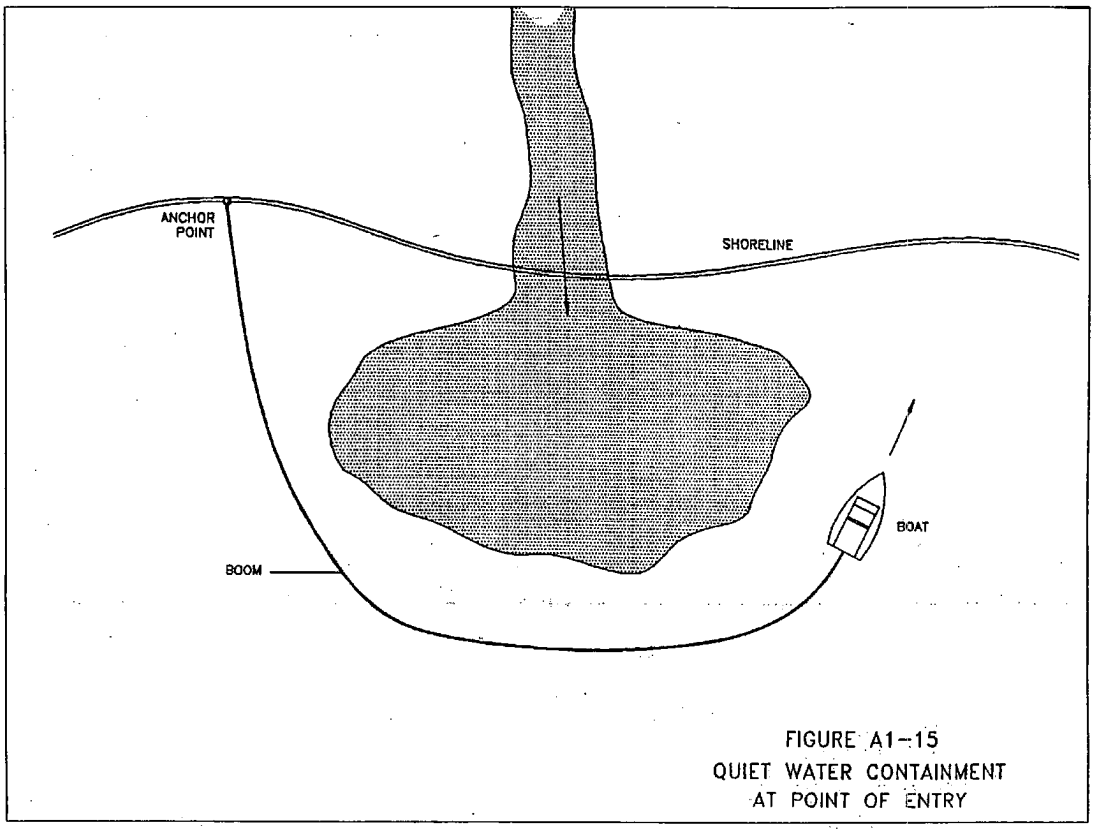


FIGURE A1-15
QUIET WATER CONTAINMENT
AT POINT OF ENTRY

Figure A1-16 River Containment Booming

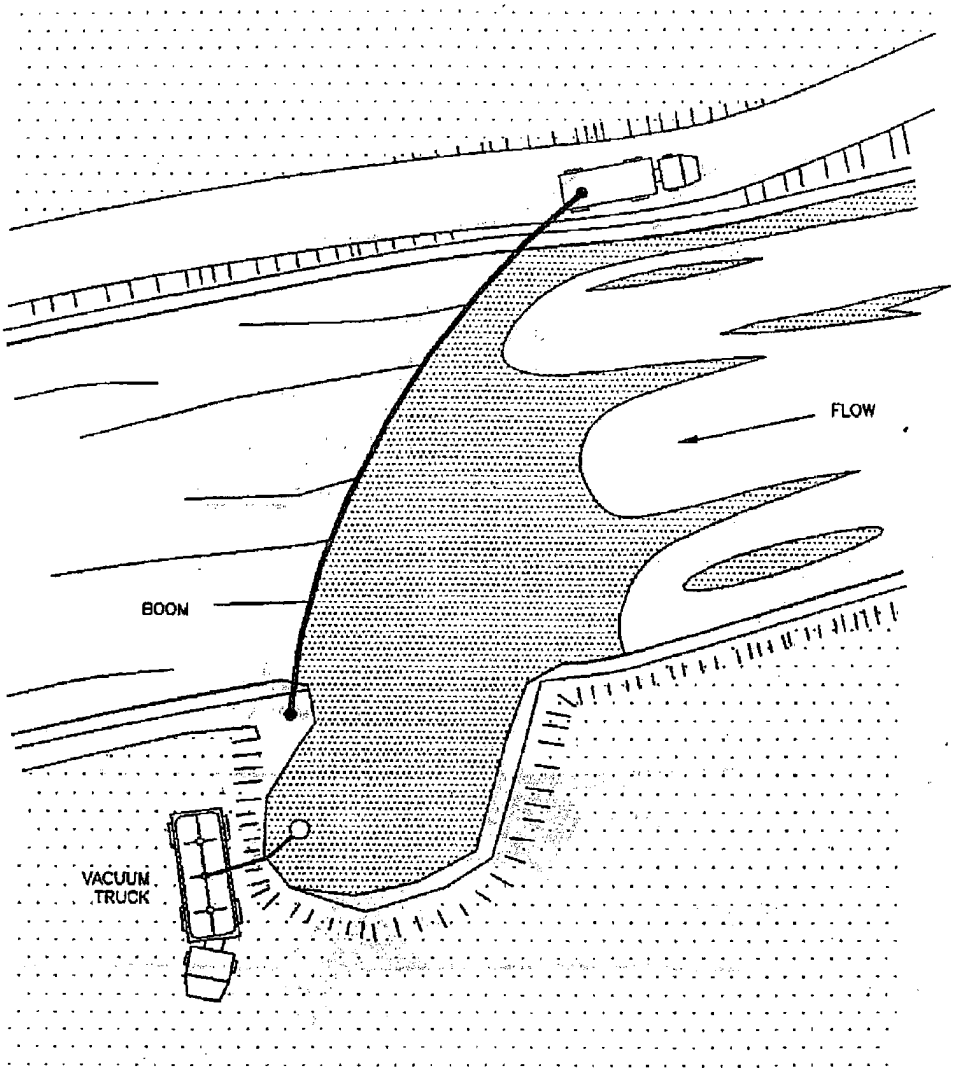


FIGURE A1–16
RIVER CONTAINMENT BOOMING

Figure A1-17 Wide River Containment Booming

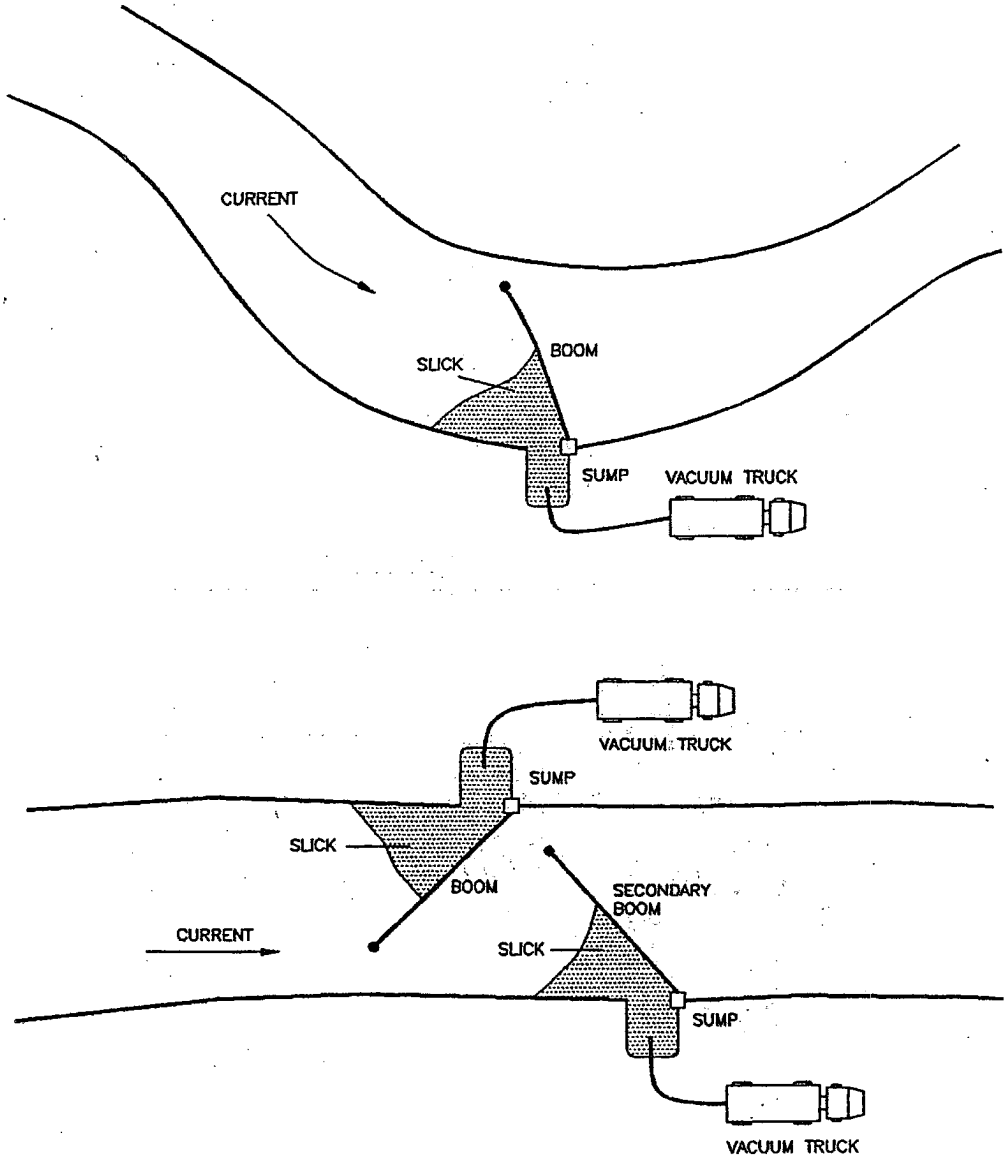


FIGURE A1–17
WIDE RIVER CONTAINMENT BOOMING

Figure A1-18 Sandbag Blocking Dam

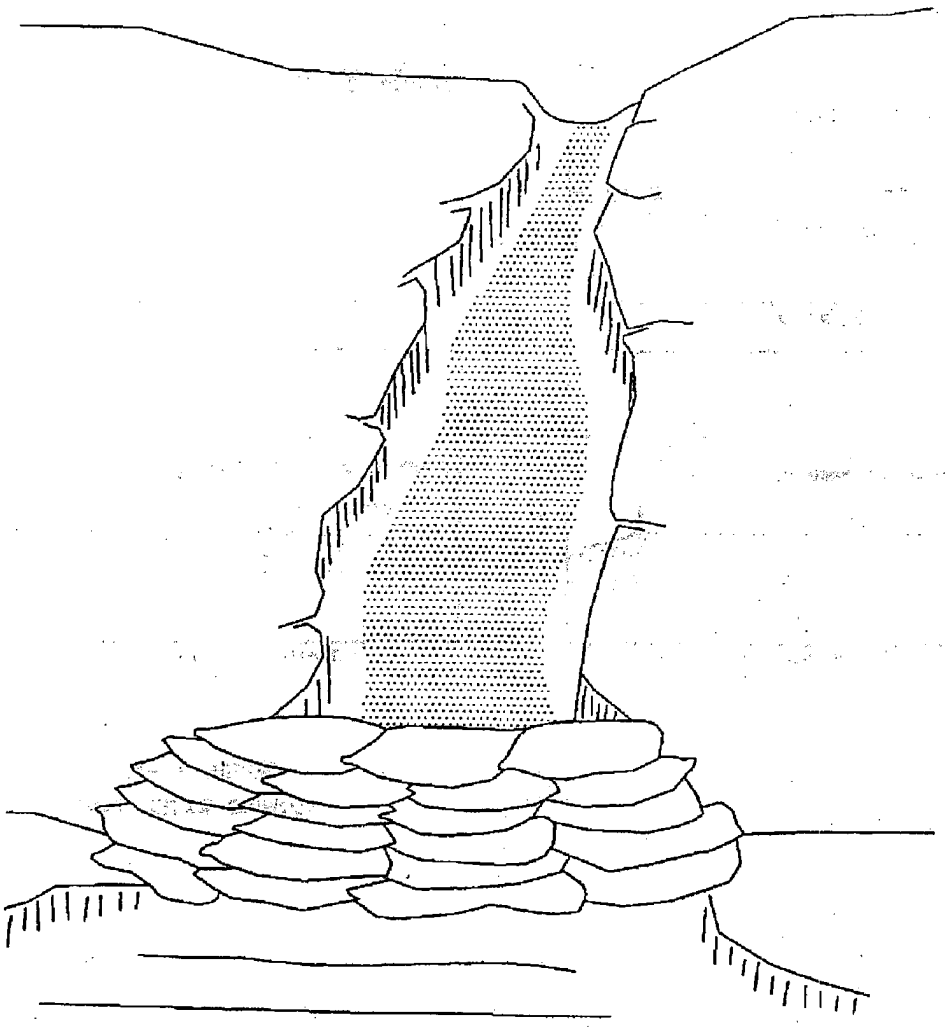


FIGURE A1–18
SANDBAG BLOCKING DAM

Figure A1-19 Flowing Water Dams

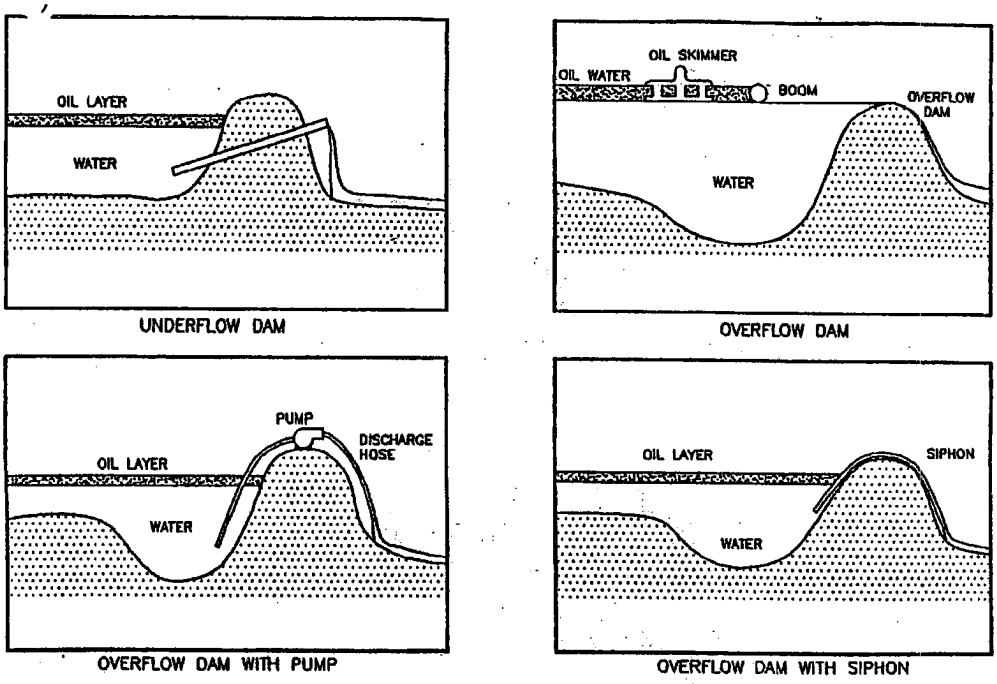


FIGURE A1–19
FLOWING WATER DAMS

Figure A1-19 Flowing Water Dams

Figure A1-20 Sorbent Barrier (Water)

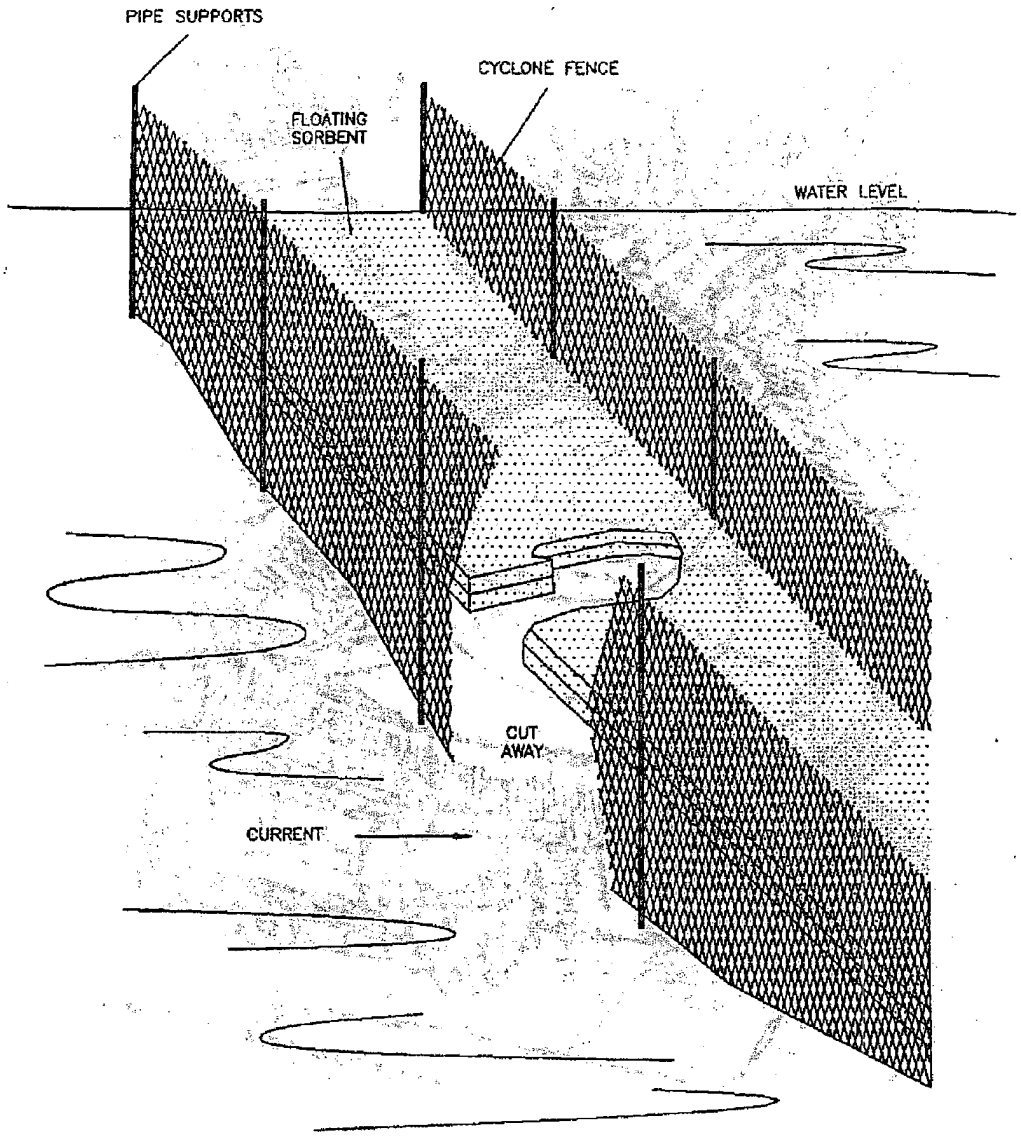


FIGURE A1-20
SORBENT BARRIER (WATER)

Figure A1-21 Earth Containment Berm (Lined)

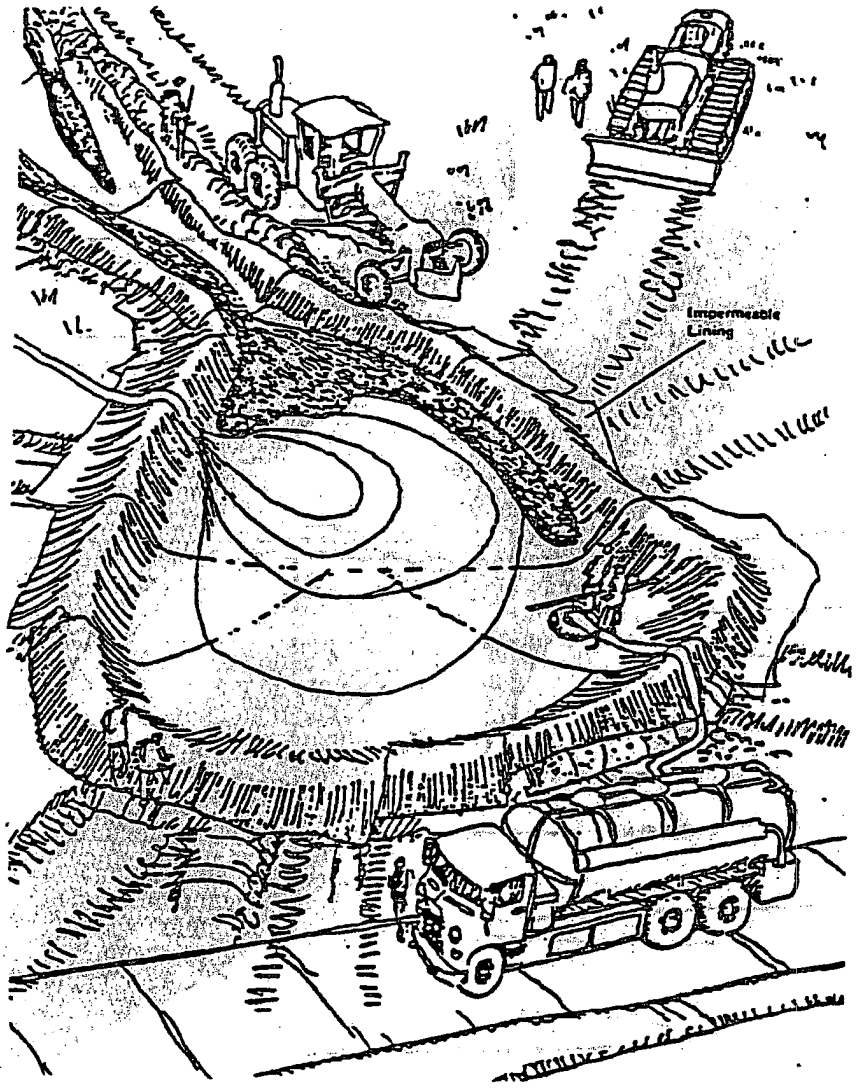


FIGURE A1–21
EARTH CONTAINMENT BERM (LINED)

