6RCC

Monzeglio, Hope, NMENV

From: Regina Allen [rmallen@trihydro.com]
Sent: Thursday, August 16, 2007 11:28 AM
To: Monzeglio, Hope, NMENV; Chavez, Carl J, EMNRD
Cc: Jim Lieb; Ed Riege; Steve Morris; Grant Price
Subject: Revised Work Plan for Tank 101/102 soil contamination delineation
Attachments: 200708_Work Plan_LTR.PDF

Hope and Carl,

I have attached a pdf version of the work plan for delineating the soil contamination near Tanks 101 and 102. The comments from Hope have been incorporated as per our conference call yesterday (Aug. 15, 2007).

Let me know if you have any further questions. Thanks.

Regina Allen
Environmental Scientist

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August 16, 2007

Mr. Jim Lieb
Environmental Engineer
Western Refining
I-40 Exit 39
Jamestown, NM 87347

RE: Work Plan for Subsurface Investigation near Tanks 101 and 102, Western Refining – Ciniza Refinery

Dear Mr. Lieb:

This Subsurface Investigation Work Plan (Plan) has been prepared as a guideline to be used during field activities intended to meet the following objectives: identify the source of two water seeps located down gradient of Tank 102 and to delineate soil contamination associated with these seeps. The New Mexico Environmental Department (NMED) has been verbally contacted by Ciniza personnel as part of the project preparation activities and is aware of the seeps/soil contamination near tanks 101 and 102. As a result, NMED has requested a work plan that will be reviewed and approved before work commences. This Plan describes the methods that will be used to obtain the information needed to meet the project objectives.

Subsurface investigation field activities will be preformed in a two phase approach. Phases I and II are Site Reconnaissance/Evaluation and Drilling and Sampling Activities, respectively.

Phase I: Site Reconnaissance/Evaluation

The objective of Phase I is to increase the understanding of current site conditions which will allow Phase II activities to be focused and efficient. Tasks associated with Phase I are presented below.

Interview Ciniza Personnel

Trihydro personnel will interview any Ciniza personnel that may have knowledge of relevant background information regarding the seeps and their potential source.

Review Ciniza's Operating Records

Trihydro personnel will review all maps and records of replacement, inspection, and installation of all subsurface utilities in the vicinity of tanks 101, 102, and the seeps.

Site walk-through with Ciniza personnel

Trihydro and Ciniza personnel will conduct a thorough site walk-through to identify the location of the seeps and look for any surficial evidence that may assist in determining the source of the seeps and/or delineating the extent of contamination. The area to be investigated during this site walk-through is shown on Figure 1. Surficial evidence of contamination related to the seeps may include staining, areas of unusually high moisture content, additional seeps, and evidence of disturbed soil. Any evidence found during the site-walk-through that may potentially be used to identify the source of the seeps and/or delineating the extent of the contamination will be photographed and recorded in Trihydro personnel's field log book. All photos associated with the subsurface investigation will be recorded on a photo log similar to the one presented as Figure 2.

Marking known utilities in the area

The appropriate Ciniza personnel will be contacted prior to the site walk-through to help identify any known subsurface utilities. These utilities will be marked with fluorescent orange spray paint or flags during the site walk-through so they may be avoided during any subsurface sampling activities. In addition, an excavation permit will be obtained from Ciniza before any drilling, excavating, or subsurface sampling commences.

Conducting an EM-31 Survey

An electromagnetic survey will be performed on an area north of tanks 101 and 102 encompassing both seeps. The area will be approximately 375 feet (north-south) by 725 feet (east-west) and is illustrated on Figure 1. The exact dimensions of the area to be surveyed may be modified based on data collected during the site walk-through. The survey will be performed with a Geonics (or similar) EM-31 ground conductivity meter.

The EM-31 ground conductivity meter creates an electromagnetic induction field into the ground and measures two components of the return electromagnetic field which vary with changes in geology or other subsurface features. The two components are a quadrature-phase component and an in-phase component. The quadrature-phase component is a direct conductivity reading of subsurface geology measured in millisiemens per meter (mS/m). Since moisture content can affect conductivity of the subsurface geology, this phase may be useful in delineating soil contamination associated with the seeps. The in-phase component is a measurement of the magnetic susceptibility of subsurface features and is a good indicator of high-conductivity features such as metal objects and is measured as the ratio of the secondary to primary magnetic field in parts per thousand (ppt). This phase will be helpful in identifying metallic subsurface utilities. The effective depth of response is up to 18 ft bgs. Calibration of the EM-31 ground conductivity meter will be conducted per the manufacturer's instruction and recorded on a calibration from similar to the one presented as Figure 3.

Continuous measurement and recording of ground conductivity and metallic response will be performed in conjunction with GPS navigation. The survey will be completed on foot by Trihydro personnel with the EM-31 and GPS units. The survey area will be divided into a bi-directional grid with a grid spacing of approximately 15 feet. The boundaries of the survey area and the boundary/grid line intersects will be staked prior to conducting the survey.

The EM-31 data will be plotted and mapped using Geosoft's OasisMontaj software. A color grid will generated using the "minimum curvature" algorithm within the program. The color grid will be overlain on an existing site map or aerial photo of the refinery to assist in analyzing the image.

Fluid Characterization

Fluids at the seeps and any potential sources identified during the above tasks will be characterized. Characterization will include, but is not limited to, field measurements of pH, conductivity, and a description of the fluids including any noted odors or sheens. In addition, samples will be collected from the seeps and sent to a laboratory to be analyzed for volatile organic compounds (VOCs) by method 8260, Semi-volatile organic compounds (SVOCs) by 8270, DRO, GRO, and RCRA metals. Other fluid samples may be analyzed for some or all of the above mentioned tests depending on the results of the analyses of the seeps. The field measurements and laboratory analyses will help to identify the type of fluids present at the seeps and may be useful in fingerprinting the source of the seeps. Additional field parameters and/or laboratory analyses may be conducted if it is decided that, based on the above tasks, the information obtained may be useful to meet project objectives.

Soil Characterization

Visually contaminated soils near the seeps, inside the tank berms (both up-gradient and down-gradient of tanks 101 and 102), and other locations, as deemed necessary based on information obtained from the completion the above tasks, will be characterized. Characterization will include logging the soil type based on the United Soil Classification System (USCS) and measuring total organic vapors (TOVs) using a photo-ionization detector (PID). A USCS soil chart is provided as Figure 4. The procedures for taking TOV measurements with a PID are outlined in the General Procedures section below. Laboratory analyses will be conducted on soil samples to show whether or not the soil contamination is seep-related. The analyses performed will be dependent on the results of the analyses performed on the fluid samples collected from the seeps. At a minimum, soil samples will be analyzed for oil range organics using EPA Method 8015 to test for both light and heavier hydrocarbons. Physical soil observations such as staining, odor, and moisture content along with TOV readings and laboratory analyses may help determine the source of the seeps and delineate the extent of contamination.

A soil sample log similar to the one provided as Figure 5 will be filled out for all soil samples characterized during the subsurface investigation field activities. Phase I soil sampling may be conducted using a variety of sampling techniques. Grab surface samples may be collected using a decontaminated spade or shovel. Shallow subsurface samples (less than 12 ft below ground surface (ft-bgs)) may be collected by using hand auger, a manual powered GeoProbe, or by installing test-pits. The most efficient of the above mentioned methods will be chosen based on field conditions. The sample methods are described in detail in the General Procedures section below.

The approximate locations of the up-gradient soil sample locations are illustrated on Figure 1. Up-gradient soil sample depths will be determined based on visual observations and PID readings. Due to the presence of relatively course grained lenses and stringers in the clay underlying the facility, contamination is most likely present in zones surrounded by non-contaminated soils. If seep-related contamination is detected, a sample will be collected above, below, and within the zone of contamination to help determine vertical extent of contamination and identify the type of contaminants. If the vertical extent of contamination can not be determined by the sampling methods proposed as part of Phase I field activities, samples will be collected during Phase II.

Upon completion of Phase I, data will be compiled and evaluated. A collaborative meeting between Ciniza, Trihydro, and NMED will be arranged to review the compiled data and determine if the overall objectives of the project have been achieved. It is possible that the data collected during Phase I will sufficiently meet the objectives of the investigation and potentially reduce the need for Phase II. If Ciniza and Trihydro believe this to be the case, NMED's approval will be obtained before Phase II is modified or omitted. If Phase I does not meet the overall objectives of the subsurface investigation, the Phase I data will assist in determining the necessity and location of boreholes to be installed during Phase II.