Figure A1-22 Dam on a Large Paved Area

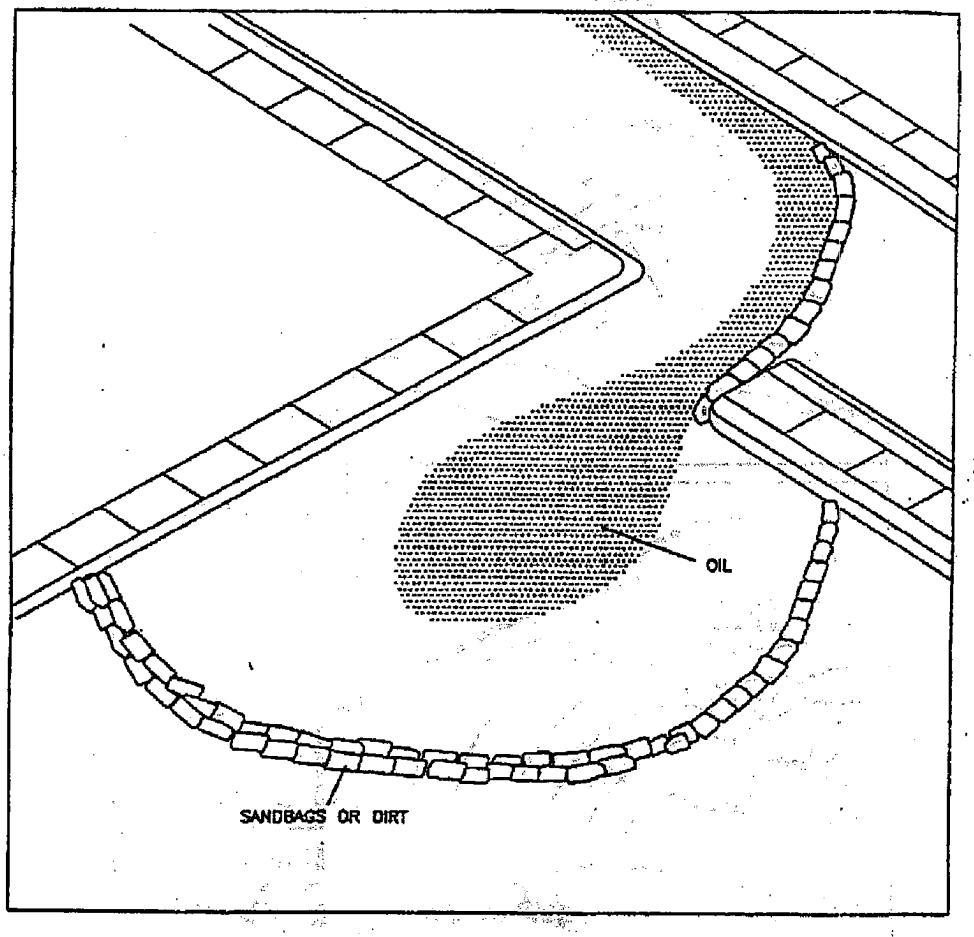


FIGURE A1-22
DAM ON A LARGE PAVED AREA

Figure A1-23 Culvert Blocking

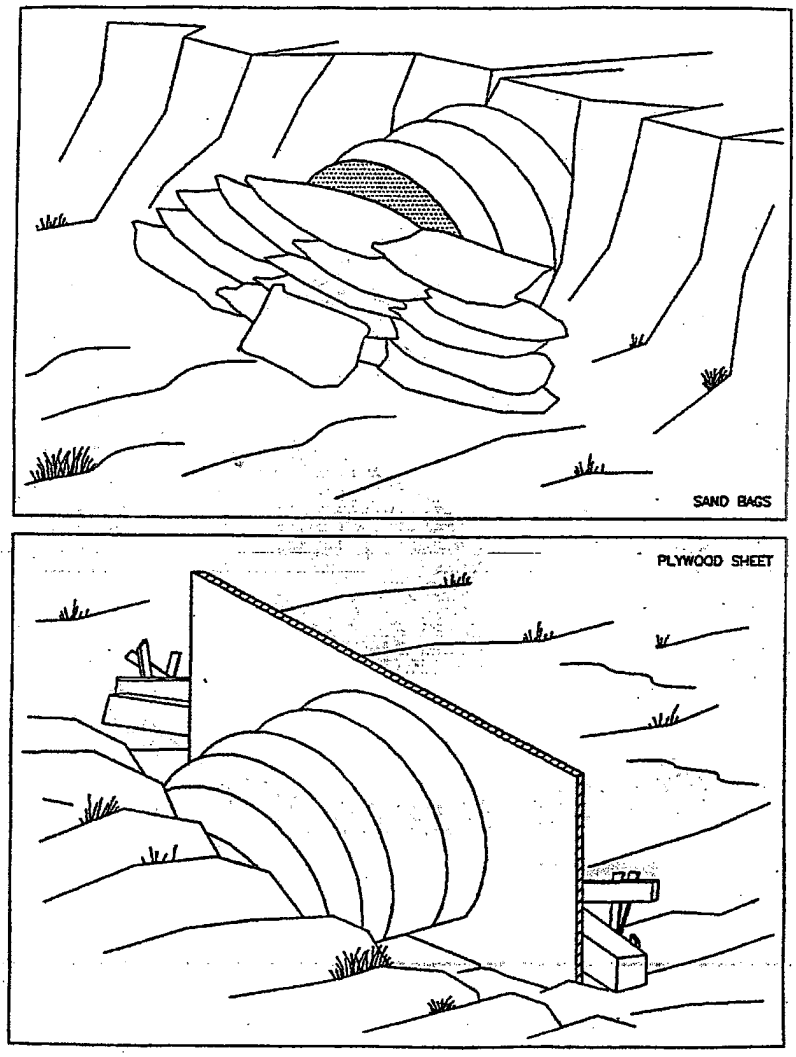


FIGURE A1–23
CULVERT BLOCKING.

Figure A1-24 Damming Flow at Borrow Ditch

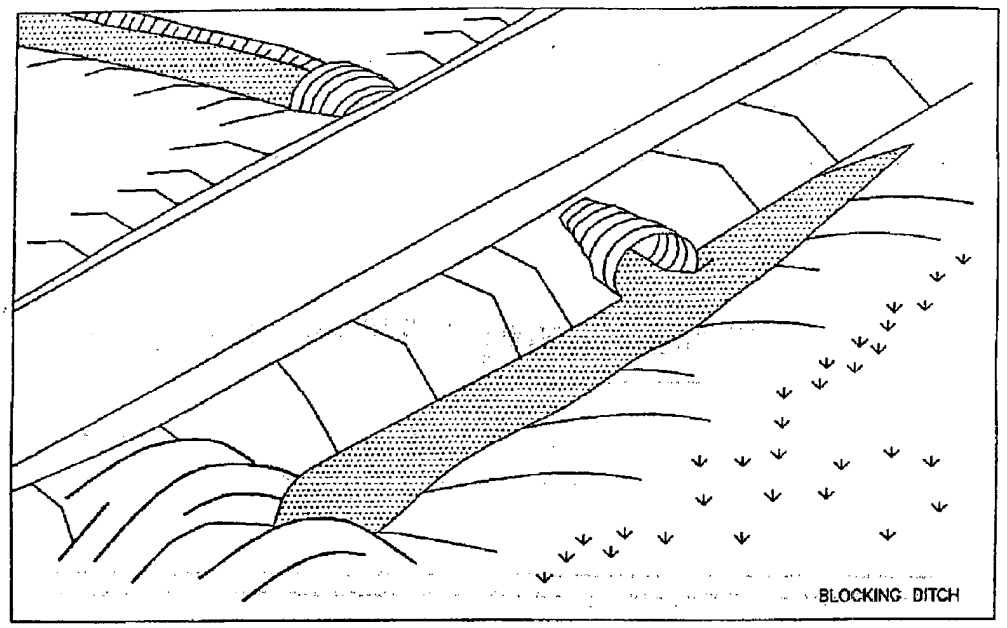


FIGURE A1-24
DAMMING FLOW AT BORROW DITCH

Figure A1-25 Storm Drain Blocking Techniques

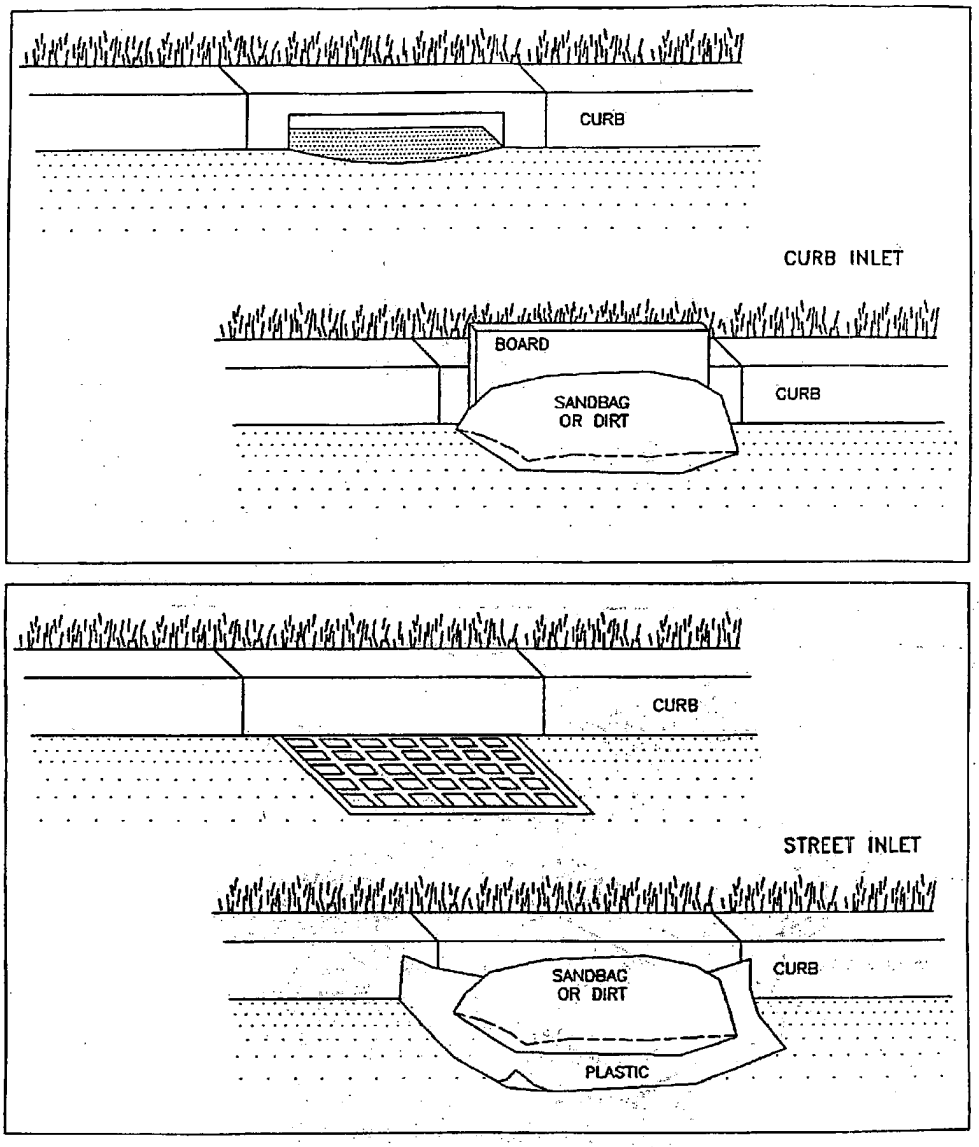


FIGURE A1–25
STORM DRAIN BLOCKING TECHNIQUES

Figure A1-26 Shoreline and Terrestrial Cleanup Procedures

Operation Pattern for a Motorized Elevating Scraper

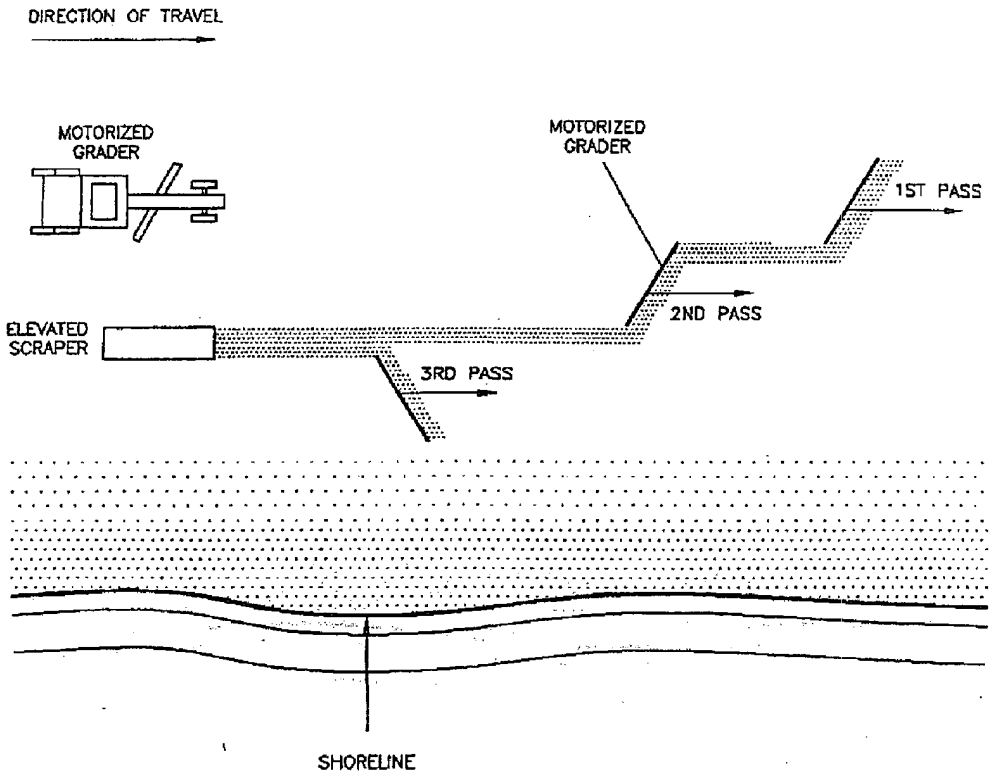


FIGURE A1-26

SHORELINE AND TERRESTRIAL CLEANUP PROCEDURES

OPERATION PATTERN FOR A MOTORIZED ELEVATING SCRAPER

Figure A1-27 Shoreline and Terrestrial Cleanup Procedures

Operation Pattern for a Motorized Elevating Scraper

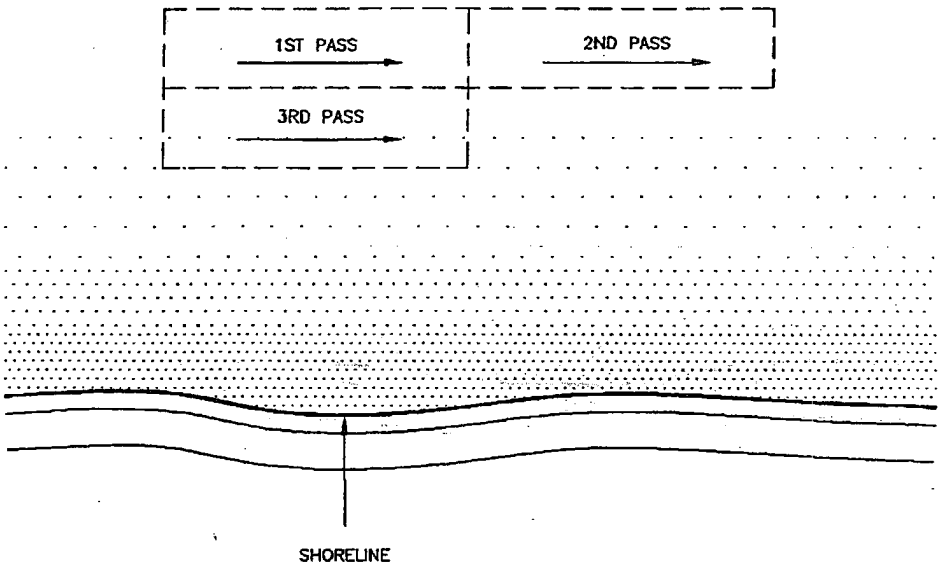


FIGURE A1–27

SHORELINE AND TERRESTRIAL CLEANUP PROCEDURES

OPERATION PATTERN FOR A MOTORIZED ELEVATING SCRAPER

Figure A1-28 Shoreline and Terrestrial Cleanup Procedures

Operational Sequence for a Front-end Loader

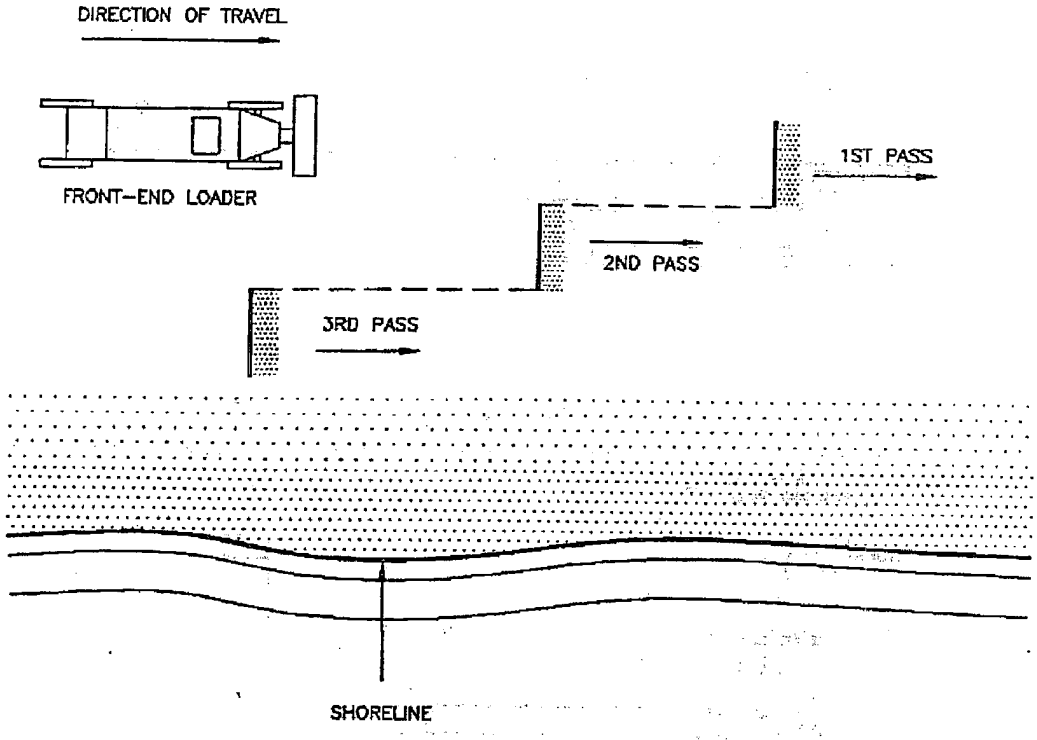


FIGURE A1–28

SHORELINE AND TERRESTRIAL CLEANUP PROCEDURES

OPERATIONAL SEQUENCE FOR A FRONT–END LOADER

Figure A1-29 Illustration of Unloading Ramp and Conveyor System

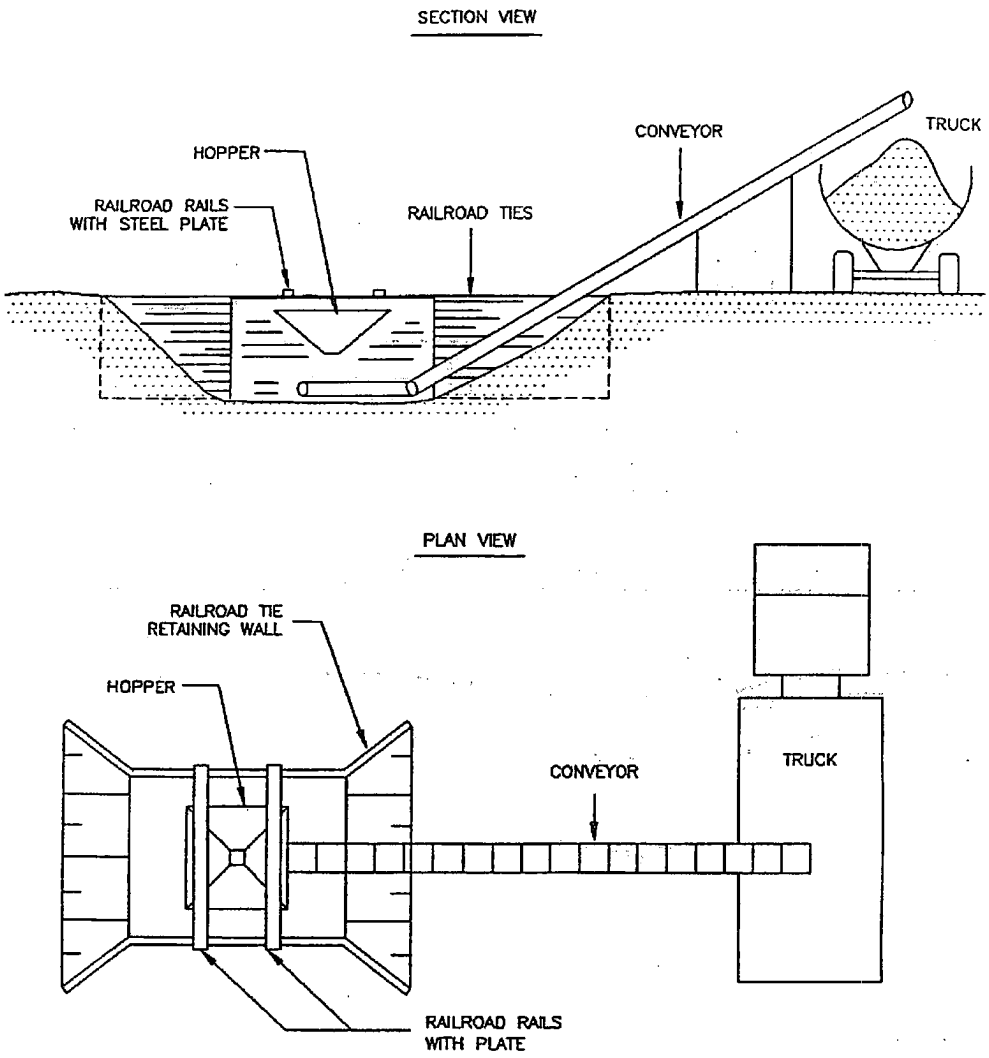


FIGURE A1-29

ILLUSTRATION OF
UNLOADING RAMP
AND CONVEYOR SYSTEM

Figure A1-30 Shoreline and Terrestrial Cleanup Procedures

Discing-In Operation for Light Oil Deposits, Stains or Final Cleanup

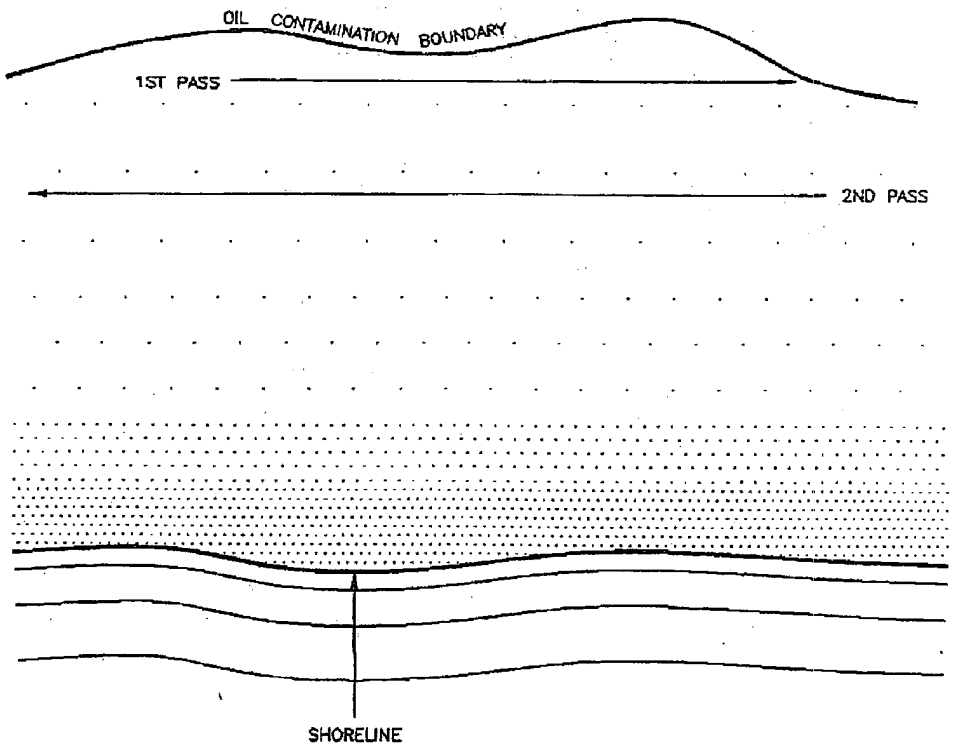


FIGURE A1-30

SHORELINE AND TERRESTRIAL CLEANUP PROCEDURES

DISCING-IN OPERATION FOR LIGHT OIL DEPOSITS, STAINS, OR FINAL CLEANUP

Figure A1-31 Typical Beach Flooding System

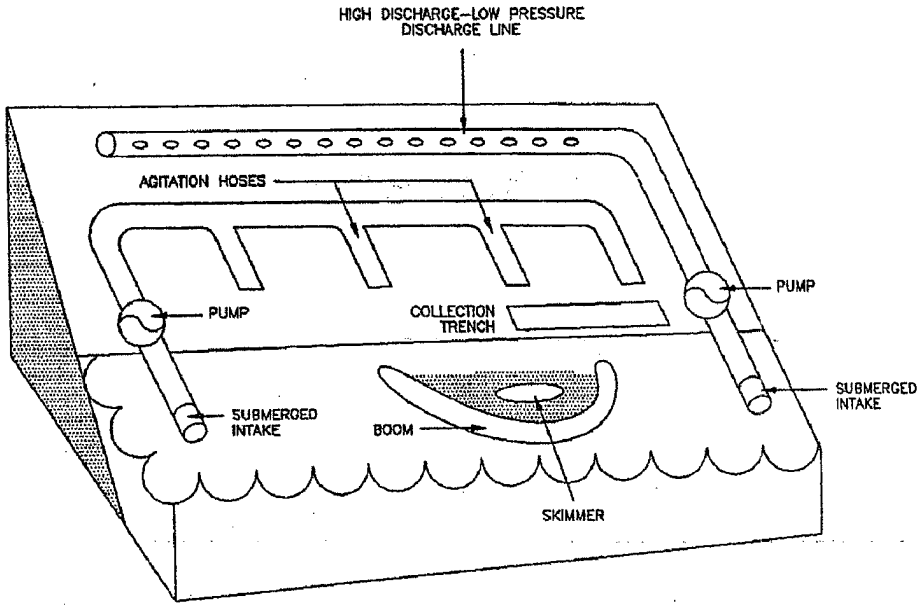


FIGURE A1–31
TYPICAL BEACH FLOODING SYSTEM

and MW-8. The LPH thickness ranged from 0.35 feet in MW-6 to 6.08 feet in MW-5. LPH is present in MW-1 but the thickness was not measured because the PetroXtractor product recovery system is deployed in the well. On October 20, 1999, LPH was detected in wells MW-1, MW-4, MW-5, MW-6, MW-7, and MW-8. The LPH thickness ranged from 0.85 feet in MW-4 to 14.88 feet in MW-1. On January 12, 2000, and February 29, 2000, LPH was detected in wells MW-1, MW-4 through MW-8 and SVE-2. The LPH thickness ranged from 2.95 feet in MW-4 to 6.65 feet in MW-5. The LPH thickness in MW-1 was not measured because of the deployment of the product recovery system.

1.5 Summary of Geology and Hydrogeology

1.5.1 Regional Setting

The regional geology surrounding the site is alluvium (unconsolidated) overlaying the Ogalalla Formation. The Ogalalla is also known as the High Plains aquifer which extends north to south from South Dakota to New Mexico and Texas. The Ogalalla was formed during the formation of the Rocky Mountains (Larimide orogeny - late Cretaceous to end of Paleocene). The Ogalalla Formation primarily consists of outwash alluvium deposited by the streams draining the newly formed Rocky Mountains. Caliche deposits are encountered in those areas considered under semiarid to arid conditions. The caliche was (and continues to be) formed as a result of the vertical movement of water through the unconsolidated alluvium from rainfall recharge (downward) and evaporation (upward). The calcium carbonate and/or calcium sulfate forms out of solution and creates a cementation effect. The origin of the calcarious material is either eolian (wind blown dust) or eroded limestone within the alluvium of the Ogalalla.

The hydrogeology of the Ogalalla aquifer can vary tremendously on a relatively small scale due to the wide grain-size distribution of the alluvial sediments. The regional water table slopes from west to east. The saturated thickness of the Ogalalla ranges from 0 feet to the west to upwards of 1,000 feet to the east. In the area of Hobbs, New Mexico, the saturated thickness may be 10 to 150 feet. Depth to groundwater is shallower to the west and gradually gets deeper to the east. Aquifer recharge is primarily rainfall; aquifer discharge is a combination of streams or springs and evapotranspiration.

1.5.2 Local Setting

Based on information obtained from the soil borings and the drilling of monitoring wells, the site specific geology consists primarily of caliche mixed with sands and some gravel. The caliche was encountered from ground surface to approximately 20 feet below ground surface. The sands and gravels were encountered below the caliche to total depth. A limestone layer was encountered approximately 20 to 24 feet below ground surface is borings located east of the excavation. The monitoring wells were surveyed for locations and elevations by a New Mexico licensed surveyor. The survey provides data which is used to create the groundwater potentiometric surface map.

Groundwater was encountered in the monitoring wells at approximately 27 feet below ground surface. In

January 2000, crude oil was detected in wells MW-1, MW-5, MW-6, MW-7, MW-8 and SVE-2. The groundwater elevation and LPH thickness data for January 12, 2000 is in Appendix A. Figure 2 (Appendix B) depicts the groundwater potentiometric surface map for the January 12, 2000 data. The current groundwater flow direction and gradient is to the southeast. The groundwater gradient is approximately 0.004 ft/ft. Based on the rising head permeability test data from wells MW-2 and MW-9, the site specific hydraulic conductivity ranges from 5.9×10^{-3} cm/sec to 3.5×10^{-4} cm/sec. Based on an estimated porosity of 30%, average hydraulic conductivity of 3.1×10^{-3} cm/sec, and a gradient of 0.004 ft/ft, the average linear groundwater velocity is approximately 42 feet per year.

5.0 Site Maintenance Activities

5.1 Biovent System Monitoring

Volatile organic compound emissions will be monitored using a PID at system activation. Air flow rates will be measured and used to calculate the mass of total hydrocarbons recovered and emitted. Once the biovent system is in place, monitoring will occur daily for one week and monthly thereafter. Oxygen, carbon dioxide, carbon monoxide, and nitrous oxide will also be monitored. The data gathered from the air monitoring will help track the progress of the biovent system. The progress of the biovent system will be included in the quarterly updates.

5.2 Groundwater Pumping/Product Skimming Monitoring

During each site visit, the groundwater pumping and product skimming system will be checked for proper operation. The groundwater from the treatment system will be sampled according to any discharge permit requirements. Point of compliance wells are proposed to be installed just down gradient of the groundwater injection wells. These wells are proposed to be sampled on a quarterly basis for BTEX and TPH to help monitor the effectiveness and integrity of the pumping system.

5.3 Equipment Maintenance

The remediation system will be monitored and maintained on a monthly schedule or on an as needed basis. This will ensure that the system is operating as designed. Checking control panel operation, fail safe alarms, and equipment cleaning will be an integral part of the routine maintenance. Emergency contact list with phone numbers will be posted outside of the equipment compound.

5.4 Closure Plan

The system will be operated until the criteria for closure are achieved or until dissolved hydrocarbon concentrations in the groundwater and/or the effluent from the soil vapor extraction system reach asymptotic concentrations. At this point in the project, a petition for system shut down will be prepared and submitted to the OCD for approval. This petition will contain system performance data and hydrocarbon removal results, and will outline the closure monitoring plan.

Confirmatory soil borings will be completed within the historical plume to track the remedial progress. The soil samples collected will be analyzed for BTEX and TPH.

The anticipated closure monitoring program will include collecting groundwater samples quarterly from the monitoring wells, for a total of four quarters. The groundwater samples will be analyzed for concentrations of BTEX and TPH. If the concentrations of dissolved BTEX exceed New Mexico Water Quality Standards in any compliance well, recommendations will be prepared. The proposed

compliance wells are MW-2, MW-9, MW-10, and MW-12.

When closure monitoring has been successfully completed, the closure monitoring data will be submitted to OCD and a request for official closure will be made. At this time the remediation equipment will be dismantled and the site wells will be properly abandoned.

GW0349

NEW MEXICO ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT

GARY E. JOHNSON
Governor
Betty Rivera
Cabinet Secretary

Lori Wrotenbery
Director
Oil Conservation Division

October 10, 2002

CERTIFIED MAIL
RETURN RECEIPT NO: 7001-1940-0004-7923-0537

Mr. Anthony C. Walker
Phillips Pipe Line Company
3B11 Adams Bldg.
Bartlesville, Oklahoma 74004

RE: DISCHARGE PERMIT GW-349
LINE NM-1-1 REMEDIATION SITE
HOBBS, NEW MEXICO

Dear Mr. Walker:

The New Mexico Oil Conservation Division (OCD) has completed a review of the following Phillips Pipe Line Company (PPL) documents regarding the treatment and re-injection of contaminated ground water as part of PPL's Stage 2 Abatement Plan Proposal for remediation of soil and ground water contamination related to a crude oil pipeline spill at PPL's Line NM-1-1 leak site in Unit N, Section 9, Township 19 South, Range 38 East, NMPM, Lea County, New Mexico:

- July 17, 2002 "PHILLIPS PIPE LINE COMPANY, NM-1 RELEASE SITE, HOBBS, NM".
- April 23, 2002 Discharge Plan Application
- April 9, 2002 "DISCHARGE PLAN FOR REMEDIATION SYSTEM, PHILLIPS PIPELINE COMPANY, NM-1 RELEASE SITE, HOBBS, NEW MEXICO"

Ground water discharge permit GW-349 for the PPL's Line NM-1-1 Release Site is hereby approved under the conditions contained in the enclosed attachment. Enclosed are two copies of the conditions of approval. **Please sign and return one copy to the New Mexico Oil Conservation Division (OCD) Santa Fe office within thirty (30) days of receipt of this letter.**

The discharge permit is approved pursuant to Section 3109.C. Note Section 3109.G, which provides for possible future amendment of the plan. Be advised that approval of this permit does not relieve PPL of responsibility should operations result in pollution of surface water, ground water or the environment. Nor does it relieve PPL of its responsibility to comply with any other governmental authority's rules and regulations.

Also be advised that all exposed pits, including lined pits and open tanks (exceeding 16 feet in diameter) shall be screened, netted or otherwise rendered nonhazardous to wildlife including migratory birds.

Section 3104 of the regulations provides: "When a plan has been approved, discharges must be consistent with the terms and conditions of the plan." Pursuant to Section 3107.C, PPL is required to notify the Director of any facility expansion, production increase or process modification that would result in any change in the discharge of water quality or volume.

Pursuant to Section 3109.H.4, this permit is for a period of five years. This permit will expire on October 10, 2007, and PPL should submit an application in ample time before this date. Section 3106.F of the regulations states that if a discharger submits a discharge permit renewal application at least 120 days before the discharge permit expires and is in compliance with the approved permit, then the existing discharge permit will not expire until the application for renewal has been approved or disapproved.

The discharge permit renewal application for the PPL Line NM-1-1 Release Site is subject to WQCC Regulation 3114. Every facility submitting a discharge plan application is assessed a filing fee of $100.00. There is also a flat fee assessed for abatement of ground water and vadose zone contamination at oil and gas sites of $2,600.00. These fees are due upon receipt of this permit.

On behalf of the staff of the OCD, I wish to thank you and your staff for your cooperation during this discharge plan review.

Sincerely,

Roger C. Anderson
Chief, Environmental Bureau
Oil Conservation Division

RCA/wco

Attachment

xc: Chris Williams, OCD Hobbs District Office
Chris Higgins, Higgins and Associates

ATTACHMENT TO THE DISCHARGE PLAN RENEWAL GW-349
PHILLIPS PETROLEUM COMPANY
LINE NM-1-1 RELEASE SITE
DISCHARGE PLAN APPROVAL CONDITIONS
October 10, 2002

1. Payment of Discharge Plan Fees: The $100.00 filing fee and the $2,600.00 flat fee have not been received by the OCD. Please remit these fees upon receipt of this permit approval. Please make all checks payable to:

   Water Quality Management Fund
   c/o New Mexico Oil Conservation Division
   1220 South St. Francis Dr.
   Santa Fe, New Mexico 87505

2. Commitments: PPL will abide by all commitments submitted in the discharge plan application documents dated July 17, 2002, April 23, 2002, April 9, 2002 and these conditions for approval.

3. Waste Disposal: All wastes will be disposed of at an OCD approved facility. Only oilfield exempt wastes shall be disposed of down Class II injection wells. Non-exempt oilfield wastes that are non-hazardous may be disposed of at an OCD approved facility upon proper waste determination per 40 CFR Part 261. Any waste stream that is not listed in the discharge plan will be approved by OCD on a case-by-case basis. Rule 712 Waste: Pursuant to Rule 712, disposal of certain non-domestic waste is permitted at solid waste facilities permitted by the New Mexico Environment Department as long as:

   a. the waste stream is identified, and authorized, as such in the discharge plan, and;

   b. existing process knowledge of such waste streams does not change without notification to the Oil Conservation Division.

4. Drum Storage: All drums containing material other than fresh water must be stored on an impermeable pad with curbing. All empty drums will be stored on their sides with the bungs in and lined up on a horizontal plane. Chemicals in other containers such as sacks or buckets will also be stored on an impermeable pad and curb type containment.

5. Process Areas: All process and maintenance areas which show evidence that leaks and spills are reaching the ground surface must be either paved and curbed or have some type of spill collection device incorporated into the design.

6. Above Ground Tanks: All above ground tanks which contain fluids other than fresh water shall be bermed to contain a volume of one-third more than the total volume of the largest tank or of all interconnected tanks. New or existing tanks that undergo major modifications, as determined by the Division, must be placed within an impermeable bermed enclosure.

7. Above Ground Saddle Tanks: Above ground saddle tanks must have impermeable pad and curb type containment unless they contain fresh water or fluids that are gases at atmospheric temperature and pressure.

8. Labeling: All tanks, drums and containers will be clearly labeled to identify their contents and other emergency notification information.

9. Below Grade Tanks/Sumps: All below grade tanks, sumps, and pits must be approved by the OCD prior to installation or upon modification and must incorporate secondary containment and leak-detection into the design. All below grade tanks and sumps must be tested annually. Results of such tests shall be maintained at the facility covered by this discharge plan and available for OCD inspection. Permit holders may propose various methods for testing such as pressure testing to 3 pounds per square inch above normal operating pressure and/or visual inspection of cleaned out tanks and/or sumps, or other OCD approved methods. The OCD will be notified at least 72 hours prior to all testing.

10. Underground Process/Wastewater Lines: All underground process/wastewater pipelines shall tested to demonstrate their mechanical integrity prior to operation and every five (5) years thereafter. Results of such tests shall be maintained at the facility covered by this discharge plan and available for OCD inspection. Permit holders may propose various methods for testing such as pressure testing to 3 pounds per square inch above normal operating pressure or other means acceptable to the OCD. The OCD will be notified at least 72 hours prior to all testing.

11. Housekeeping: All systems designed for spill collection/prevention will be inspected weekly and after each storm event to ensure proper operation and to prevent overtopping or system failure. A record of inspections will be retained on site for a period of five years.

12. Spill Reporting: All effluent discharges that are greater than New Mexico Water Quality Control Commission (WQCC) standards, and all spills and releases shall be reported pursuant to OCD Rule 116 and WQCC 1203.

13. Treatment System Monitoring: Effluent from the ground water treatment system will be sampled and analyzed for concentrations of benzene, toluene, ethylbenzene and xylene (BTEX) and chloride on a weekly basis for one month, and thenceforth on a monthly basis using EPA approved methods and quality assurance/quality control (QA/QC).

14. Ground Water Monitoring: Ground water from all site monitor wells which do not contain free phase products will be sampled and analyzed according to the previously approved Abatement Plan (AP-10) for the site.

15. Reporting: PPL shall file an annual report on the remediation and monitoring system. The report shall be submitted to the OCD Santa Fe Office by April 1 of each year with a copy provided to the OCD Hobbs District Office. The report shall contain:

a. A description of all remediation and monitoring activities which have occurred during the last calendar year.

b. A geologic/lithologic log and well completion diagram for any injection well and monitor well installed during the last calendar year.

c. A quarterly water table potentiometric map showing the location of the spill areas, monitor wells, injection wells and any other pertinent site features as well as the direction and magnitude of the hydraulic gradient.

d. A quarterly product thickness map created using the measured free product thickness observed in each ground water monitoring well.

e. Isopleth maps for contaminants of concern which were observed during the investigations.

f. Summary tables of all past and present effluent and ground water quality sampling results including copies of all recent laboratory analytical data sheets and associated QA/QC data.

g. The monthly volume of product and water recovered from each recovery well and the total volume of product and water recovered to date.

h. The monthly volume of effluent injected in each injection well and the total volume injected in each well to date.

i. The disposition of all wastes generated.

16. Transfer of Discharge Plan: The OCD will be notified prior to any transfer of ownership, control, or possession of a facility with an approved discharge plan. A written commitment to comply with the terms and conditions of the previously approved discharge plan must be submitted by the purchaser and approved by the OCD prior to transfer.

17. Storm Water Plan: PPL shall maintain storm water runoff controls. As a result of operations, if any water contaminant that exceeds the WQCC standards listed in 20 NMAC 6.2.3101 is discharged in any storm water run-off, then PPL shall take immediate actions to mitigate the effects of the run-off, notify the OCD within 24 hours, and modify the discharge plan to include a formal storm water run-off containment plan and submit for OCD approval within 15 days.

18. Closure: The OCD will be notified when operations are discontinued for a period in excess of six months. Prior to closure of the facility, the company will submit a closure plan for approval. Closure and waste disposal will be in accordance with the statutes, rules and regulations in effect at the time of closure.

9. Conditions accepted by: Phillips Pipe Line Company, by the officer whose signature appears below, accepts this permit and agrees to comply with all terms and conditions contained herein. Phillips Pipe Line Company further acknowledges that the Division for good cause shown as necessary to protect fresh water, human health and the environment may change the conditions and requirements of this permit administratively.

Phillips Pipe Line Company

Print Name: Carol Bland

Signature: Carol Bland

Title: Site Manager, Risk Management and Remediation

Date: 01/17/07

Higgins and Associates, LLC

RECEIVED
JUL 26 2002
ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

July 17, 2002

Mr. Bill Olsen
State of New Mexico
Oil Conservation Division
1220 South St. Francis Dr.
Sante Fe, NM 87505

Re: Phillips Pipe Line Company, NM-1 Release Site, Hobbs, NM

Dear Mr. Olsen

As part of a Discharge Plan application, plans and specifications describing the remediation system to address a crude oil release relating to the above referenced facility were submitted to your office. These documents showed the numbers, sizes, locations and other characteristics of the components of the planned remediation system. The remediation plan is being implemented and the installation of the system wells and system piping has been completed. Some changes to the proposed system occurred subsequent to submittal of the Discharge Plan Application. This letter is intended to update you on these changes.

A copy of a revised Site Plan is attached to assist you in your review of the changes. Modifications from the proposed system include two fewer injection wells (IW-1 and IW-8 were not installed), relocation from the design spec's, of the free product recovery system to an isolated compound. Other minor changes include a larger equipment building and the utilization of alternative piping.

The change in the injection wells was necessary due to benzene concentrations being detected in MW-13 during the third and forth quarter of 2001. The detection of hydrocarbons in this well resulted in the movement of IW-4 and IW-5 approximately 150 feet to the south of their proposed location. Extraction well EW-2 was also moved approximately 200 feet to the south to insure capture of the hydrocarbon plume. The changes in the extraction well and injection well locations negated the need for injection wells IW-1 and IW-8. The change in the design for the free product recovery system was based on the installation of a product recovery system at the site in 2001. Since an equipment compound for the product recovery system had been constructed with

8200 South Akron Street, Suite 120 ◦ Centennial, Colorado 80112
Phone 303-708-9846 ◦ Fax 303-708-9848

installation of that system, the product recovery system components for EW-1 and EW-2 will be connected to the existing system.

None of the changes made a material change on the effectiveness of the remediation system. This includes the elimination of the 2 injection wells. Computer models indicate that hydraulic control will be maintained without wells IW-1 and IW-8 (see attached letter from Baker Consultants, Inc.).

Electrical installation and equipment deployment is anticipated to occur in August with system start-up and operation shortly thereafter.

Should you have any questions about the changes or require any additional information, please feel free to contact me.

Sincerely,
Higgins and Associates, LLC

Chris Higgins
Principal

Cc: Mr. Tony Walker – Phillips Pipe Line Company

Baker Consultants, Inc.

Mr. Chris Higgins
Higgins & Associates, LLC
8200 S. Akron St, Suite 120
Englewood, CO 80112-3505

July 11, 2002

Subject: Summary of Ground Water Modeling Results for the PPL Hobbs NM-1-1 Site

Dear Chris:

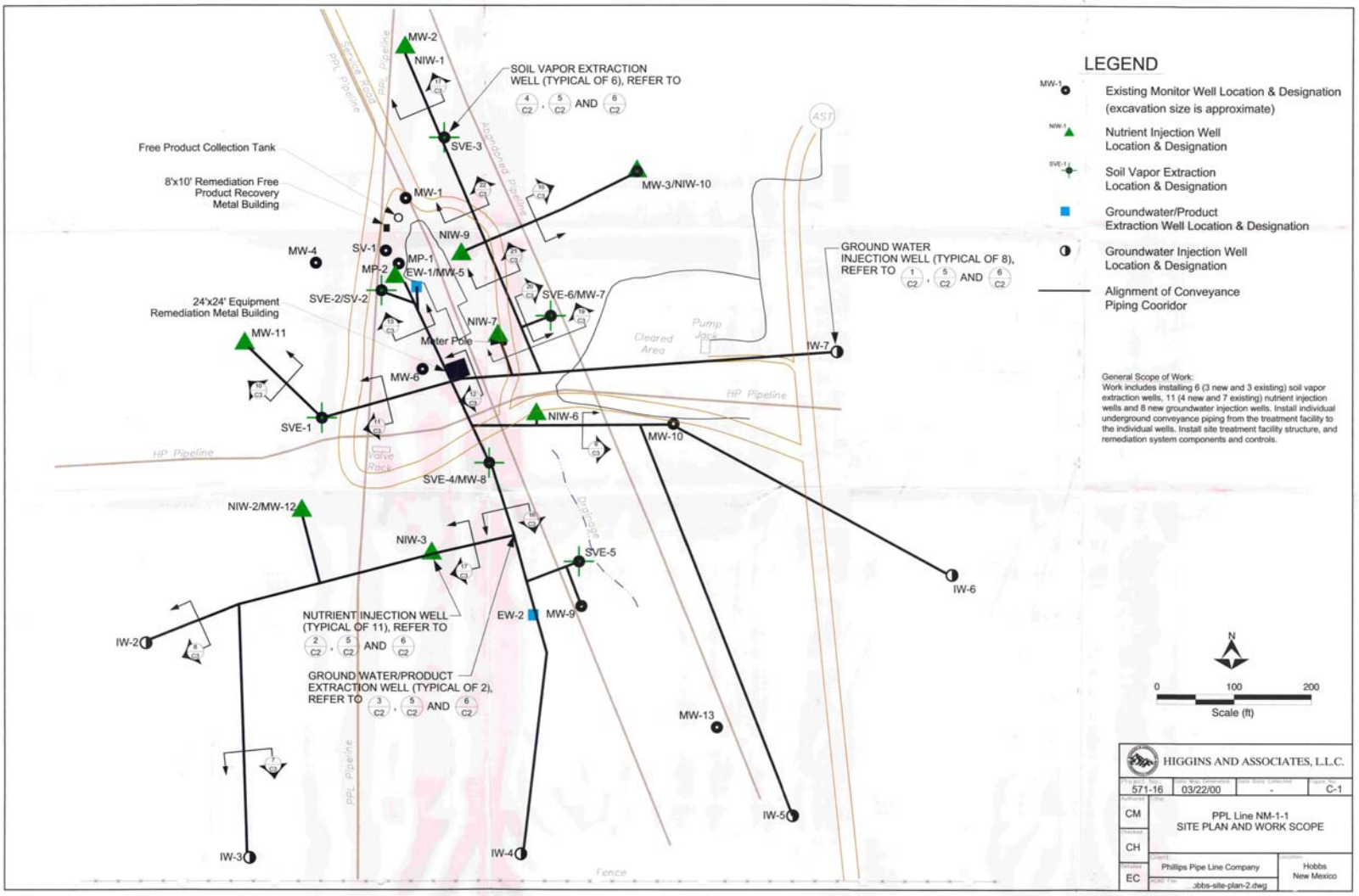
In late April and early May of this year Baker Consultants, Inc. (BCI) updated the numerical ground water flow model for the Hobbs, New Mexico NM-1-1 site as described in our letter to Higgins & Associates, LLC dated May 3, 2002. The model simulations evaluated the capture-effectiveness of the ground water containment system given contaminant distribution information available at that time. The results indicate that the ground water extraction, treatment and reinjection system will adequately contain the defined floating and dissolved organic compounds when it is operational.

Please let me know if there is any additional information that we can provide regarding this project.