Phase II: Drilling and Sampling Activities

Phase II is designed to collect additional data not obtained during Phase I in order to achieve the overall objectives of the subsurface investigation (determining the source of the seeps and delineating the extent of contamination associated with the seeps). Tasks associated with Phase II are presented below.

Continuous Coring of Proposed Borehole Locations

Borehole locations that will assist in achieving overall project objectives will be selected and mapped after the completion of Phase I. Once locations are chosen and the safety procedures outlined in the General Procedures section have been followed, boreholes will be continuously cored using a hollow stem auger equipped with a core barrel to a depth determined to be clean by the field geologist or until groundwater is encountered. Cuttings will be stored on plastic sheeting until project objectives have been met. At that point, based on sampling results and the conclusions of the subsurface field investigation, it will be determined whether or not the boreholes can be backfilled with the excavated material. Ciniza will obtain NMED approval before backfilling the boreholes with the excavated material.

If the results and conclusions of the subsurface investigation determine that the boreholes may not be backfilled with the excavated material, an appropriate disposal method will be implemented after NMED approval is obtained. The boreholes will then be abandoned with clean soil or hydrated bentonite chips.

Field Screening of Continuous Cores

Field screening of continuous cores will be conducted using a PID at intervals no greater than 5 ft. The PID field screening and calibration methods described in the General Procedures section will be utilized.

Borehole Logging

A borehole log similar to the one provided as Figure 7 will be filled out for each borehole installed. Additional field documentation and logging information is provided in the General Procedures section. Photographs will also be taken of each borehole location and documented on the photo log.

Collecting groundwater, LNAPL, and/or soil samples as necessary

If groundwater or LNAPL is encountered during drilling and the information collected during Phase I suggests that a groundwater or LNAPL sample may be useful in achieving the overall project goals, a sample will be collected with a disposable bailer. All sample locations will be photographed and documented. All procedures outlined in the General Procedures section will be followed.

Soil samples will be collected from locations selected based on the results of Phase I to confirm the extent of contamination associated with the seeps. The samples will be extracted from the core barrel using a shovel or trowel as needed and transferred into the appropriate sample container. The analyses conducted will be dependent on the results of the analyses performed on the fluid samples collected from the seeps The laboratory results along with the PID readings and field observations will be accurate indicators of the extent of contamination. All procedures outlined in the General Procedures section will be followed.

Evaluation of Results

After the above tasks have been completed and all data has been compiled and evaluated, a discussion will be held between Ciniza, Trihydro, and NMED to verify that project objectives have been met. If it is determined that project objectives have not been met, this discussion will be used to come to determine what additional data needs to be collected in order to achieve the project goals.

General Procedures:

The following Procedures will be followed during the completion of Phases I and II of the field activities.

Field Documentation and Logging Procedures

Field observations will be critical to meeting project objectives and the verification and interpretation of the laboratory data. Field observations made during soil characterization/sampling will be recorded in the field log book and the forms presented as figures 5 and 6. The following information will be recorded, in indelible ink, where appropriate for each sample:

- Date and name of observer.
- Names and affiliations of sampling team members.
- Names and affiliations of others present at the sampling sites.
- Weather conditions.
- Sampling location and time of sampling.
- Dimensions and orientation of the finished test pit.
- Orientation of sampling location.
- Health and safety measures implemented.
- Sampling site condition upon arrival (concrete cover, standing water, erosion, etc.)
- Soil characteristics and texture.
- Soil observations, including discoloration, hydrocarbon sheens, moisture content, etc.
- Deviations from or clarifications of sampling procedures.
- Miscellaneous conditions which the sampling team finds noteworthy.
- Sampler and model number, sampler calibration, photographs, and other QA/QC data as applicable.
- Type of debris or waste.

- Color of waste, soil and stained soil.
- Relative viscosity of waste.
- Depth below ground surface at which waste, debris, or stained soil is observed.
- Whether groundwater was observed and the depth below ground surface to groundwater.
- Odor qualities (sweet, sulfurous, strong, etc.) will also be recorded if casually noticed; however, field personnel will be cautioned against unnecessary exposure to volatile constituents. PID measurements are intended to measure volatile organic chemicals that might also be detected as odor.

Photograph Documentation Procedures

Photographs will be used to substantiate and augment the field notes. Photographs will be used following the investigation to document the color of sample media, course material at the location, soil staining, stressed vegetation, or other information that led to the collection of samples, and other defining features at each location.