Sincerely,

Fred G. Baker, PhD, PE
Consulting Hydrogeologist

2970 Howell Road • Golden, Colorado • 80401 • (303) 271-1111


MW-2
NIW-1
SOIL VAPOR EXTRACTION WELL (TYPICAL OF 6), REFER TO 4 C2, 5 C2 AND 6 C2
SVE-3
Free Product Collection Tank
8'x10' Remediation Free Product Recovery Metal Building
MW-1
MW-3/NIW-10
NIW-9
MW-4
SV-1
MP-1
MP-2
EW-1/MW-5
SVE-2/SV-2
SVE-6/MW-7
24'x24' Equipment Remediation Metal Building
NIW-7
Meter Pole
MW-11
MW-6
SVE-1
NIW-6
MW-10
SVE-4/MW-8
NIW-2/MW-12
NIW-3
SVE-5
IW-2
NUTRIENT INJECTION WELL (TYPICAL OF 11), REFER TO 2 C2, 5 C2 AND 6 C2
EW-2
MW-9
GROUND WATER/PRODUCT EXTRACTION WELL (TYPICAL OF 2), REFER TO 3 C2, 5 C2 AND 6 C2
MW-13
IW-5
IW-3
IW-4
GROUND WATER INJECTION WELL (TYPICAL OF 8), REFER TO 1 C2, 5 C2 AND 6 C2
IW-7
IW-6
AST
Pump Jack
Cleared Area
Valve Rack
Drainage
HP Pipeline
PPL Pipeline
Abandoned Pipeline
Fence
LEGEND
Existing Monitor Well Location & Designation (excavation size is approximate)
Nutrient Injection Well Location & Designation
Soil Vapor Extraction Location & Designation
Groundwater/Product Extraction Well Location & Designation
Groundwater Injection Well Location & Designation
Alignment of Conveyance Piping Cooridor
General Scope of Work:
Work includes installing 6 (3 new and 3 existing) soil vapor extraction wells, 11 (4 new and 7 existing) nutrient injection wells and 8 new groundwater injection wells. Install individual underground conveyance piping from the treatment facility to the individual wells. Install site treatment facility structure, and remediation system components and controls.
N
0
100
200
Scale (ft)
HIGGINS AND ASSOCIATES, L.L.C.
Project No. 571-16
Date 03/22/00
Figure No. C-1
Approved CM
Checked CH
Drafted EC
PPL Line NM-1-1
SITE PLAN AND WORK SCOPE
Client Phillips Pipe Line Company
Location Hobbs New Mexico
CAD File hobbs-site-plan-2.dwg

GW-349

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Revised January 24, 2001

Submit Original
Plus 1 Copy
to Santa Fe
1 Copy to Appropriate
District Office

DISCHARGE PLAN APPLICATION FOR SERVICE COMPANIES,GAS PLANTS, REFINERIES, COMPRESSOR, GEOTHERMAL FACILITES AND CRUDE OIL PUMP STATIONS

(Refer to the OCD Guidelines for assistance in completing the application)

☒ New ☐ Renewal ☐ Modification

1. Type: LOCAL WELLFIELD GATHERING PIPELINE
2. Operator: PHILLIPS PIPE LINE COMPANY

   Address: 3B 11 ADAMS BLDG BARTLESVILLE, OK 74004

   Contact Person: MR. ANTHONY WALKER Phone: _____

3. Location: SW /4 SW /4 Section 9 Township 19 S Range 38 E

   Submit large scale topographic map showing exact location.

4. Attach the name, telephone number and address of the landowner of the facility site.
5. Attach the description of the facility with a diagram indicating location of fences, pits, dikes and tanks on the facility.
6. Attach a description of all materials stored or used at the facility.
7. Attach a description of present sources of effluent and waste solids. Average quality and daily volume of waste water must be included.
8. Attach a description of current liquid and solid waste collection/treatment/disposal procedures.
9. Attach a description of proposed modifications to existing collection/treatment/disposal systems.
10. Attach a routine inspection and maintenance plan to ensure permit compliance.
11. Attach a contingency plan for reporting and clean-up of spills or releases.
12. Attach geological/hydrological information for the facility. Depth to and quality of ground water must be included.
13. Attach a facility closure plan, and other information as is necessary to demonstrate compliance with any other OCD rules, regulations and/or orders.

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MAY 01 2002
ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

14. CERTIFICATIONI hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

Name: ANTHONY C. WALKER Title: ENVIRONMENTAL REPRESENTATIVE

Signature: Anthony C Walker Date: 4/23/2002

Discharge Plan
for
Remediation System

Phillips Pipe Line Company
NM-1 Release Site
Hobbs, New Mexico

April 9, 2002

1. **Type of Operation:** Remediation system to address a release from a crude oil pipeline.

2. **Name of Operator:** Phillips Pipe Line Company
   3B11 Adams Bldg
   Bartlesville, OK 74004

3. **Location of the Discharge Plan Facility:** The subject site is located in Unit N, Section 9, Township 19 South, Range 38 East, NMPM, Lea County, NM.

4. **Landowners:** Will N. Terry
   Trust et. Al.
   P.O. Box 686
   Hobbs, NM 88241

5. **Facility Description:** The site is largely undeveloped arid land primarily used as grazing land for cattle. Two crude oil production wells are located near the pipeline release. Two gathering lines parallel each other at the release site. One line is a six-inch diameter line and the second line is an eight-inch diameter line. The lines are separated by approximately one foot and are installed three to four feet beneath the ground surface. The line leak was discovered by the detection of oil impacts on the ground surface. The amount of crude oil released is unknown. A set of project drawings of the proposed remediation system are attached as Figures G-1, C-1, C2, C3, M-1, M-2, E-1, and S-1.

6. **Material Stored/Used at the Facility**: Crude oil is gathered from local wells and is pumped to an above ground storage tank. The pipeline is buried in an area of open cattle grazing. Storage associated with the remediation system includes recovered liquid phase hydrocarbons (LPH) and other materials (Aqua Mag, Hydrogen Peroxide, and Nitrous Oxide) described in the following paragraphs.

7. **Sources and Quantities of Effluent and Waste Solids Generated at the Facility**: For a complete understanding of the waste characterized to date and potential waste and effluent, a summary is provided below.

   A. Information relevant to effluent and waste characterization: Approximately 1,500 cubic yards of soil were excavated from the release area. With permission of the New Mexico Oil Commission Department (NMOCD) and the Texas Railroad Commission (TRC), the

excavated soil was transported to Gaines County, Texas where it was used as road base material. All drill cuttings during well installation were spread out next to each well.

All well development and purge water from well sampling was containerized in 55-gallon drums.

The crude oil removed from MW-1 is stored in a 12-foot diameter, 140 barrel above ground storage tank. The tank is located adjacent to well MW-1 and is centered within an earthen berm designed to hold twice the capacity of the storage tank. Once the tank fills to capacity, the product will be pumped and hauled off to the Phillips Pipe Line - Gaines Pump Station.

The crude oil removed from the excavation pothole is transported by vacuum trucks and hauled off to the Phillips Pipe Line - Gaines Pump Station.

B. Information pertaining to characteristics of soil and groundwater:

See attached Table 1 Soil Analytical Results and Table 2 Groundwater Analytical Results for concentrations of hydrocarbons. Table 3 details the concentrations of inorganic parameters in groundwater.

In July 1999, total dissolved solids ranged from 510 mg/L to 1,000 mg/L. Chloride ranged from 28 mg/L to 190 mg/L. In October 1999, the chloride concentrations ranged from 110 mg/L to 180 mg/L. The NMWQCC chloride standard for groundwater with less than 10,000 mg/L TDS is 0.1 mg/L. However, background concentrations of chloride are elevated in arid regions associated with an unconfined aquifer in contact with caliche. No other analyte was detected above the NMWQCC standards for groundwater with a TDS of less than 10,000 mg/L.

See attached document entitled "Get to know your petroleum types" by Uhler, McCarthy, and Stout for a description of crude oil.

8. **Description of Current Liquid and Solid Waste Collection-Storage-Disposal Procedures:** Current activities are limited to free product recovery. Free product is recovered and stored in the previously discussed above ground storage tank. Construction of the proposed remediation system is anticipated to begin in late Spring 2002.

9. **Proposed Modifications:** The proposed groundwater pump and treat system will consist of two recovery wells. A product skimming system will be deployed in the same recovery wells. One recovery well will be located

adjacent to MW-5 near the excavation. The other recovery well will be placed between wells MW-8 and MW-9. The placement of recovery wells is based on the results of the groundwater modeling. Groundwater will be extracted from the two recovery wells utilizing submersible electric pumps at rates of approximately 25 gpm and 15 gpm, respectively. The pumping rates will be adjusted as necessary to provide hydraulic control of the hydrocarbon plume. The product skimmers will be deployed above the pumps and will provide water free recovery of the LPH. The intakes for the groundwater recovery pumps will be set below the LPH layer. The water level will be controlled with probes which will shut down the groundwater extraction pump if the product layer comes near the pump intake. Groundwater will be pumped through a manifolded system to the equipment compound, treated, and then injected into the aquifer through the proposed eight injection wells. The eight injection wells are located down and cross gradient of the hydrocarbon plume to act as a barrier preventing additional migration of the LPH and dissolved phase plume.

The LPH skimmers will pump the crude oil to an above ground storage tank located adjacent to the equipment compound. The groundwater will be pumped from the recovery wells through conveyance lines to an oil/water separator equipped with a stabilization tank. The oil/water separator will be a coalescing type separator with the following features; water influent diffuser and chamber, oil/water separator chamber with coalescing media, oil skimmer, solids accumulation chamber, clean water effluent chamber, oil reservoir, and separator cover with quick release latches. The separator will be sized to effectively treat 60 gpm of water. The oil/water separator with receiving tank will be equipped with level controls (high-high level switch, high level switch, and low level switch) to prevent an uncontrolled discharge from the tank. A transfer pump will route the processed water from the separator through a water filtration unit to remove suspended solids and to an air stripper water treatment system. The manufacture and model of the air stripper is currently being selected. The stripper will be sized to effectively treat an influent flow rate of 60 gpm containing 4,500 ug/L of benzene. The air stripper will be a low profile multiple tray stripper equipped with level control probes to prevent an uncontrolled discharge of process water from the stripper. The air supply blower for the air stripper will be equipped with a low flow switch which will shut down the groundwater pumping system incase of a low airflow condition. The effluent water from the air stripper will be routed through a filter to remove suspended solids and then will be routed through a secondary treatment system as a polish. The secondary treatment system is anticipated to consist of two 3,000 pound carbon vessels in series. The influent to the stripper, the effluent to the secondary treatment system, and the effluent of the secondary treatment system will be equipped with sampling ports.

The treated groundwater will be injected into the saturated zone through eight injection wells as discussed previously. The flow into each injection will be regulated with valves. The injection wells will be equipped with high liquid level sensors which will stop flow to the injection well incase of a high water level condition in the recovery well.

The groundwater treatment system will be equipped with a chemical injection system to reduce fouling and maintain the efficiency of the treatment system. Aqua Mag (Distributed by Kraft Enterprises, Telephone #505/835-2948) will be used to provide a sequestering, dispersing and buffering action within the process water and will be injected into the process flow stream using a peristaltic metering pump prior to the air stripper. AQUA MAG is an ortho-polyphosphate blend which is USEPA and USDA approved. Information concerning the chemical properties of AQUA MAG and benefits are attached.

Hydrogen peroxide may be used to minimize biofouling of the remediation system and injection wells. If necessary, the hydrogen peroxide will be injected into the process flow stream prior to the air stripper.

The water treatment system will be maintained as per the manufacture recommendations. The air stripper trays will be removed and cleaned periodically to maintain optimum efficiency. The secondary treatment system will also be maintained to insure optimum performance.

10. **Inspection, Maintenance and Reporting:** Groundwater samples will continue to be collected from all wells absent of product on a quarterly basis. The sampling and monitoring scope of work will be as follows:

- All wells will be gauged for depth to water, depth to product (if any), and total depth.
- Select wells absent of LPHs will be purged a minimum of three well volumes. Measurements of temperature, pH, and conductivity will be collected during well development to insure the water sampled is from the surrounding aquifer.
- Groundwater samples will be collected from select wells absent of LPHs. The groundwater samples will be analyzed to determine concentrations of BTEX and TPH by EPA Method 8021/8015 Modified and chloride.

Inspection and maintenance of equipment associated with the remediation program will also occur on a regularly scheduled basis. The proposed remediation system includes mechanical equipment that will need routine maintenance. All equipment will be maintained according to the

manufacturer's recommended practices. Monthly site/equipment inspections and the proposed telemetric notification system ensure permit compliance. Winterization and harsh conditions are anticipated in the design.

Discharge permit monitoring requirements include:
Flow: (Design basis is 40 gpm annual w/operational peak up to 60 gpm) monitored on a weekly basis via flow meter.

11. **Spill/Leak Prevention & Reporting Procedures (Contingency Plans):** The groundwater treatment system has been designed with numerous fail safes to prevent accidental discharges of untreated groundwater to the surface or subsurface. In the unlikely event that an accidental discharge of process water would occur, Phillips Pipe Line Company maintains a spill response program for the State of New Mexico. A copy of this plan is available upon request.

12. **Site Characteristics:** Regional Setting: The regional geology surrounding the site is alluvium (unconsolidated) overlaying the Ogalalla Formation. The Ogalalla is also known as the High Plains aquifer which extends north to south from South Dakota to New Mexico and Texas. The Ogalalla was formed during the formation of the Rocky Mountains (Larimide orogeny - late Cretaceous to end of Paleocene). The Ogalalla Formation primarily consists of outwash alluvium deposited by the streams draining the newly formed Rocky Mountains. Caliche deposits are encountered in those areas considered under semiarid to arid conditions. The caliche was (and continues to be) formed as a result of the vertical movement of water through the unconsolidated alluvium from rainfall recharge (downward) and evaporation (upward). The calcium carbonate and/or calcium sulfate forms out of solution and creates a cementation effect. The origin of the calcareous material is either eolian (wind blown dust) or eroded limestone within the alluvium of the Ogalalla.

The hydrogeology of the Ogalalla aquifer can vary tremendously on a relatively small scale due to the wide grain-size distribution of the alluvial sediments. The regional water table slopes from west to east. The saturated thickness of the Ogalalla ranges from 0 feet to the west to upwards of 1,000 feet to the east. In the area of Hobbs, New Mexico, the saturated thickness may be 10 to 150 feet. Depth to groundwater is shallower to the west and gradually gets deeper to the east. Aquifer recharge is primarily rainfall; aquifer discharge is a combination of streams or springs and evapotranspiration.

Local Setting: Based on information obtained from the soil borings and the drilling of monitoring wells, the site specific geology consists primarily of caliche mixed with sands and some gravel. The caliche was

encountered from ground surface to approximately 20 feet below ground surface. The sands and gravels were encountered below the caliche to total depth. A New Mexico licensed surveyor was contracted to establish locations and elevations of the monitoring wells.

There are no surface water bodies within 0.5 mile of the facility.

Groundwater was encountered in the monitoring wells at approximately 27 feet below ground surface. Attached is a Figure that illustrates the groundwater potentiometric surface for a recent monitoring event. The groundwater flow direction and gradient is to the southeast. The groundwater gradient is approximately 0.004 ft/ft.

Based on rising head permeability test data from wells MW-2 and MW-9, the site specific hydraulic conductivity ranges from 5.9×10^{-3} cm/sec to 3.5×10^{-4} cm/sec. Based on an estimated porosity of 30%, average hydraulic conductivity of 3.1×10^{-3} cm/sec, and a gradient of 0.004 ft/ft, the average linear groundwater velocity is approximately 42 feet per year.

A record search for area landownership and water wells within 1 mile of the site was performed. The attached Water Well Locations Map and associated data sheets show the results of a record search and water well locations. The wells listed are U.S.G.S. registered. There are seven U.S.G.S. registered wells within a one mile radius of the project site. These wells were installed in the 1940's and designated to be used for irrigation.

The site is located in an area where flood potential is very low. Major precipitation or run-off is not anticipated to impact the project. No flood protection measures are planned.

13. Other Compelling Information:

Quality Assurance Plan: Industry accepted standard operating practices will be followed for all field activities to insure the quality of the data obtained. These procedures are summarized as follows:

- Well development and purging activities for the monitoring wells will be conducted from the cleanest well (based on past data and field observations) to the most contaminated well to minimize potential cross contamination between wells.

- All reusable sampling equipment will be decontaminated utilizing an alconox wash and distilled water rinse prior to sampling activities and between each well or sampling point.

- Groundwater samples will be collected utilizing new disposable bailers. One duplicate sample will be collected during the sampling activities. In addition to the duplicate sample, one trip blank sample will be analyzed for the cooler containing the samples for BTEX analysis.

- The groundwater samples will be collected in the appropriate sample containers, labeled, sealed with custody seals, and placed on ice. The samples will be logged on a chain-of-custody form and submitted to the laboratory for analysis.

- New disposable gloves will be utilized for all sampling activities and will be discarded between samples.

The above sampling program will be effective in tracking the effectiveness of the remedial activities at the site. The monitoring plan will be modified as necessary to insure that the systems are operating as designed.

Modifications to the sampling program will be communicated to all appropriate parties prior to implementation.

Closure Plan: The remedial approach for the NM-1-1 release site consists of several different remedial technologies working in conjunction with each other. However, certain components of the system may operate longer than other components. The objective of the groundwater/product extraction system is to control migration of the hydrocarbon plume and for capture of the LPH. The duration for operation of the groundwater treatment system will be based on the continued remedial effectiveness of the system. When hydrocarbon concentrations in the groundwater have been reduced to levels which will be addressed by other remedial components operating at the site as outlined in the Stage 2 Abatement Plan, then groundwater pumping will be discontinued. Once all parameters for closure have been met as outlined in the abatement plan then the following closure plan will be implemented.

The system will be operated until the criteria for closure are achieved or until dissolved hydrocarbon concentrations in the groundwater and/or the effluent from the soil vapor extraction system reach asymptotic concentrations. At this point in the project, a petition for system shut down will be prepared and submitted to the OCD for approval. This petition will contain system performance data and hydrocarbon removal results, and will outline the closure monitoring plan.

Confirmatory soil borings will be completed within the historical plume to track the remedial progress. The soil samples collected will be analyzed for BTEX and TPH.

The anticipated closure monitoring program will include collecting groundwater samples quarterly from the monitoring wells, for a total of four quarters. The groundwater samples will be analyzed for concentrations of BTEX and TPH. If the concentrations of dissolved BTEX exceed New Mexico Water Quality Standards in any compliance well, recommendations will be prepared. The proposed compliance wells are MW-2, MW-9, MW-10, and MW-12.

When closure monitoring has been successfully completed, the closure monitoring data will be submitted to OCD and a request for official closure will be made. At this time the remediation equipment will be dismantled and the site wells will be properly abandoned.

Statement of Commitment: Phillips Pipe Line Company endorses a policy of regulatory compliance and intends to fully comply with NMOCD Rule 116 and WQCC Section 1203.

Remediation System Design Drawings

PPL Line NM-1-1 Site
Phillips Pipe Line Company
Hobbs, New Mexico

Site Location Map

Drawing Sheet Index	
Drawing Number	Description
G-1	SYMBOLS AND ABBREVIATIONS
C-1	SITE PLAN WITH SCOPE OF WORK
C-2	WELL COMPLETION DETAILS
C-3	PIPING TRENCH AND GENERAL DETAILS
M-1	PIPING AND INSTRUMENTATION DIAGRAM
M-2	TREATMENT FACILITY FLOOR PLAN
E-1	ELECTRICAL ONE-LINE DIAGRAM
S-1	EQUIPMENT AND MATERIAL SPECIFICATIONS

HIGGINS AND ASSOCIATES, L.L.C.

Project No.	Date Map Generated	Date Data Collected	Figure No.
	5/15/00		

Authored: CH	Title: PPL Line NM-1-1 TITLE SHEET
Checked: CJ	
Detailed: DG	Client: Phillips Pipe Line Company
	Location: Hobbs New Mexico
	ACAD File: TitleSheet.dwg

PRIMARY ELEMENT SYMBOLS - FLOW

- ORIFICE PLATE
- PITOT TUBE
- VENTURI OR FLOW TUBE
- FLOW SENSOR
- SIGHT FLOW INDICATOR
- FLUME
- WEIR
- TURBINE OR PROPELLOR OR DISK TYPE METER
- MAGNETIC FLOW METER

LINE SYMBOLS

- MAJOR FLOW LINE
- SECONDARY FLOW LINE
- CONNECTION TO PROCESS, MECHANICAL
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL NO WIRING OR TUBING
- SOFTWARE LINK
- FLEXIBLE HOSE
- LINE CONTINUATION
- TIE POINT
- SPECIFICATION BREAK XX = PIPING MATERIAL

MATERIAL IDENTIFICATION

BI	BLACK IRON PIPE
CPVC	CHLORINATED POLYVINYL CHLORIDE
CSP	CARBON STEEL PIPE
COP	COPPER
CMP	CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
GALV	GALVANIZED STEEL PIPE
GRC	GALVANIZED RIGGID CONDUIT
GW	GROUNDWATER
HDPE	HIGH DENSITY POLYETHYLENE
KT	KITEC
PE	POLYETHYLENE PIPE
PP	POLYPROPYLENE PIPE
PVC	POLYVINYL CHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER HOSE
SS	STAINLESS STEEL

LINE TYPE

AIR	AIR, ATMOSPHERIC PRESSURE
BW	BACKWASH
C	CAUSTIC
CA	COMPRESSED AIR
CGW	CONTAMINATED GROUNDWATER
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
FL	FIRE LINE
LD	LEAK DETECTION
NG	NATURAL GAS
NPW	NON-POTABLE WATER
P	PRODUCT
PW	POTABLE WATER
S	SANITARY SEWER
SCH	SCHEDULE
SL	SLUDGE
SP	SAMPLE PORT
SS/SW	STORM DRAIN
TF	TOTAL FLUIDS
TGW	TREATED GROUNDWATER
UGE	UNDERGROUND ELECTRICAL
V	VENT
VAP	VAPOR

INSTRUMENT IDENTIFICATION TABLE

MEASURED VARIABLE	CONTROLLERS				READOUT DEVICES		SWITCHES AND ALARM DEVICES			TRANSMITTERS				PRIMARY ELEMENTS
	RECORDING	INDICATING	BLIND	SELF-ACTUATED CONTROL VALVES	RECORDING	INDICATING	HIGH	LOW	COMB	RECORDING	INDICATING	BLIND		
ANALYSIS	ARC	AIC	AC		AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE
BURNER/COMBUSTION	BRC	BIC	BC		BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE
VOLTAGE	CRC	CIC	CC		CR	CI	CSH	CSL	CSHL	CRT	CIT	CT	CY	CE
FLOW RATE	FRC	FIC	FC	FCV FOV	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE
FLOW QUANTITY	FQRC	FQIC			FQR	FQI	FQSH	FQSL			FQIT	FQT	FQY	FQE
FLOW RATIO	FFRC	FFIC	FFC				FFSH	FFSL						FE
GROUNDWATER									GSHL					
HAND		HIC	HC						HSHL					
CURRENT	IRC	IIC			IR	I	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE
POWER	JRC	JIC			JR	J	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE
VMC OR SCHEDULE	KRC	KIC	KC	KCV	KR	KI	KSH	KSL	KSL	KRT	KIT	KT	KY	KE
LEVEL	LRC	LIC	LC	LCV	LR	LI	LSH	LSL	LSHL	LRT	LIT	LT	LY	LE
PRESSURE OR VACUUM	PRC	PIC	PC	PCV	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE
PRESSURE DIFFERENTIAL	PDRC	PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSL		PDRT	PDIT	PDT	PDY	PE
QUANTITY	QRC	QIC			QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE
RADIOACTIVITY	RRC	RIC	RC		RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE
SPEED/FREQUENCY	SRC	SIC	SC	SCV	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE
TEMPERATURE	TRC	TIC	TC	TCV	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE
TEMPERATURE DIFFERENTIAL	TDRC	TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSL		TDRT	TDIT	TDT	TDY	TE
MULTIVARIABLE					UR	UI							UY	
VIBRATION/MECHANICAL					VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE
WEIGHT OR FORCE	WRC	WIC	WC	WCV	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE
WEIGHT/FORCE DIFFERENTIAL	WDRC	WDIC	WDC	WDCV	WDR	WDI	WDSH	WDSL		WDRT	WDIT	WDT	WDY	WDE
GAUGE/STATE/PRESSURE		YIC	YC		YR	YI	YSH	YSL			YIT	YT	YY	YE
POSITION	ZRC	ZIC	ZC	ZCV	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE
GAUGING DEVICES	ZDRC	ZDIC	ZDC	ZDCV	ZDR	ZDI	ZDSH	ZDSL		ZDRT	ZDIT	ZDT	ZDY	ZDE

PROCESS PIPING IDENTIFICATION

4" - VAP - PVC

- 4" — PIPE DIAMETER
- VAP — MATERIAL BEING CONVEYED
- PVC — PIPE CONSTRUCTION MATERIAL

EQUIPMENT SYMBOLS

- SUBMERSIBLE PUMP (PS) PNEUMATIC DRIVEN
- BLOWER (B)
- CENTRIFUGAL PUMP (P)
- AIR COMPRESSOR (C)
- SUBMERSIBLE PUMP (PS) ELECTRIC DRIVEN
- STORAGE TANK (T)

VALVE AND PIPING SYMBOLS

- GATE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- PLUG VALVE
- 3-WAY VALVE
- NORMALLY OPEN
- NORMALLY CLOSED
- ANGLE VALVE
- RELIEF OR SAFETY VALVE
- DIAPHRAGM VALVE
- SELF-CONTAINED PRESSURE REGULATING VALVE W/RELIEF
- KNIFE GATE VALVE
- BACKFLOW PREVENTER
- ROTAMETER
- BASKET TYPE STRAINER
- VACUUM RELIEF VALVE
- CAPPED TEE
- Y-TYPE STRAINER
- DUPLEX STRAINER
- SLEEVE COUPLING (SC)
- FLOOR DRAIN
- EQUIPMENT DRAIN
- CLEANOUT (CO)
- REMOVABLE PLUG
- REMOVABLE CAP
- BLIND FLANGE
- EXHAUST TO ATMOSPHERE (INSIDE)
- EXHAUST TO ATMOSPHERE (OUTSIDE)
- REDUCER
- UNION
- QUICK DISCONNECT COUPLING
- CAMLOCK COUPLING
- GAUGE SEAL
- FILTER
- WATER HAMMER ARRESTOR

GENERAL ABBREVIATIONS

DO	DISSOLVED OXYGEN
FC	FAIL CLOSED
FQI	FLOW QUANTITY INDICATOR
FS	FLOW SENSOR
HOA	HAND-OFF-AUTOMATIC
I/I	CURRENT-TO-CURRENT
I/P	CURRENT-TO-PNEUMATIC
LEL	LOWER EXPLOSIVE LIMIT
LR	LOCAL-REMOTE
MCP	MAIN CONTROL PANEL
NEC	NATIONAL ELECTRIC CODE
OC	OPEN-CLOSE
OO	ON-OFF (MAINTAINED)
ORP	OXIDATION REDUCTION POTENTIAL
OWS	OIL/WATER SEPARATOR
SVE	SOIL VAPOR EXTRACTION

GENERAL INSTRUMENT SYMBOLS

ONE VARIABLE TWO VARIABLES

- LOCALLY MOUNTED
- MAIN PANEL MOUNTED
- REAR-OF-PANEL MOUNTED
- INTERLOCK
- PURGE
- SHARED DISPLAY, SHARED CONTROL LOCAL MOUNTED
- SHARED DISPLAY, SHARED CONTROL MAIN PANEL MOUNTED

VALVE OPERATOR SYMBOLS

- S — SOLENOID
- M — MOTOR, ELECTRIC
- DIAPHRAGM WITH POSITIONER
- DIAPHRAGM

HIGGINS AND ASSOCIATES, L.L.C.