A color photograph will be taken of each soil characterization/sample location, fluid sample location, and of any other noteworthy location that might be useful to meet the project objectives. Each photograph will be numbered and recorded on a photo log similar to the one presented as Figure 2. Following field activities, a separate photographic log will be created for possible use in reporting activities associated with the subsurface investigation. The photographic log will contain the following information:

- Date
- Time
- Photographer
- Field sample identification number
- Direction of the photographic view
- Sequential number of the photograph

PID Field Screening Procedures

The PID will be calibrated using a 100 ppm isobutylene standard each morning before field activities commence. A sample calibration form is provided as Figure 3. Field screening with the PID will involve placement of a representative soil sample into a clean sealable plastic bag for sufficient time for the sample to reach standard temperature (approximately 70 degrees F). Once the sample has reached the required temperature, the PID probe shall be inserted into the bag and the reading taken. Samples should be screened at as close to the same temperature as possible to obtain consistent results.

Hand Auger and Manual Powered GeoProbe Sampling Procedures

Soil samples will be collected from designated locations and depths using a decontaminated 3.25 inch hand auger with 2 inch split stainless steel core sampler or a manually powered GeoProbe with a 1.5 inch core tube lined with a clean acetate liner. The sampling apparatus will be manually driven to the desired sample depth. The sample will then be extracted from the sampler using a shovel or trowel as needed and transferred into the appropriate sample container.

Test Pit Sampling Procedures

The use of test pits may provide an economic and effective alternative to the use of test borings at locations where shallow subsurface samples or data need to be collected. Test pits also provide the opportunity for direct examination of subsurface materials. Once a test pit location has been selected and access controls and health and safety precautions have been implemented, the test pit will be installed using backhoe provided by Ciniza. If the desired sample depth is four feet or less, samplers may enter the test pit and collect the sample with a clean shovel or spade. If the desired sample depth is deeper than 4 feet, one of two approaches may be taken. The first option is excavating the test pit to four ft-bgs and achieving additional depth by using a hand auger or manual geoprobe from the bottom of the test pit. The second option is excavating the test pit to the desired sample depth and collecting a sample directly from the clean bucket of the backhoe being careful to avoid soil that has come in contact with the bucket.

As excavation of a test pit proceeds, all test pit pertinent information will be recorded on a test pit log similar to the one provided as Figure 6. Additional documenting procedures are discussed in the Procedures section below. All soil excavated from any Phase I test pits will be stored on plastic sheeting until project objectives have been met. At that point, based on sampling results and the conclusions of the subsurface field investigation, it will be determined whether or not the test pits can be backfilled with the excavated material. Ciniza will obtain NMED approval before backfilling the test pits with the excavated material. If the results and conclusions of the subsurface investigation determine that the test pits may not be backfilled with the excavated material, an appropriate disposal method will be implemented after NMED approval is obtained. The test pits will then be abandoned with clean soil.

Continuous Core Sampling Procedures

Selected boreholes installed using a hollow stem auger drill rig equipped with a core barrel will be sampled for laboratory analyses. The auger will be advanced to approximately 1 foot above the desired sample collection depth. The clean, decontaminated core barrel will then be advanced through the desired sample collection depth and extracted. Any acetate liners (or equivalent) that are used to line the core barrel will be cut open using a clean, decontaminated liner cutting tool. The samples will be extracted from the liner (or directly from the core barrel if no liner is used) using a shovel or trowel as needed and transferred into the appropriate sample container.

Equipment Decontamination Procedures

Sampling equipment will be decontaminated prior to sampling in the field and after sampling at each location. Sampling equipment will be disassembled into component parts prior to decontamination. Sampling devices will be decontaminated using warm non-phosphate detergent solution (e.g., Alconox) and then rinsing with well water. Sampling devices will be dried before use by air drying or with clean paper towels. Decontaminated sampling devices and containers will be stored in contaminant-free locations or containers until use.

Decontamination of heavy equipment (e.g. backhoe) will not be necessary because this equipment will not contact the material to be sampled. To ensure proper equipment decontamination, one equipment blank will be collected from the sampling equipment used for each day of sampling. Equipment blanks will be collected in appropriate containers.