Project No.:	Date Map Generated: 03/22/00	Date Data Collected: -	Figure No. G-1
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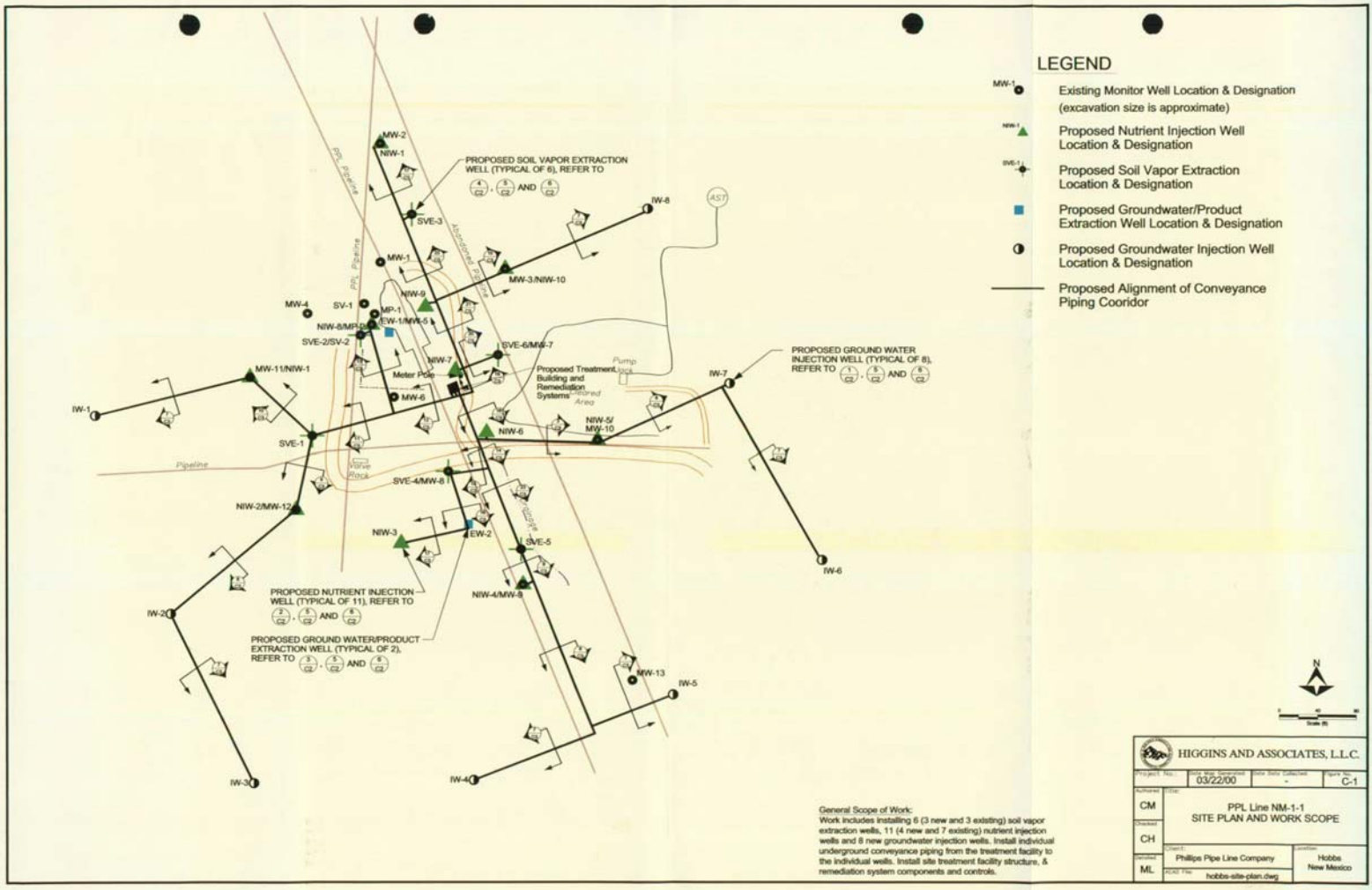
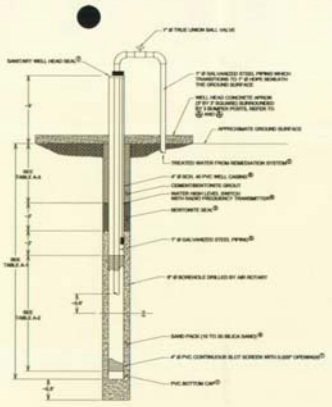
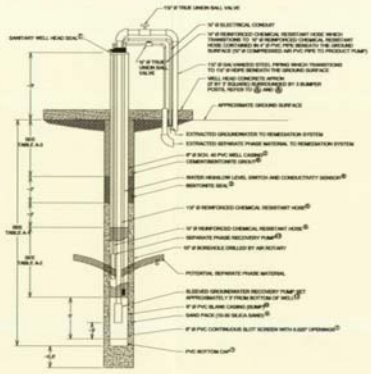


General Scope of Work:
Work includes installing 6 (3 new and 3 existing) soil vapor extraction wells, 11 (4 new and 7 existing) nutrient injection wells and 8 new groundwater injection wells. Install individual underground conveyance piping from the treatment facility to the individual wells. Install site treatment facility structure, & remediation system components and controls.



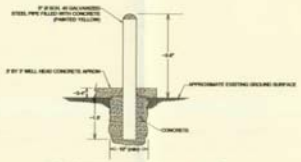
PROPOSED GROUNDWATER INJECTION WELL (TYP.) 1/C1
NOT TO SCALE



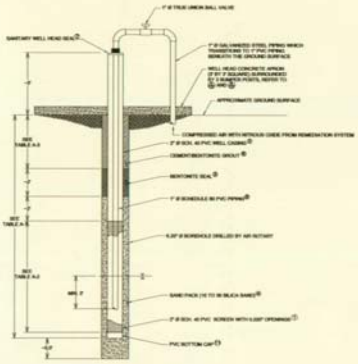
PROPOSED GROUNDWATER PRODUCT EXTRACTION WELL (TYP.) 3/C1
NOT TO SCALE

WELL PROTECTION BUMPER POSTS (TYP.) 5/C1
NOT TO SCALE

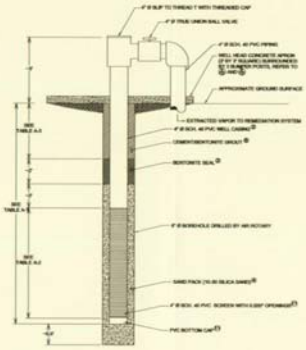
NOTE:
(•) EQUIPMENT AND MATERIAL SPECIFICATIONS PROVIDED ON DRAWING S1.



WELL PROTECTION BUMPER POSTS (TYP.) 5/C1
NOT TO SCALE



PROPOSED NUTRIENT INJECTION WELL (TYP.) 2/C1
NOT TO SCALE



PROPOSED SOIL VAPOR EXTRACTION WELL (TYP.) 4/C1
NOT TO SCALE

Table A
Anticipated Well Construction Data

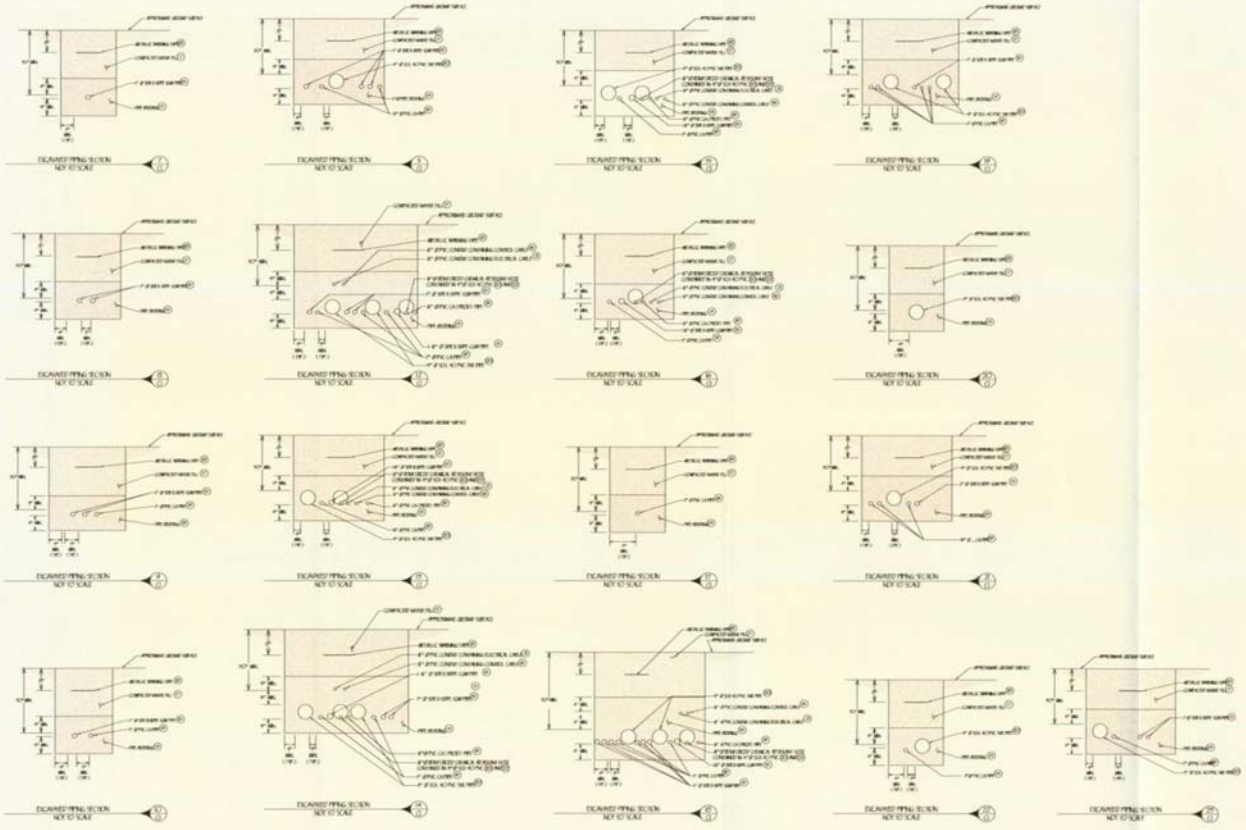
Well ID	Well Type	Well Diameter (Inches)	1 Casing TD (Feet BGS)	2 Screen Interval (Feet BGS)	3 Grout Interval (Feet BGS)
IW-1	GW Injection	4	40	15.5 to 39.5	0 to 15.5
IW-2	GW Injection	4	40	15.5 to 39.5	0 to 15.5
IW-3	GW Injection	4	40	15.5 to 39.5	0 to 15.5
IW-4	GW Injection	4	40	15.5 to 39.5	0 to 15.5
IW-5	GW Injection	4	40	15.5 to 39.5	0 to 15.5
IW-6	GW Injection	4	40	15.5 to 39.5	0 to 15.5
IW-7	GW Injection	4	40	15.5 to 39.5	0 to 15.5
IW-8	GW Injection	4	40	15.5 to 39.5	0 to 15.5
NSW-1&IW-11	Nut. Injection	2	39	19 to 39	0 to 14
NSW-2&IW-12	Nut. Injection	2	39	17 to 37	0 to 15
NSW-3	Nut. Injection	2	39	17.5 to 37.5	0 to 13.5
NSW-4&IW-9	Nut. Injection	2	40	20 to 40	0 to 16
NSW-5&IW-10	Nut. Injection	2	40	20 to 40	0 to 16
NSW-6	Nut. Injection	2	39	17.5 to 37.5	0 to 13.5
NSW-7	Nut. Injection	2	39	17.5 to 37.5	0 to 13.5
NSW-8&IP-2	Nut. Injection	2	39	19 to 39	0 to 4
NSW-9	Nut. Injection	2	39	17.5 to 37.5	0 to 13.5
NSW-10&IW-3	Nut. Injection	2	40	20 to 40	0 to 16
NSW-11&IW-2	Nut. Injection	2	40	20 to 40	0 to 16
EW-1&IW-1	GW/Prod. Ext.	4	37	17 to 37	0 to 13
EW-2	GW/Prod. Ext.	6	40	15.5 to 39.5	0 to 15.5
SVE-1	Soil Vapor Ext.	4	39	12.5 to 37.5	0 to 8.5
SVE-2/SV-2	Soil Vapor Ext.	4	39	19 to 39	0 to 6
SVE-3	Soil Vapor Ext.	4	39	12.5 to 37.5	0 to 8.5
SVE-4&NW-4	Soil Vapor Ext.	2	40	20 to 40	0 to 16
SVE-5	Soil Vapor Ext.	4	39	12.5 to 37.5	0 to 8.5
SVE-6&NW-7	Soil Vapor Ext.	2	40	20 to 40	0 to 16

Notes:
ID = Identification
BGS = below ground surface
Nut. = Nutrient
Ext. = Extraction
GW = Groundwater
Prod. = Product

HIGGINS AND ASSOCIATES, L.L.C.

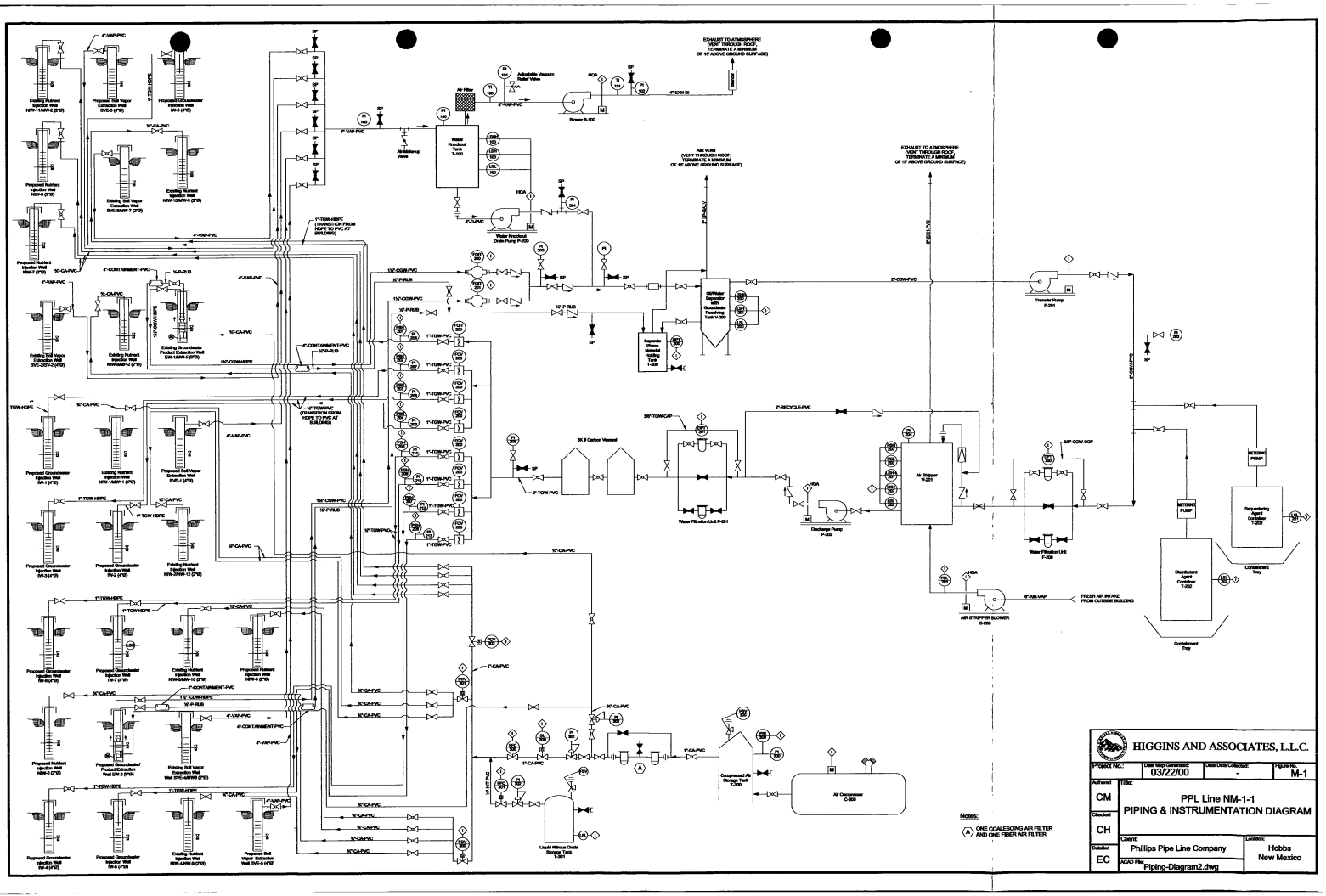
Project No.	Date Well Completed	Date Water Collected	Figure No.
	04/04/00		C-2

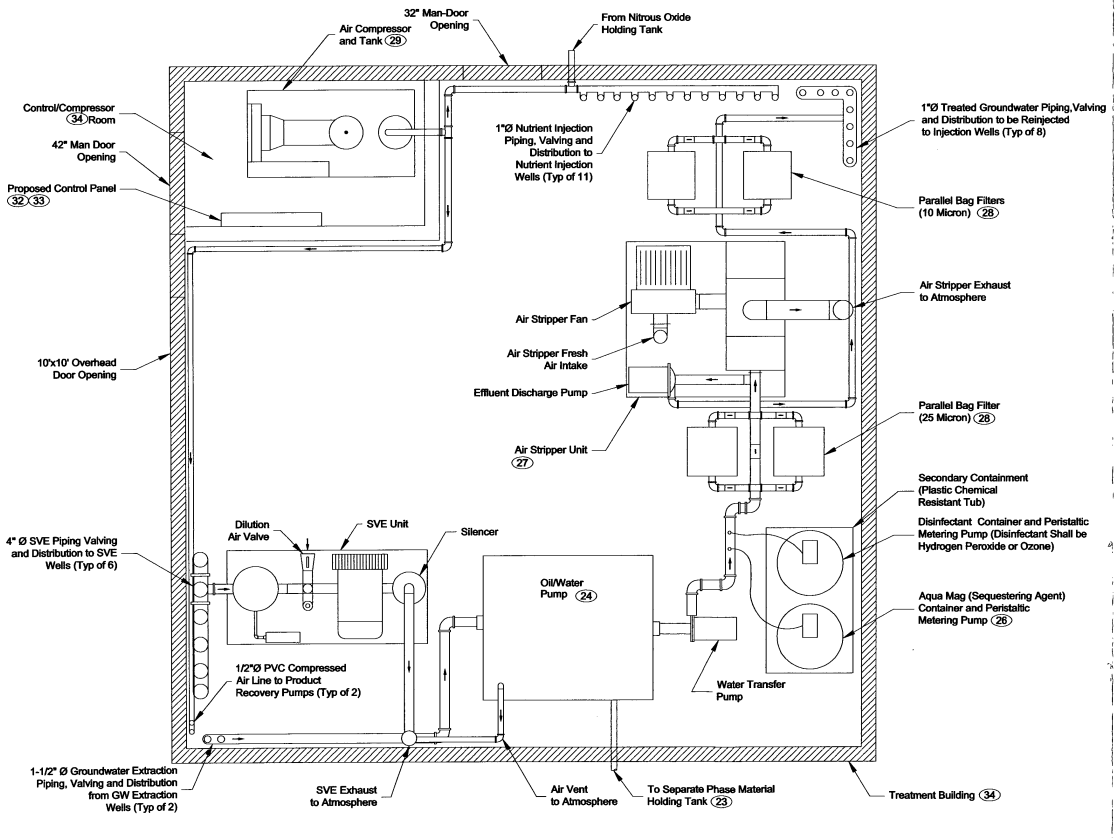
Authored	Title:
CM	PPL Line NM-1-1 WELL COMPLETION DETAILS
Checked	
CH	
Detailed	Client:
EC	Phillips Pipe Line Company
	Location: Hobbs New Mexico
	ACAD File: Hobbs-Schematic.dwg



HIGGINS AND ASSOCIATES, L.L.C.