Quality Control/Quality Assurance Procedures

The following QAQC procedures will be followed:

- Data listed in the Field Documentation and Logging section will be documented on field data sheets. The field data sheets that will be used are included as figures 5 and 6.
- Sample container will be filled completely to minimize headspace and immediately sealed.
- Sample containers will be immediately labeled, recorded on the soil sampling field forms, and stored on blue ice (or equivalent) for transport to the laboratory.
- One blind duplicate will be collected per 20 samples collected.
- Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples will be collected and labeled as MS/MSD samples.
- One equipment blank will be collected each day of sampling.
- Chain-of Custody (COC) will be completed and will accompany the samples to the laboratory.
- The shipping container will be sealed with a custody seal to ensure that the samples have not been disturbed during transportation to the laboratory.

Health and Safety Procedures

Prior to any work being performed for the subsurface investigation, the Ciniza Refinery safe work procedure titled "Safe Work Procedure # 404: Excavations" will be followed. This safe work procedure includes an excavation permit that will be approved and signed by the maintenance manager, maintenance supervisor, lab/operations shift supervisor, and safety representative. The permit is required to be renewed daily. The personnel listed above must re-sign the permit in order for it to be renewed.

Proper access controls and health and safety precautions will be implemented prior to field activities. Protective measures will be employed for limiting access to the sampling sites during sampling, particularly where the use of excavations and/or heavy equipment is required.

Trihydro proposes to implement Phase I of this work plan the week of August 19, 2007. Phase II may commence at a mutually convenient date after Phase I activities have been completed. If you have any questions, please feel free to contact us at (307) 745-7474.