Project No.	Date Map Generated: 04/04/00	Date Data Collected	Sheet No. C-3
Authored: CM	Title: PIPING TRENCH AND GENERAL DETAILS		
Checked: CH	Client: Phillips Pipe Line Company	Location: Hobbs New Mexico	
Calculated: EC	AutoCAD File: hobbs-schematic-2.dwg		


EXHAUST TO ATMOSPHERE (VENT THROUGH ROOF, TERMINATE A MINIMUM OF 10' ABOVE GROUND SURFACE)
AIR VENT (VENT THROUGH ROOF, TERMINATE A MINIMUM OF 10' ABOVE GROUND SURFACE)
EXHAUST TO ATMOSPHERE (VENT THROUGH ROOF, TERMINATE A MINIMUM OF 10' ABOVE GROUND SURFACE)
Existing Nutrient Injection Well NW-11MW-2 (2"/5')
Proposed Soil Vapor Extraction Well SVE-3 (4"/5')
Proposed Groundwater Injection Well IW-8 (4"/5')
Existing Nutrient Injection Well NW-10MW-3 (2"/5')
Existing Soil Vapor Extraction Well SVE-5MW-7 (2"/5')
Proposed Nutrient Injection Well NW-4 (2"/5')
Proposed Nutrient Injection Well NW-7 (2"/5')
Existing Soil Vapor Extraction Well SVE-3SW-2 (4"/5')
Existing Nutrient Injection Well NW-5MW-2 (2"/5')
Existing Groundwater Product Extraction Well EW-1MW-5 (6"/5')
Proposed Groundwater Injection Well IW-1 (4"/5')
Existing Nutrient Injection Well NW-1MW-1 (4"/5')
Proposed Soil Vapor Extraction Well SVE-1 (4"/5')
Proposed Groundwater Injection Well IW-3 (4"/5')
Proposed Groundwater Injection Well IW-2 (4"/5')
Existing Nutrient Injection Well NW-3MW-12 (2"/5')
Proposed Groundwater Injection Well IW-5 (4"/5')
Proposed Groundwater Injection Well IW-7 (4"/5')
Existing Nutrient Injection Well NW-5MW-10 (2"/5')
Proposed Nutrient Injection Well NW-9 (2"/5')
Proposed Nutrient Injection Well NW-2 (2"/5')
Proposed Groundwater Product Extraction Well EW-2 (6"/5')
Existing Soil Vapor Extraction Well SVE-4MW8 (2"/5')
Proposed Groundwater Injection Well IW-4 (4"/5')
Proposed Groundwater Injection Well IW-6 (4"/5')
Existing Nutrient Injection Well NW-4MW-9 (2"/5')
Proposed Soil Vapor Extraction Well SVE-6 (4"/5')
Adjustable Vacuum Relief Valve
Air Filter
Blower B-100
Air Make-up Valve
Water Knockout Tank T-100
Water Knockout Drain Pump P-200
Vacuum Enhanced Material Holding Tank T-300
Oil/Water Separator with Groundwater Recycling Tank V-300
Transfer Pump P-201
3K # Carbon Vessel
Water Filtration Unit F-201
Discharge Pump P-202
Air Stripper V-201
Water Filtration Unit F-200
Decontaminating Agent Container T-202
Containment Tray
Disinfectant Agent Container T-202
Containment Tray
AIR STRIPPER BLOWER B-200
FRESH AIR INTAKE FROM OUTSIDE BUILDING
Liquid Nitrous Oxide Storage Tank T-301
Compressed Air Storage Tank T-302
Air Compressor C-300
Notes:
(A) ONE COALESCING AIR FILTER AND ONE FIBER AIR FILTER
HIGGINS AND ASSOCIATES, L.L.C.
Project No.:
Date Map Generated: 03/22/00
Date Data Collected: -
Figure No. M-1
Authored: CM
Checked: CH
Detailed: EC
Title: PPL Line NM-1-1 PIPING & INSTRUMENTATION DIAGRAM
Client: Phillips Pipe Line Company
Location: Hobbs New Mexico
ACAD File: Piping-Diagram2.dwg



Note:
(#) Equipment and Materials Specification Provided on Drawing S1

N

0 1.5 3
Scale (ft)

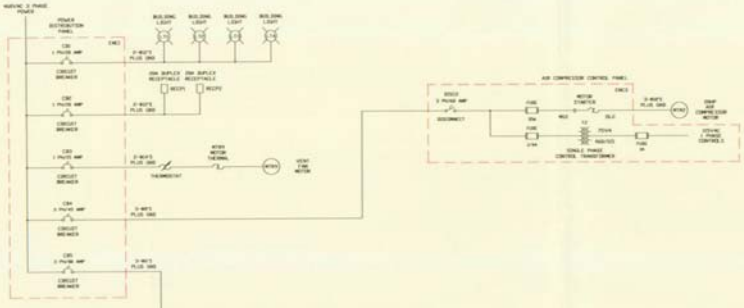
HIGGINS AND ASSOCIATES, L.L.C.

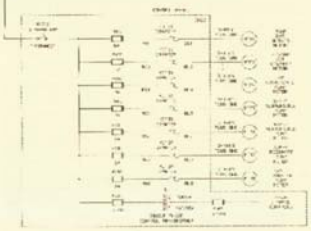
Project No.:	Date Map Generated: 5/8/00	Date Data Collected:	Figure No. M-2

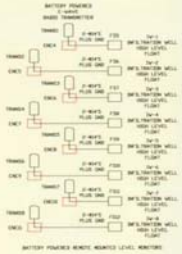
Authored: CH
Checked: CJ
Detailed: DG

Title: PPL Line NM-1-1
TREATMENT FACILITY FLOOR PLAN

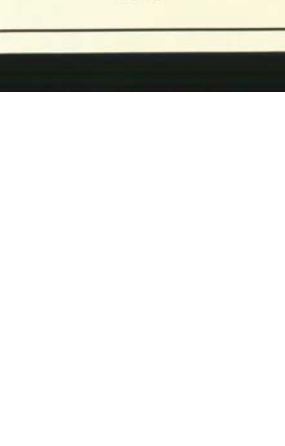
Client: Phillips Pipe Line Company
Location: Hobbs New Mexico
ACAD File: Treatment.dwg







EQUIPMENT SCHEDULE							
ITEM NUMBER	EQUIPMENT DESCRIPTION	MOTOR HP	VOLTS	PH	FLA	LOAD KW	LB AMPS
M1A1	EVE BLOWER MOTOR	30	460	3	40	58	
M1A2	AIR COMPRESSOR MOTOR	25	460	3	31	35	
M1A3	AIR STRIPPER BLOWER MOTOR	7-1/2	460	3	9.6	12	
M1A4	CONDENSATE PUMP	1	460	3	1.4	3	
M1A5	SUBMERSIBLE PUMP (EW-1)	3/4	460	3	1.6	3	
M1A6	SUBMERSIBLE PUMP (EW-2)	1/2	460	3	1.0	2	
M1A7	DISCHARGE PUMP	1/2	460	3	1.0	2	
M1A8	TRANSFER PUMP	1/2	460	3	1.0	2	
M1A9	VENT FAN MOTOR		115	1			15
T1	CONTROL TRANSFORMER	3000 VA	460	1	1.25	2 1/2	
T2	CONTROL TRANSFORMER	750 VA	460	1	1.63	3 1/4	



Prepared By:

EPG COMPANIES

HIGGINS AND ASSOCIATES, L.L.C.

Project No.:	Date Map Generated: 5/15/00	Date Data Collected:	Work No.: E-1

Authored: CH

Checked: CJ

Detailed: ML

Title:

PPL Line NM-1-1
ELECTRICAL ONE-LINE DIAGRAM

Client: Phillips Pipe Line Company

Location: Hobbs New Mexico

CAD File: one-line.dwg

1 Polyvinyl chloride (PVC) Well Sc[illegible]d Bottom Cap: Schedule 40 PVC, 0.02-inch continuous slot with American Sta[illegible]d Testing Materials (ASTM) F480 Schedule 40 flush thread fittings and Viton O-ring.

2 Well Casing: Schedule (SCH) 40 PVC, ASTM D1785, Class 12454B white, PVC Type 1, with ASTM F480 flush thread fittings with Buno-N O-ring. The threaded joint of the casing will be cut perpendicular and smooth at the wellhead, as appropriate.

3 Bentonite Seal: Wyoming bentonite chips or approved equal hydrated with drinking water following installing.

4 Sand Pack: Silica sand, manufactured by Colorado Silica sand or approved equal.

5 Galvanized Piping: Galvanized piping shall meet ANSI and ASTM standards and shall be pressure rated for a minimum of 150 PSI.

6 Cement/Bentonite Grout: Portland type II or API Class B cement with 3 to 5 percent bentonite by weight and/or conforming to State requirements.

7 Sanitary Wellhead Seal: Simmons Class 25 painted cast-iron expandable well seal (or approved equivalent) with Buno-N seal, having a vapor tight seal to casing and vapor tight openings for the drop pipe, control wiring, electrical cable, air line and product hose. The sanitary wellhead seal for the groundwater/product extraction wells shall be double hole and will have a zinc-plated steel eyebolt on the bottom for the product pump cable.

8 Well Level Switches:

Groundwater Injection Wells - High Level Switches: Wireless switch (complete with level probe, receiver and transmitter) that uses a radio frequency (i.e., E-Wave) type technology to send a signal to the treatment system in case of a high water level alarm in the groundwater injection well. The high level sensor and coded signal wires shall be constructed of a material (i.e., PVC) that is resistant to gasoline, oil and various chemicals and is waterproof. A minimum of 50-feet of coded signal wire will be provided with each sensor. The high level sensors shall be connected to individual transmitter enclosures mounted near the wellheads of each injection well. An E-Wave transmitter Model T1B which provides a signal range of up to one-mile or equivalent shall be provided. The transmitter will be battery operated with a minimum life expectancy of three years. An E-Wave receiver Model R2P shall be mounted by the main controller and located within line of sight of all transmitters. The receiver shall accept signals from all the transmitters to shut-off the discharge pump in an alarm condition.

Groundwater Extraction Wells - Conductivity (or Density) Probes: Conductivity probes with water high/low level probes will be designed to operate the groundwater extraction pumps. The conductivity level probes and signal wire shall be constructed of a material that is resistant to gasoline, oil and various chemicals and is waterproof. A minimum of 50-feet of color-coded chemical resistant signal wire will be provided with each sensor.

9 PVC Well Screen and Bottom Cap: Schedule (Sch.) 40 PVC, 0.02-inch slot, ASTM D1784 Class 12454B white PVC Type 1 with ASTM F480 flush thread fittings with Buno-N O-ring.

10 PVC Sump: Schedule 40 PVC casing with ASTM F480 Schedule 40 flush thread fittings and Viton O-ring.

11 Groundwater Recovery Pump and Safety Cable:

Groundwater Extraction Well EW-1/MW-5: Groundwater extraction pump shall be a SurePump (TSP5-4 supplied by EPG Companies Inc.) stainless steel submersible water pump capable of extracting a minimum of 25 gallons per minute at a minimum of feet of head of 60-feet or approved equivalent. The pump motor shall be a 0.75 Horse Power, 460 VAC, 3 wire, 3-phase pollution recovery motor, with 50-feet of chemical resistant jacketed CP motor lead, or approved equivalent. The seals will be constructed of Teflon. The submersible groundwater recovery pump shall be set at the selected depth with a 1½-inch reinforced chemical resistant hose secured through the wellhead sanitary seal.

Groundwater Extraction Well EW-2: Groundwater extraction pump shall be a SurePump (TSP3-4 supplied by EPG Companies Inc.) stainless steel submersible water pump capable of extracting a minimum of 15 gallons per minute at a minimum of feet of head of 70-feet or approved equivalent. The pump motor shall be a 0.5 HorsePower, 460 VAC, 3 wire, 3-phase pollution recovery motor, with 50-feet of chemical resistant jacketed CP motor lead, or approved equivalent. The seals will be constructed of Teflon. The submersible groundwater recovery pump shall be set at the selected depth with an 11/4-inch galvanized steel drop pipe secured through the wellhead sanitary seal.

12 Separate-Phase Recovery Pump and Safety Cable: The separate-phase recovery pump shall be a Durham Geo Flexible Axial Peristaltic (FAP) pump assembly with filter regulator (TR-516) with density skimmer suitable (TR-702) for the separate-phase material present (supplied by EPG Companies Inc.) or approved equivalent (i.e., Geotech/ORS Small Diameter Probe Scavenger Product recovery system deployed with a groundwater extraction pump system). The FAP Plus down-well controlled pump system shall be comprised of a FAP Plus pump, skimmer assembly, and filter/regulator assembly. The compressor will be sized to provide adequate compressed air for the pneumatic pumps and nutrient injection well system. A solenoid control valve with 24-hour timer shall allow cycling of the air supply to the pump. The separate-phase recovery pump will be attached to a multi-strand SS wire with minimum tensile strength of 500 pounds that will be hooked to the eyehook at the wellhead sanitary seal.

13 Cement: Portland type II or API Class B cement or approved equivalent. Concrete for wellhead apron will be troweled to drain away from well enclosures and edged on alls sides.

14 Pipe Bedding: Clean sand/gravel mix free of organic matter, #4 mesh fine, ASTM 10M or approved equal from local borrow source.

15 HDPE Conveyance Piping: High-density polyethylene (HDPE) SDR 11 (pressure rated for 160 PSI) using a PE 3408 high density, high extra molecular weight polyethylene piping system.

16 Control Conduit and Cable: Control conduit and cable will be provided in accordance with manufacturers recommendations, National Electric Code (NEC) and local building codes.

17 Compacted Native Fill: Fill shall be on-site material free from organic matter, compacted in lifts of 9-inches or less with particle sizes not to exceed 3-inch in diameter. Fill will be compacted to at least 90 percent relative compaction.

18 Metallic Warning Tape: Tape shall be detectable metallic tape for underground burial within the conveyance piping trenches. The tape shall be installed in accordance with the manufacturer's specifications.

19 Compressed Air (Nutrient Injection and Product Pump) Piping: The compressed air piping shall be SCH 80 PVC meeting ASTM D1785, Class 12454B white, Type 1, Grade 1. The piping shall be solvent welded.

20 PVC Conveyance Piping: The PVC conveyance piping shall be SCH 40 PVC meeting ASTM D1785, Class 12454B white, Type 1, Grade 1. The piping shall be solvent welded.

21 [illegible]cal Conduit and Cable: Electrical conduit and cable will be provided in accordance [illegible]e electrical one-line drawings, NEC and local building codes.

22 Chemical Resistant Hose: The chemical resistant hose shall be Goodyear Ortac (or approved equivalent) rated for 200-PSI oil and heat resistant seamless synthetic rubber, reinforced with high strength cord.

23 Separate-Phase Material Holding Tank: The separate-phase material holding tank shall be the existing steel tank currently in use at the Site. This tank will be integrated into the proposed remediation system for storage of recovered separate-phase material. The separate-phase material tank shall have a high-level switch that provides an alarm and shut-off mechanism that closes the air supply solenoid valve when the product elevation in the tank reaches a pre-set high level.

24 Oil/Water Separator with Receiving Tank: Oil/Water Separator shall be an EPG Companies fiberglass oil/water separator (Model OS16) with built in expanded effluent pumping chamber or approved equivalent. The Oil/Water Separator shall be an coalescing type separator with the following features: water influent diffuser and chamber, oil/water separator chamber with coalescing media, oil skimmer, solids accumulation chamber, clean water effluent chamber, oil reservoir, and separator cover with quick release latches. The oil/water separator shall be sized to effectively treat 60 gpm of water. The oil/water separator with receiving tank shall have level controls (high-high level switch, high level switch and low level switch) which will control the treated water transfer pump and provide an alarm and shut-off mechanism for liquid high levels.

25 Soil Vapor Extraction System: Model VES-RT-30, skid mounted, with Rotron EN14 regenerative blower, 30 HP, 460V, 3 Phase, explosion-proof motor, vacuum relief valve, vacuum gauge, CS-24a condensate filter separator, 3-point level sensor/sight tube, manual drain condensate pump, 1 HP, 460V, 3 Phase, explosion-proof motor, dilution air valve, discharge silencer, and carbon steel piping and fittings.

26 Chemical Injection Systems:

Aqua Mag: Aqua Mag (Distributed by Kraft Enterprises 505.835.2948) will be used to provide a sequestering, dispersing and buffering action within the process water and will be injected into the process flow stream using a Stenner peristaltic metering pump prior to the air stripper. The Aqua Mag container (55 gallon drum) and metering pump shall be provided and installed in accordance with the manufacturer and/or distributor's requirements.

Disinfectant: Disinfectant (Distributed by Kraft Enterprises 505.835.2948) will be used to minimize biofouling of the remediation system and injection wells and will be injected into the process flow stream using a Stenner peristaltic metering pump prior to the air stripper. The disinfectant shall be hydrogen peroxide and shall be provided in a container with a metering pump. The disinfectant, container and metering pump shall be provided and installed in accordance with the manufacturer and/or distributor's requirements.

27 Low-Profile Air Stripper System: STAT 80 (or approved equivalent), 4-tray or sufficient trays to treat impacted water, stainless steel construction, demister, influent/effluent flanges, latches/fasteners, gaskets, steel skid, 7-1/2 HP, 460V, 3 Phase, explosion-proof blower, low pressure switch, pressure gauge, influent transfer pump, and discharge pump with ½ HP, 460V, 3 Phase explosion-proof motors and Viton seals, 3-point level sensor/sight tube and piping.

28 Water Filtration Units: FSI Bag Filters, Model FSPN-85, (or approved equivalent) carbon steel housings, 2-inch NPT fittings, O-ring seal and leg assembly. There shall be two units installed with isolation/bypass valves in parallel prior to the air stripper inlet each with a 25-micron bag. There will be two units installed with isolation/bypass valves in parallel after the air stripper discharge pump each with a 10-micron bag.

29 Air Compressor: Palatek Rotary Screw compressor (or approved equivalent), 80 CFM at up to 25 PSI, Model 20D, mounted on 120 gallon tank, 20 HP, 460V, 3 phase, TEFC motor, NEMA 4 control box, magnetic starter, air cooled oil cooler, air cooled after cooler, high temperature and low oil shut downs, particulate filter, coalescing filter, auto drain, one pressure regulator for 5 CFM at 80 PSI, one pressure regulator for 75 CFM at 10 PSI, pressure gauges (2), solenoid valves (2) for discharge line and compressor maintenance kit.

30 Liquid Nitrous Oxide Storage Tank and System: A 250 to a 500-gallon pressure vessel (equivalent to a propane pressure vessel) with a pressure regulator and control valve shall be provided or leased. The pressure vessel shall be built to ASME Code. The nitrous oxide shall be provided at a pressure of 5 PSI higher than the pressure in the compressed air line. The flow of the nitrous oxide into the compressed air line will be controlled using a flow controller that is actuated by a flow meter on the compressed air line. In-line check valves will be installed after the flow meter and flow controller to prevent back flow of the nitrous oxide or compressed air stream. A solenoid valve on the nitrous oxide tank discharge piping shall be provided to assure that the nitrous oxide does not flow into the nutrient injection wells without the compressor airline open. The nitrous oxide solenoid valve shall be open only when the nutrient injection solenoid valve is open.

31 Pressure Testing: Pressure test entire groundwater conveyance line using a pressure decay test. The groundwater conveyance line shall be water tested at a pressure of at least 75 PSI, losing no more than 1 PSI over a period of 10 minutes. Pressure testing to be verified by the oversight person.

Pressure Test entire compressed air line using a pressure decay test. The compressed air line shall be air tested at a pressure of at least 100 PSI, losing no more than 1 PSI per minute over a period of 10 minutes. Pressure testing to be verified by the oversight person.

32 Main Control Panel: The main control panel shall be UL listed and include motor starters, relays and alarm interlocks. The control panel(s) shall be mounted in a separate enclosed room within the building and shall operate all the remediation equipment. An explosion-proof control panel is not required. The control panel enclosure shall be NEMA 4 construction. The conduits from the enclosure(s) shall be sealed to prevent explosive vapors from traveling into the control panel(s). The alarm sequence for the remediation system is provided in the table below:

[illegible]ogic Description

Component	Switch	Light	Logic	Motor
[illegible]	[illegible]	Green	HAND - [illegible]; OFF - turns pump off; AUTO - runs if there is not a high level in the O/WS [illegible]	[illegible]
HIGH [illegible] OIL/WATER [illegible]	–	Amber	[illegible]	–
[illegible]	–	Amber	[illegible]	–
[illegible] PUMP	[illegible]	Green	HAND - turns pump on; OFF - turns pump off; AUTO - runs if there is not a high filter pressure [illegible]	[illegible]
WATER FILTER HIGH PRESSURE SWITCH	–	Amber	[illegible]	–
[illegible] BLOWER	HOA	Green	HAND - turns blower on; OFF - turns blower off; AUTO - [illegible]	7½ HP
LOW AIR PRESSURE SWITCH		Amber	[illegible]	
HIGH LEVEL AIR [illegible]	–	Amber	[illegible]	–
DISCHARGE PUMP	[illegible]	Green	HAND - turns pump on; OFF - turns pump off; AUTO - [illegible]	–
DISCHARGE FILTER HIGH PRESSURE SWITCH	–	Amber	[illegible]	–
[illegible]	–	Amber	[illegible]	–
VAPOR EXTRACTION BLOWER	HOA	Green	HAND - turns blower on; OFF - turns blower off; AUTO - [illegible]	30HP
CONDENSATE PUMP	HOA	Green	HAND - turns blower on; OFF - turns blower off; AUTO - runs if there is not a high level in the O/WS [illegible]	1 HP
[illegible]	[illegible]	–	[illegible] alarms	–
[illegible]			All pumps and blowers [illegible]	
AQUA MAG METERING PUMP	AUTO-OFF	–	AUTO - [illegible]; OFF - turns power off to metering pump	–
DISINFECTANT METERING PUMP	AUTO-OFF	–	AUTO - [illegible]; OFF - turns power off to metering pump	–
NITROUS OXIDE CONTROLLER	AUTO-OFF	–	AUTO - [illegible]; OFF - turns power off to nitrous oxide controller	–
AIR COMPRESSOR	AUTO-OFF		AUTO - [illegible] high temperature [illegible] pressure switch; OFF - turns air compressor off	20 HP
PRODUCT PUMPS SOLENOID VALVE	OPEN-CLOSE-AUTO	Green (open)	OPEN - opens solenoid valve; CLOSE - closes solenoid valve; AUTO - opens solenoid valve if there is not a high level in the product tank, and the 24 hour [illegible]	–
NITROUS OXIDE SOLENOID VALVE	OPEN-CLOSE-AUTO	Green (open)	OPEN - opens solenoid valve; CLOSE - closes solenoid valve; AUTO - opens solenoid valve if one of the zone solenoid valves [illegible]	–
ZONE 1 SOLENOID VALVE (NUTRIENT INJECTION WELLS)	OPEN-CLOSE-AUTO	Green (open)	OPEN - opens solenoid valve; CLOSE - closes solenoid valve; AUTO - opens solenoid valve with adjustable sequential timer (0 to 24 hours) with initial setting of 1-1/2 hours sequencing with other [illegible]	
ZONE 2 SOLENOID VALVE (NUTRIENT INJECTION WELLS)	OPEN-CLOSE-AUTO	Green (open)	OPEN - opens solenoid valve; CLOSE - closes solenoid valve; AUTO - opens solenoid valve with adjustable sequential timer (0 to 24 hours) with initial setting of 1-1/2 hours sequencing with other [illegible]	–
ZONE 3 SOLENOID VALVE (NUTRIENT INJECTION WELLS)	OPEN-CLOSE-AUTO	Green (open)	OPEN - opens solenoid valve; CLOSE - closes solenoid valve; AUTO - opens solenoid valve with adjustable sequential timer (0 to 24 hours) with initial setting of 1-1/2 hours sequencing with other [illegible]	
AUTODIALER			[illegible]: 1. Power failure 2. [illegible] 3. High product level 4. [illegible] high pressure 5. High water level air stripper [illegible] 6. [illegible] 7. [illegible] high level 8. High level [illegible] wells	

33 Telemetry: The teleme[illegible] be a Sensaphone 1108 (or approved equivalent) with automatic dial out, a mi[illegible] of 8 user-selectable inputs (alarm conditions), a minimum of 8 dialup numbers. The telemetry shall be capable of calling out using cellular type phone service. The telemetry shall be programmed to provide alarm status for the high water levels in the treated water injection wells, air stripper low pressure alarm, air stripper sump high/high water level alarm, high level alarm in influent oil/water separator, high level alarm in separate phase materials holding tank, bag filters high pressure alarm, condensate high level alarm and power failure alarm.

34 Enclosure: The building enclosure shall be a metal pre-engineered building (i.e., Metallic Building manufactured by NCI and installed by Mid-West Buildings - 505.392.0892 or approved equivalent) with minimum dimensions of 24-feet long by 24-feet wide and 14-feet high with a separate control/compressor room with minimum dimensions of 8-feet long by 5-feet wide. The building enclosure shall be constructed by and supplied with all the necessary component parts to form a complete building system. All parts shall be new and free from any defects or imperfections and shall be installed in accordance with the manufacturers specifications and by an approved manufacturers representative. At a minimum, the enclosure shall have 1 man-door for access to the building, 1 man-door for access to the control/compressor room and 1 overhead door for placing equipment in the building. A building foundation shall be installed in accordance with the requirements of the building manufacturer.

The enclosure shall be internally lighted, cooled (with fans and vents), and insulated. Lights and fans shall be explosion proof. An automatic ventilation system shall be included to prevent the equipment from overheating. The building shall be furnished with a weatherproof exterior paint or equivalent.

HIGGINS AND ASSOCIATES, L.L.C.

Project No.:	Date Map Generated: 7/13/00	Date Data Collected:	Figure No. S-1

Authored: CH
Checked: CJ
Detailed: ML

Title: PPL Line NM-1-1 EQUIPMENT AND MATERIALS SPECIFICATIONS

Client: Phillips Pipe Line Company

Location: Hobbs New Mexico

ACAD File: Titlesheet.dwg

PPL/Hobbs
Hobbs, NM
Inorganic Data

(Results in mg/L unless otherwise noted)

Analyte	NM Standards for Groundwater with <10,000 mg/L TDS	MW-2	MW-3	MW-4	MW-9	MW-10
Date		07/16/99	07/16/99	07/16/99	07/16/99	07/16/99
Lithium (ug/L)		56	53	<50	<50	110
Silicon		65.5	65	59	75	59.3
Strontium		1,400	1,200	860	2,700	2,100
Uranium (ug/L)	**5,000 ug/L**	<20.0	<20.0	<20.0	<20.0	<20.0
Mercury	**0.002**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Arsenic	**0.1**	0.0082	0.0058	0.006	<0.005	0.0052
Barium	**1**	0.14	0.095	0.08	0.12	0.08
Boron	**0.75**	0.26	0.25	0.25	0.13	0.25
Cadmium	**0.01**	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium		140	98	95	150	96
Chromium	**0.05**	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	**0.05**	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium		24	17	16	20	15
Potassium		3	3.1	3.3	3.9	2.9
Selenium	**0.05**	0.0069	0.0055	0.005	0.0057	<0.005
Silver	**0.05**	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium		86	75	110	38	83
Alkalinity		350	340	580	2,800	430
Bromide		1	0.95	0.92	0.99	0.8
Chloride	**0.1**	28	170	190	140	100
Fluoride	**1.6**	1.1	1.4	1.4	0.66	1.3
Sulfate	**600**	150	76	120	85	59
Total Dissolved Solids	**1,000**	1,000	540	690	740	510
pH	**Between 6 and 9**	7.63	7.70	7.68	7.77	7.73
Conductivity		1,290	870	870	810	770

PPL/Hobbs
Hobbs, New Mexico

Soil Analytical Data

Well	Date	Depth (ft)	PID Reading (ppm)	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethylbenzene (mg/Kg)	Xylenes (mg/Kg)	TPH (mg/Kg)
MW-2	07/13/99	10.0 - 12.0	26	<0.025	<0.025	<0.025	<0.025	<10
MW-2	07/13/99	30.0 - 32.0	16	<0.025	<0.025	<0.025	<0.025	39.6
MW-3	07/15/99	20.0 - 22.0	48	<0.025	<0.025	<0.025	<0.025	<10
MW-3	07/15/99	30.0 - 32.0	140	<0.025	<0.025	<0.025	<0.025	<10
MW-4	07/14/99	20.0 - 22.0	0	<0.025	<0.025	<0.025	0.032	<10
MW-4	07/14/99	30.0 - 32.0	134	0.029	0.16	0.25	0.27	286
MW-5	07/15/99	20.0 - 22.0	314	<0.025	<0.025	<0.025	<0.025	<10
MW-5	07/15/99	30.0 - 32.0	>2,000	12	94	95	150	50,600
MW-6	07/14/99	24.0 - 26.0	16	<0.025	<0.025	<0.025	<0.025	<10
MW-6	07/14/99	30.0 - 32.0	331	0.074	0.62	0.98	1.3	1762
MW-7	07/13/99	14.0 - 16.0	16	<0.025	<0.025	<0.025	<0.025	<10
MW-7	07/13/99	30.0 - 32.0	672	0.14	1.8	3.2	4.7	756
MW-8	07/13/99	20.0 - 22.0	1	<0.025	<0.025	<0.025	<0.025	<10
MW-8	07/13/99	30.0 - 32.0	235	0.15	0.99	1.2	1.6	912
MW-9	07/14/99	20.0 - 22.0	3	<0.025	<0.025	<0.025	<0.025	<10
MW-9	07/14/99	30.0 - 32.0	15	<0.025	<0.025	<0.025	<0.025	<10
MW-10	07/15/99	20.0 - 22.0	10	<0.025	<0.025	<0.025	<0.025	<10
MW-10	07/15/99	30.0 - 32.0	40	<0.025	<0.025	<0.025	<0.025	<10
MW-11	10/19/99	14.0 - 16.0	2	<0.025	<0.025	<0.025	<0.025	<10
MW-11	10/19/99	30.0 - 32.0	2	<0.025	<0.025	<0.025	<0.025	<10
MW-12	10/19/99	14.0 - 16.0	1	<0.025	<0.025	<0.025	<0.025	<10

Groundwater Analytical Data
PPL/Hobbs
Hobbs, NM

Well	Date	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)	TVPH/TEPH (ug/L)
MW-2	07/16/99	3.6	2.7	1.3	0.5	<2,000
MW-2	10/20/99	4.2	2.5	1.3	1.3	<2,000
MW-2	01/13/00	1.9	0.5	<0.5	<0.5	<2,000
MW-2	04/06/00	4.3	4.1	1.4	<2	<1,000
MW-2	08/01/00	1.7	1.5	0.72	<2	<1000
MW-2	11/15/00	52.0	36.0	7.80	9.4	640/<520
MW-2	03/06/01	7.3	5.0	1.40	2.1	140/<560
MW-2	06/26/01	4.9	3.2	1.00	<2	180/<560
MW-2	09/28/01	18.0	7.4	1.40	2.1	200/<560
MW-2	12/12/01	3.6	2.9	<1.0	1.6	<100/122
MW-3	07/16/99	<0.5	<0.5	<0.5	<0.5	<2,000
MW-3	10/20/99	2.6	1.0	<0.5	<0.5	<2,000
MW-3	01/13/00	20	16	9.2	20	<2,000
MW-3	04/06/00	3,800	3,800	910	1,100	<1,000
MW-4	07/16/99	720	1,100	260	280	3,000
MW-9	07/16/99	<0.5	<0.5	<0.5	<0.5	<2,000
MW-9	10/20/99	2.8	<0.5	<0.5	<0.5	<2,000
MW-9	01/13/00	110	2	20	15	<2,000
MW-9	04/06/00	2,700	870	500	460	370
MW-9	08/01/00	3,400	1,100	520	270	1100
MW-9	11/15/00	4,200	120	460	140	16,000/730
MW-9	03/06/01	4,300	370	920	210	20,000/<560
MW-10	07/16/99	1.8	<0.5	<0.5	<0.5	<2,000
MW-10	10/20/99	3.8	2.3	<0.5	<0.5	<2,000
MW-10	01/13/00	2	1	2.5	2	<2,000
MW-10	04/06/00	2.7	7.2	0.69	<2	<1,000
MW-10	08/01/00	40	1.2	2.7	10	<1000
MW-10	11/15/00	2,000	18.0	310	210	8900/780
MW-10	03/06/01	4,400	7.8	120	190	17,000/570
MW-10	06/26/01	5,600	1,300	670	<40	31,000/2400
MW-10	09/25/01	5,900	1,200	760	570	26,000/<530
MW-10	12/12/01	7,090	1,560	868	655	23,500 /1,350
MW-11	10/20/99	<0.5	<0.5	1.2	1.3	<2,000
MW-11	01/13/00	<0.5	<0.5	<0.5	<0.5	<2,000
MW-11	04/06/00	<0.5	<0.5	<0.5	<2	<1,000
MW-11	08/01/00	<0.5	<0.5	<0.5	<2	<1000
MW-11	11/15/00	<0.5	<0.5	<0.5	<2	<100/2000
MW-11	03/06/01	0.64	1.1	<0.5	<2	<100/<560
MW-11	06/26/01	<0.5	<0.5	<0.5	<2	<100/<530
MW-11	09/25/01	1.30	<0.5	<0.5	<2	<100/<540
MW-11	12/12/01	<1.00	<1.00	<1.00	<1.00	<100/<100

Groundwater Analytical Data
PPL/Hobbs
Hobbs, NM

Well	Date	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)	TVPH/TEPH (ug/L)
MW-12	10/20/99	1.1	<0.5	<0.5	<0.5	<2,000
MW-12	01/13/00	<0.5	<0.5	<0.5	<0.5	<2,000
MW-12	04/06/00	<0.5	<0.5	<0.5	<2	<1,000
MW-12	08/01/00	<0.5	<0.5	<0.5	<2	<1000
MW-12	11/15/00	<0.5	<0.5	<0.5	<2	<100/<560
MW-12	03/06/01	0.85	0.63	<0.5	<2	<100/<560
MW-12	06/26/01	<0.5	<0.5	<0.5	<2	<100/<530
MW-12	09/25/01	2.80	0.53	<0.5	<2	<100/<520
MW-12	12/12/01	<1.00	<1.00	<1.00	<1.00	<100/<100
MW-13	04/06/00	<0.5	<0.5	<0.5	<2	<1,000
MW-13	08/01/00	<0.5	<0.5	<0.5	<2	<1000
MW-13	11/15/00	<0.5	<0.5	<0.5	<2	<100/570
MW-13	03/06/01	<0.5	1.3	<0.5	<2	<100/<550
MW-13	06/26/01	<0.5	<0.5	<0.5	<2	<100/<500
MW-13	09/25/01	22.0	3.4	2.5	<2	150/<500
MW-13	12/12/01	439	<1.00	<1.00	20.4	1,240/125

environmental forensics

Get to know your petroleum types

By Allen D. Uhler, Kevin J. McCarthy, and Scott A. Stout

Knowledge of the makeup of crude and refined petroleum is fundamental to the understanding of its measurement, identification and differentiation in the environment. Following is an overview of the characteristics and gross chromatographic features of various petroleum products environmental professionals are likely to encounter in conventional or environmental forensic site investigations.

Fugitive petroleum may be found in many manifestations: crude oil, intermediate products, refined products, residual products, waste products, and mixtures of any and all of the above in a range of weathering states from unaltered to highly degraded. To identify the nature of petroleum at a contaminated site, a fundamental understanding of the character of the products being studied is a necessity.

Gas chromatographic methods, such as modifications of EPA Method 8015, have become perhaps the most popular means for identification of petroleum.

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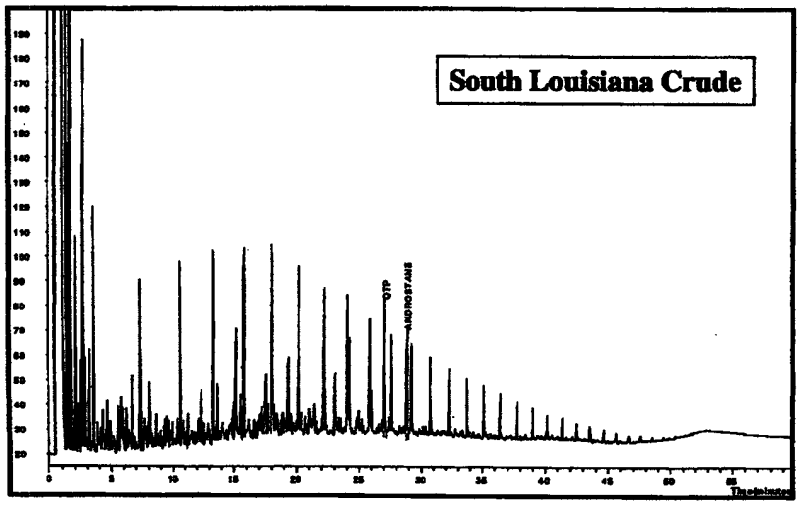


Figure 1

Generally most useful for identifying fresh to mildly degraded products, gas chromatography with FID reveals much about the potential identity of petroleum products found at contaminated sites.

Crude oils

Crude oils are exactly what the name implies: mixtures of hydrocarbons produced directly from a geologic formation. Crude oil compositions vary widely depending largely on the geologic formation from which they originate. Depending on the sources of carbon from which the oils are generated and the geologic environment in which they migrated and were reservoired, they can have dramatically varied compositions, such as relative amounts of paraffinic, aromatic, and asphaltenic compounds.

While there is no singular example of a representative crude oil, generally what one observes is a broad molecular weight range material, such as C_4 to C_{40} hydrocarbons. The hydrocarbon types that typically compose a crude oil are straight-chain, branched-chain and cyclic aliphatics, mono- and polycyclic aromatic hydrocarbons (PAH), and various polar compounds such as sulfur-, nitrogen-, and oxygen-containing moieties.

Chromatographically, 20 percent to 70 percent of the individual compounds are resolved individual components, with the remaining hydrocarbons part of an unresolved complex mixture (UCM) that typifies most crudes. See figure 1, page 26. As crude oils weather, the more labile compounds are removed and the gross chromatographic character of the crude oil becomes increasingly dominated by the UCM.

Some crude oils — particularly those that have been weathered — can be confused with residual products like heavy fuel oils.

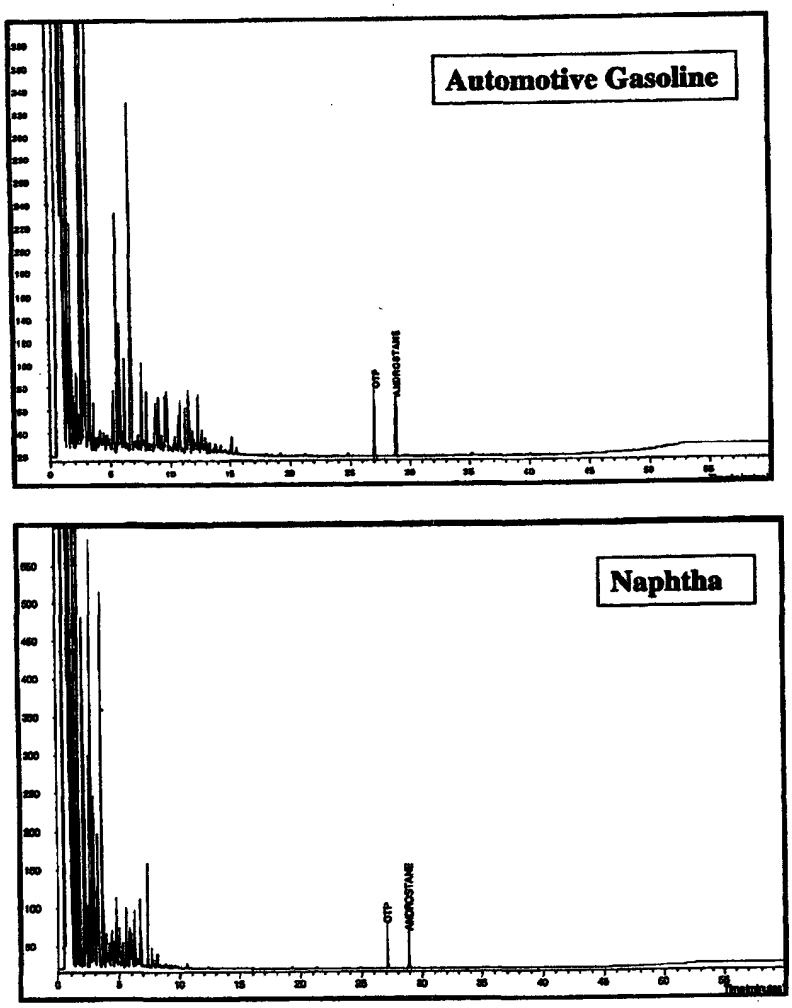


Figure 2

Generally speaking, one can expect to find crude oil contamination in limited locations such as at crude oil transshipment terminals, along crude oil piplines at or near refineries, or near naturally occurring seeps.

Refined petroleum

All refined petroleum products are, at a minimum, boiling point range cuts of crude oil obtained through a variety of distillation processes. Certain cuts may be further amended through various blending or catalytic processes at the refinery to give the final product characteristics desired by the refinery customer or to meet regulatory performance requirements.

Light distillates are typically products in the C_3 to C_{12} boiling point range; they include aviation gas, naphtha, automotive gasoline and a large number of utility solvents such as Stoddard solvent. Other unique intermediate refining products such as reformate — predominately a C_6 to C_9 monoaromatic cut — and isomerate — a C_4 to C_6 iso-alkane cut —would under most circumstances be found near refineries, since these materials are manufactured on-site and used in blending of finished products.

Typical of fresh light distillates is a predominance of light-end, resolved hydrocarbons and a minimal UCM. Automotive gasoline — obviously a common light distillate encountered in site assessments — has considerable amounts of aromatic compounds, notably benzene and its various C_1-, C_2-, and C_3-homologues, toluene, ethylbenzene, and o-, m-, and p-xylenes. Other compound classes found in abundance in automotive gasoline includes branched chained alkanes such as isooctane, and olefins-hydrocarbons with double bonds not typically found in crude oils in measurable concentrations but rather are added to the fuels during the formulation process.

Modern gasolines also contain significant amounts of oxygenate additives, such as methyl-*tert*-butyl-ether (MTBE) and *tert*-methyl amyl ether (TAME) that are distinguishing features of this product. Gasolines can be chromatographically differentiated from similar products such as naphtha, which is a straight-run distillate that is not blended, reformulated or enhanced, giving it the classical look of a distilled product. See figure 2, this page.

Mid-range distillates

This class of product covers a rather broad hydrocarbon range of about C_6 to C_{25} and, hence, includes a large number of refinery products such as kerosene, jet fuels, and diesel products. See figure 3, page 28. The lightest of the range includes diesel #1 or kerosene, generally represented by C_{10} to C_{22} hydrocarbons, dominated by resolved compounds in the C_{12}-C_{15} range and containing a well defined UCM centered on the boiling point range of the product.

The most commonly encountered jet fuels — Jet A, JP-4, JP-5 and recently, JP-8 — are all kerosene-range products, and share some similarities. Kerosene, Jet A (commercial airline fuel) and JP-5 (Navy aircraft fuel) are very similar in gross composition, with many of the differences in them attributable to additives designed to control such parameters as freeze point and pour point characteristics. JP-4, a military aircraft fuel, is a lighter product of about 65 percent gasoline range, which is dominated by a normal alkanes from C_5 through C_{15}. JP-8 is a newer military formula designed to replace JP-4 and JP-5. It resembles a cut with a boiling range that

encompasses these two common military fuels.

Somewhat heavier mid-range distillates are represented by the ubiquitous diesel fuels. Wider cut products in the C_{12} to C_{25} range, diesel #2 and home heating fuel oil #2 are very similar in composition; their GC chromatograms are dominated by resolved hydrocarbons in the C_{13} to C_{18} range and show the characteristic and predominant central UCM.

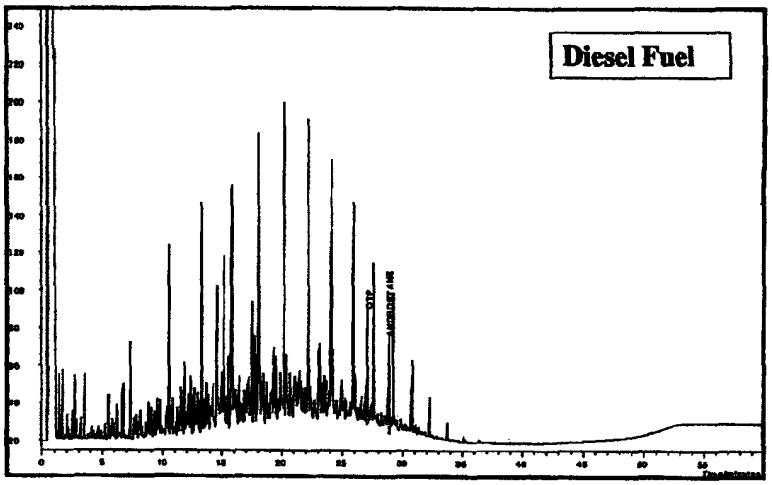
Heavy fuels and residuals

Classic heavy fuel types include fuel #4 and fuel #6, also known as Bunker C or residual. Additional specialty heavy fuels such as fuel #3 and fuel #5, while occasionally encountered, are not considered typical. Fuel #6 is usually considered a distillation residual material whose composition varies greatly based upon the parent crude oil and on the processes it has undergone. These heavy and residual products are typified by a broad resolved alkane envelope in the C_{15} to C_{30} range and a large UCM that can make up 50 percent or more of the total peak area in the GC chromatogram of a heavy fuel.

Lubricating oils are specialty residual products that have a broad UCM profile in the C_{25} to C_{40} range. See figure 4, this page. Notably absent from lubricating oil is individual resolved hydrocarbons — alkanes or waxes — which have been preferentially removed during refining.

Primer wrap-up

Knowing the basic features of crude oil and major refined products often can help the environmental professional quickly classify fugitive petroleum using rather straightforward gas chromatographic techniques. However, what happens to the chemicals, and hence, chromatographic features of these products when they weather? Can we still identify such material as petroleum and differentiate among similar weathered products? The next several installments to this series will focus on the weathering characteristics of the major classes of refined petroleum, and will provide insights into the measurement processes needed to identify weathered products when they are encountered as fugitive materials in the environment.



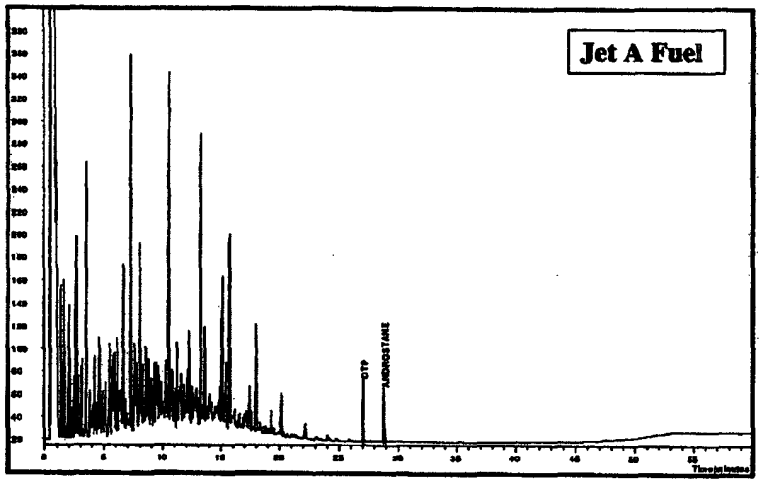


Figure 3

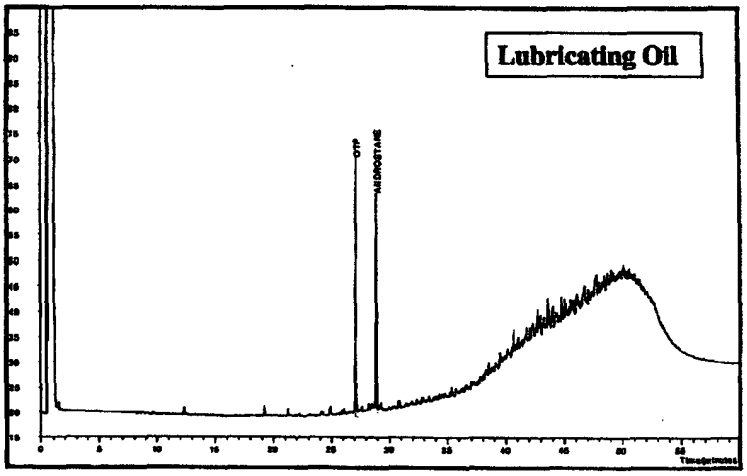


Figure 4

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CARUS

CARUS ORTHO/POLYPHOSPHATE BLENDS

CORROSION INHIBITION AND SEQUESTRATION

Carus ortho/polyphosphate blends actively inhibit corrosion by forming a microscopic, protective film on the inside surface of water pipes. This process limits the release of lead, copper, and iron from water mains and domestic plumbing. These ortho/polyphosphate blends help to reduce rusty water and prevent the formation of iron deposits, resulting in greater chlorine residuals in the system. After using these products, chlorine has been shown to be more effective at controlling biofilm regrowth in the distribution system.

Carus ortho/polyphosphate blends also act as sequestering agents to reduce stains, discoloration, and rusty water caused by iron and manganese. Threshold treatment with these products holds scale-causing minerals, such as calcium, in solution as well. Carus blends remove existing scale and iron tuberculation buildup to improve water quality and distribution flow rates. By sequestering raw water minerals at the source, the demand for chlorine is reduced, resulting in less chlorine consumption.

PROPERTIES

	AQUA MAG®	F-25-S	TPC® 636F	F-35	AQUA MAG® HP	TPC® 632S	TPC® 582	TPC® 682
Appearance	Clear Liquid	Clear Liquid	Clear Liquid	Clear Liquid	Clear Liquid	Clear Liquid	White Powder	White Powder
Ortho/Poly Ratio	30/70	40/60	50/50	50/50	70/30	70/30	25/75	50/50
Specific Gravity	1.37±0.03	1.38±0.03	1.40±0.03	1.39±0.03	1.57±0.03	1.33±0.03	N/A	N/A
pH	5.2±0.3 (neat)	5.5±0.3 (neat)	4.7±0.3 (neat)	4.5±0.3 (neat)	10.4±0.3 (neat)	4.2±0.3 (neat)	6.8±0.3 (1% sol.)	5.8±0.3 (1% sol.)
Freezing Point	<38°F	<35°F	<20°F	<20°F	<16°F	<10°F	N/A	N/A
Bulk Density	11.4 lbs./gal.	11.5 lbs./gal.	11.7 lbs./gal.	11.6 lbs./gal.	13.1 lbs./gal.	11.1 lbs./gal.	78 lbs./ft³ (packed)	81 lbs./ft³ (packed)
Total Phosphate	34.5%±1%	31%±1%	36%±1%	36%±1%	30%±1%	31%±1%	86%±2%	86%±2%
Solubility	Complete	Complete	Complete	Complete	Complete	Complete	3.5 lbs./gal.	5.8 lbs./gal.
NSF Max Feed Rate	23 mg/L	29 mg/L	39 mg/L	24 mg/L	30 mg/L	28 mg/L	11 mg/L	10 mg/L

All Carus ortho/polyphosphate blends are certified to ANSI/NSF Standard 60.

(over)

Responsible Care®
A Public Commitment

CARUS CHEMICAL COMPANY
315 Fifth Street • Peru, IL 61354
Tel: (815) 223-1500 Fax: (815) 224-6697
Web: www.caruschem.com • E-Mail: salesmkt@caruschem.com

CARUS

AQUA MAG®
Blended Phosphate

AQUA MAG® blended phosphate is an effective corrosion inhibitor and sequestrant for use in potable and industrial water systems. The product is a liquid concentrate of exceptional purity, clarity, and stability, utilizing a broad spectrum of phosphates for better sequestration and corrosion control.

BENEFITS OF AQUA MAG® BLENDED PHOSPHATE

- Inhibits corrosion of steel distribution system water lines, iron and galvanized piping, and lead and copper plumbing.
- Decreases iron tuberculation, which can extend the life of the distribution system.
- Inhibits lead and copper leaching, which results in lower lead and copper in the delivered potable water.
- Lessens the occurrence of microbial-influenced corrosion, providing longer system life.
- Controls iron and manganese, minimizing rusty or dirty water in the system.
- Reduces discoloration, staining, and mineral build-up, resulting in fewer customer complaints.
- Diminishes calcium scale deposits typically seen in hot water lines and heaters.
- Lowers chlorine demand and improves disinfection.
- Saves money by reducing corrosion and scale, lowering chlorine demand, and decreasing hydrant flushing, leaks, and failures.

PROPERTIES AND CERTIFICATIONS

- Clear homogeneous liquid
- Viscosity <2 cps at 70° F
- Totally soluble and freeze/thaw stable
- NSF maximum feed rate 23 mg/L
- Freezing Point <38° F
- Shelf Life (neat) 2 years
- Specific Gravity 1.367 ± 0.01
- Total Phosphate 34.5% ± 1.0%
- pH (neat) 5.2 ± 0.5
- Ratio ortho/complex polyphosphate 30/70
- Bulk Density 11.4 lbs. per gallon
- USEPA, USDA, UL. ANSI/NSF Standard 60, Kosher approved

SHIPPING AND HANDLING

AQUA MAG® blended phosphate is packaged in 1, 5, 15, 30 & 55 gallon containers and is available in bulk quantities from the manufacturing facility, local warehouses, and bulk terminals. The product is shipped in safety-sealed, food-grade containers or certified tankers. Each container is identified by lot number.

APPLICATION

AQUA MAG® blended phosphate is applied using a chemical metering pump. In most applications, AQUA MAG® blended phosphate is fed as a concentrate without the necessity of dilution. For dosage rates or answers to technical questions, please call Carus Chemical Company (800) 435-6856.

Responsible Care®
A Public Commitment

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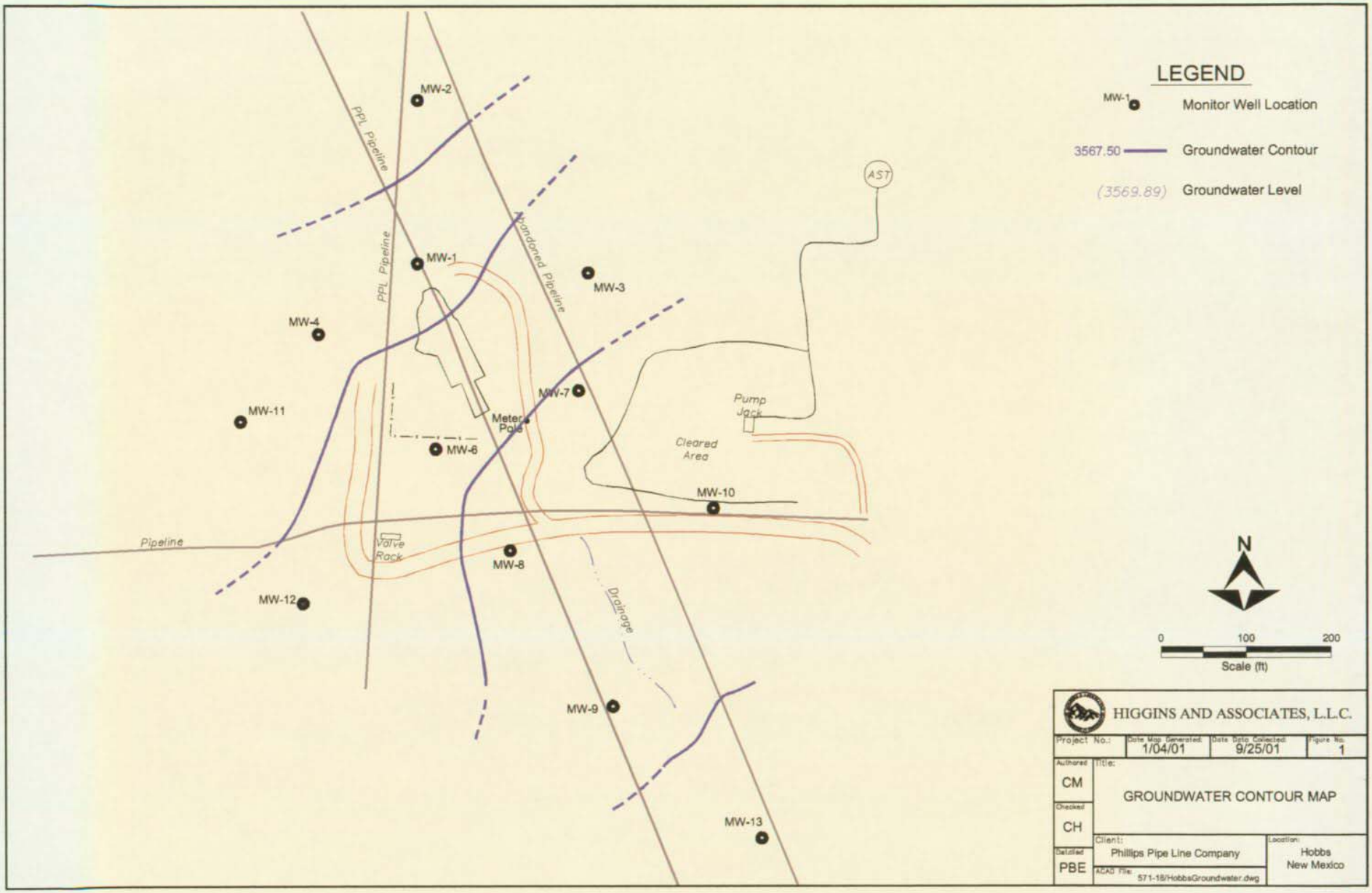

LEGEND
MW-1 Monitor Well Location
3567.50 Groundwater Contour
(3569.89) Groundwater Level
MW-2
MW-1
MW-3
MW-4
MW-11
MW-6
MW-7
MW-10
MW-8
MW-12
MW-9
MW-13
PPL Pipeline
PPL Pipeline
Abandoned Pipeline
AST
Pump Jack
Cleared Area
Meter Pole
Valve Rack
Pipeline
Drainage
N
0 100 200
Scale (ft)
HIGGINS AND ASSOCIATES, L.L.C.
Project No.:
Date Map Generated: 1/04/01
Date Data Collected: 9/25/01
Figure No. 1
Authored CM
Checked CH
Detailed PBE
Title: GROUNDWATER CONTOUR MAP
Client: Phillips Pipe Line Company
Location: Hobbs New Mexico
ACAD File: 571-18/HobbsGroundwater.dwg

LEGEND

MW-1 ● Monitor Well (excavation size is approximate)

SB-1 ○ Soil Boring

N

0 100 200

Scale (ft)

HIGGINS AND ASSOCIATES, L.L.C.

Project No.:	Date Map Generated: 02/25/00	Date Data Collected: 01/00	Figure No. -

Authored: CH

Checked: CH

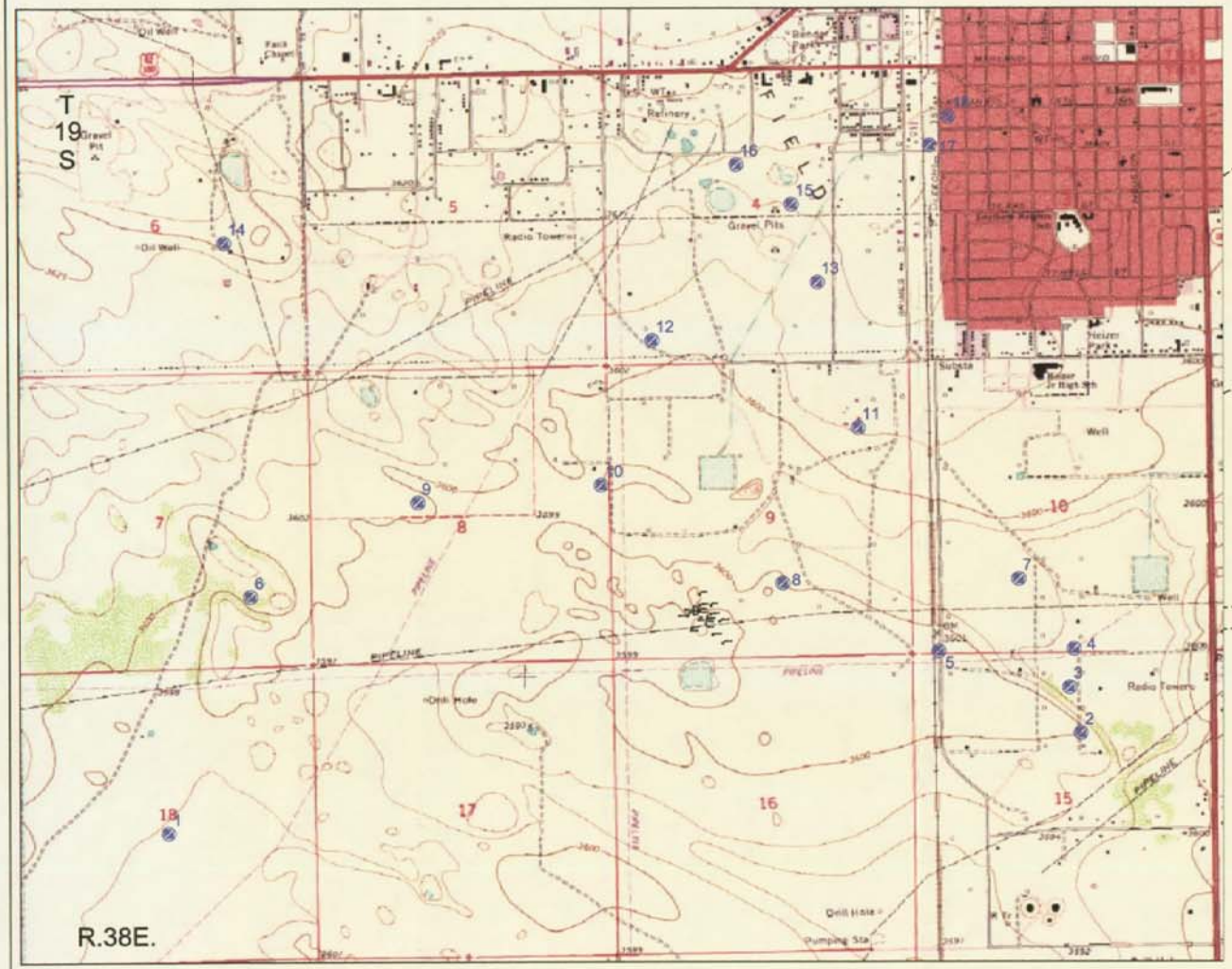
Detailed: ML

Title: PPL Line NM-1-1 Groundwater Potentiometric Surface Under Pumping Conditions

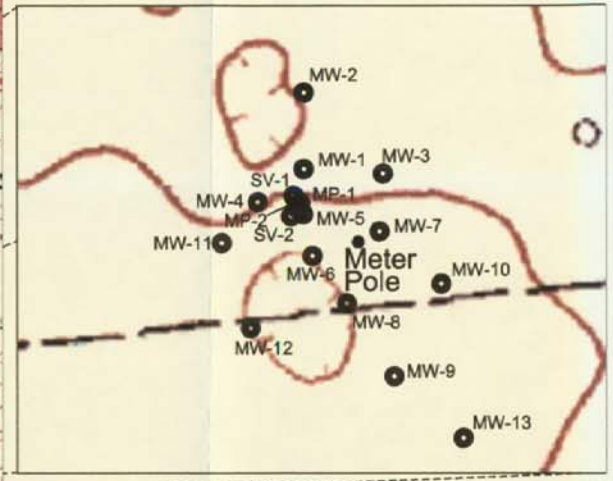
Client: Phillips Pipe Line Company

ACAD File:

Location: Hobbs New Mexico



Topographics Source: USGS 7.5' Quad.;Hobbs West, NM



LEGEND

- Ground Water Well
- Monitor Well

Note: ground water well label refers to Water Well Report 10/1/1999

0 2000 4000
Scale (ft)

N

HIGGINS AND ASSOCIATES, L.L.C.

Project No.:	Date Map Generated: 6/27/00	Date Data Collected:	Figure No. -

Authored: CH
Checked: CJ
Detailed: ML

Title: PPL Line NM-1-1
Water Well Locations

Client: Phillips Pipe Line Company

Location: Hobbs New Mexico

ACAD File: 571-16\waterwells-utm.dwg

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Water Well Report™

October 1, 1999

CLIENT

Higgins and Associates

9940 East Costilla Avenue, Suite B

Englewood, CO 80112

SITE

Hobbs and East Hobbs

Sections 8 & 9

Hobbs, New Mexico

100199-044

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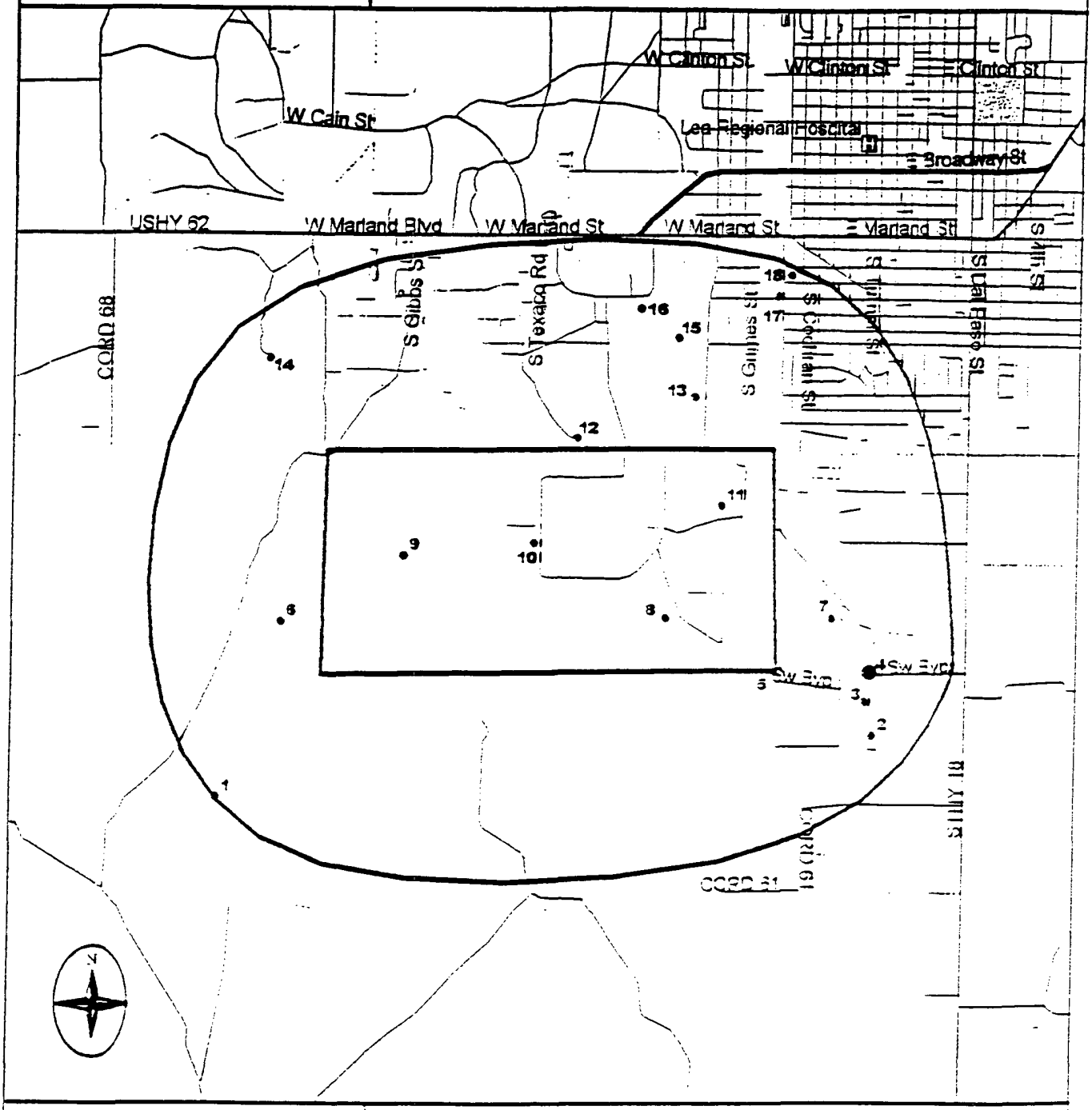
Water Well Report™

Map of Wells within Defined Polygon



Subject Site
Ground Water Wells (Closed)
Ground Water Well
Airport
Hospital
Highway
Primary road
Secondary and connecting road
Local road
Access road
Water body
Park
State

0 0.464787 Miles

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October 1, 1999

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Water Well Report™

DETAILS

State ID	323933103111401
Banks ID	3502501220
Owner Of Well	COCHRAN, C.B.
Type Of Well	Domestic
Depth Drilled	N/A '
Completion Date	N/A
Longitude	-103.18722222
Latitude	32.6591666667

MAP ID: 1

State ID	323948103080501
Banks ID	3502501233
Owner Of Well	WALKER OIL CORP.
Type Of Well	Unused
Depth Drilled	58 '
Completion Date	N/A
Longitude	-103.13472222
Latitude	32.6633333333

MAP ID: 2

State ID	323956103080701
Banks ID	3502501238
Owner Of Well	MIDWEST OIL CO.
Type Of Well	Unused
Depth Drilled	N/A '
Completion Date	N/A
Longitude	-103.13527778
Latitude	32.6655555556

MAP ID: 3

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DETAILS

State ID	324003103080601	MAP ID
Banks ID	3502501242	4
Owner Of Well	SHELL OIL CO.	
Type Of Well	Unused	
Depth Drilled	37 '	
Completion Date	N/A	
Longitude	-103.135	
Latitude	32.6675	

State ID	324003103080602	MAP ID
Banks ID	3502501243	4
Owner Of Well	SHELL OIL CO.	
Type Of Well	Unused	
Depth Drilled	49 '	
Completion Date	N/A	
Longitude	-103.135	
Latitude	32.6675	

State ID	324003103083401	MAP ID
Banks ID	3502501244	5
Owner Of Well	PAN AMERICAN PET.	
Type Of Well	Unused	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.14277778	
Latitude	32.6675	

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DETAILS

State ID	324015103105601	MAP ID
Banks ID	3502501249	6
Owner Of Well	COCHRAN,	
Type Of Well	Stock	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.18222222	
Latitude	32.6708333333	

State ID	324016103081701	MAP ID
Banks ID	3502501252	7
Owner Of Well	THORP, D.C.	
Type Of Well	Irrigation	
Depth Drilled	125 '	
Completion Date	N/A	
Longitude	-103.13805556	
Latitude	32.6711111111	

State ID	324016103090601	MAP ID
Banks ID	3502501253	8
Owner Of Well	TERRY, WILL	
Type Of Well	Stock	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.15166667	
Latitude	32.6711111111	

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DETAILS

State ID	324031103102101	MAP ID
Banks ID	3502501263	9
Owner Of Well	BYROM, W.K.	
Type Of Well	Unused	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.1725	
Latitude	32.6752777778	

State ID	324034103094401	MAP ID
Banks ID	3502501265	10
Owner Of Well	GACKLE, ALBERT	
Type Of Well	Unused	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.16222222	
Latitude	32.6761111111	

State ID	324043103085001	MAP ID
Banks ID	3502501273	11
Owner Of Well	AMOCO PRODUCTION CO.	
Type Of Well	Unused	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.14722222	
Latitude	32.6786111111	

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DETAILS

State ID	324059103093201	MAP ID
Banks ID	3502501282	12
Owner Of Well	TEXACO	
Type Of Well	Unused	
Depth Drilled	35 '	
Completion Date	N/A	
Longitude	-103.15888889	
Latitude	32.6830555556	

State ID	324109103085801	MAP ID
Banks ID	3502501297	13
Owner Of Well	LAMBERT	
Type Of Well	Unused	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.14944444	
Latitude	32.6858333333	

State ID	324118103110001	MAP ID
Banks ID	3502501303	14
Owner Of Well	FOWLER, CLARA	
Type Of Well	Stock	
Depth Drilled	N/A '	
Completion Date	N/A	
Longitude	-103.18333333	
Latitude	32.6883333333	

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DETAILS

State ID	324123103090301
Banks ID	3502501309
Owner Of Well	STANOLIND OIL
Type Of Well	Unused
Depth Drilled	N/A '
Completion Date	N/A
Longitude	-103.15083333
Latitude	32.6897222222

MAP ID: 15

State ID	324130103091401
Banks ID	3502501319
Owner Of Well	PECOS VALLEY OIL CO.
Type Of Well	Domestic
Depth Drilled	N/A '
Completion Date	N/A
Longitude	-103.15388889
Latitude	32.6916666667

MAP ID: 16

State ID	324133103083401
Banks ID	3502501324
Owner Of Well	N/A
Type Of Well	N/A
Depth Drilled	N/A '
Completion Date	N/A
Longitude	-103.14277778
Latitude	32.6925

MAP ID: 17

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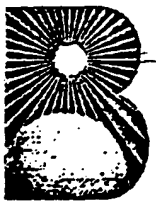

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Water Well Report™

DETAILS

State ID	324138103083001
Banks ID	3502501332
Owner Of Well	MR. PROLLACK
Type Of Well	Unused
Depth Drilled	70'
Completion Date	N/A
Longitude	-103.14166667
Latitude	32.6938888889

MAP ID
18

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Banks Information Solutions, Inc.

Water Well Report™

SUMMARY

Water Well Report™ Research Mapping Protocol

Banks Information Solutions, Inc. Water Well Report™ is prepared from existing state water well databases and additional file data/records research conducted at the State Engineers Office located in Roswell, New Mexico. In New Mexico, water wells are located within a grid system using section, township, and range. The locations of these wells on the enclosed map were plotted using a GIS program, ArcView 3.0a, with the aid of the section, township, and range of the wells provided by the drillers logs.

Banks Information Solutions, Inc. has performed a thorough and diligent search of all groundwater well information provided and recorded with the New Mexico State Engineers Office. All mapped locations are based on information obtained from the NMSEO. Although Banks performs quality assurance and quality control on all research projects, we recognize that any inaccuracies of the records and mapped well locations could possibly be traced to the appropriate regulatory authority or the actual driller. It may be possible that some water well schedules and logs have never been submitted to the regulatory authority by the water driller and, thus, may explain the possible unaccountability of privately drilled wells. It is uncertain if the above listing provides 100% of the existing wells within the area of review. Therefore, Banks Information Solutions, Inc. cannot fully guarantee the accuracy of the data or well location(s) of those maps and records maintained by the New Mexico State Engineer regulatory authorities.

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