Sincerely,
Trihydro Corporation

Calvin Niss
Vice President

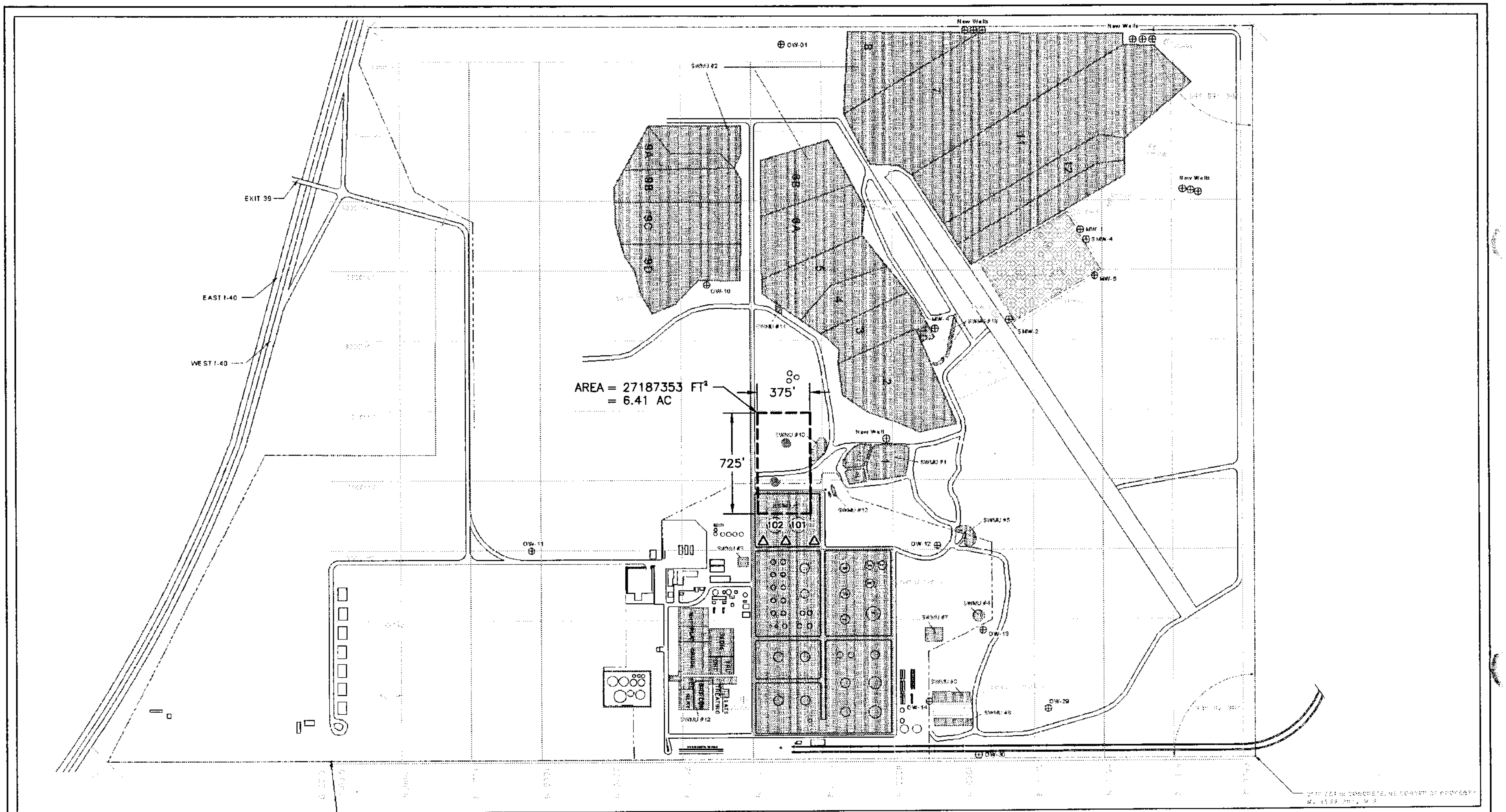
Regina Allen
Project Manager

697-007-001

Enclosures

cc: Ed Riege, Western Refining

FIGURES



Basemap provided by Ciniza Refinery

EXPLANATION

●	APPROXIMATE LOCATION OF SEEP
△	APPROXIMATE UP-GRADIENT SOIL SAMPLE LOCATION
— — — —	APPROXIMATE EM-31 SURVEY AND SITE WALK-THROUGH AREA
FT²	SQUARE FEET
AC	ACRES

N

0 ~700'

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FIGURE 1

APPROXIMATE EM-31 SURVEY AREA, SITE WALK-THROUGH AREA, AND SEEP LOCATIONS SUBSURFACE INVESTIGATION NEAR TANKS 101 AND 102

WESTERN REFINING
CINIZA REFINERY
GALLUP, NEW MEXICO

Drawn By: PC	Checked By: GP	Scale: 1" = ~700'	Date: 8/6/07	File: 697EM31SEEPLOC

FIGURE 2. PHOTOGRAPH LOG
Ciniza Refinery, Gallup, New Mexico

Project Name: ______________________________

Site and Photograph Date: ______________________________

Photo Number		Date		Photograph Description

FIGURE 3: DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date:________________

Filed Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- % from Standard)	Calibrator Initials

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

____
Site Manager

Figure 4: Example USCS Classification Chart

MAJOR DIVISION			GROUP SYMBOL	TYPICAL NAMES (% PASSING #200 SIEVE)	CLASSIFICATION CRITERIA		
Coarse-Grained Soil (<50% passing #200 sieve)	**Gravels** (G>S) (≤50 % passing #4 sieve)	Clean Gravels	GW	Well-graded (poorly-sorted) gravels and gravel-sand mixtures, little or no fines	≤5% passing #200 sieve	If percentage of fines is between 5% and 12%, then soil is considered a borderline classification. These soils require a dual classification symbol.	$C_U = D_{60}/D_{10}$ Greater than 4 and $C_Z = (D_{30})^2/(D_{10} x D_{60})$ Between 1 & 3
			GP	Poorly graded (well-sorted) gravels & gravel-sand mixtures, little or no fines	≤5% passing #200 sieve		Not meeting both criteria for GW
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures	≥12 % passing #200 sieve		Atterberg limits plot below "A" line or plasticity index less than 4
			GC	Clayey gravels, gravel-sand-clay mixtures	≥12 % passing #200 sieve		Atterberg limits plot above "A" line and plasticity index greater than 7
	Sands (G<S) (>50 % passing #4 sieve)	Clean Sands	SW	Well-graded (poorly-sorted) sands and gravelly sand, little or no fines	≤5% passing #200 sieve		$C_U = D_{60}/D_{10}$ Greater than 6 and $C_Z = (D_{30})^2/(D_{10} x D_{60})$ Between 1 and 3
			SP	Poorly-graded (well-sorted) sands and gravelly sands, little of no fines	≤5% passing #200 sieve		Not meeting both criteria for SW
		Sands with Fines	SM	Silty sands, sand-silt mixtures	≥12 % passing #200 sieve		Atterberg limits plot below "A" line or plasticity index less than 4
			SC	Clayey sands, sand-clay mixture	≥12 % passing #200 sieve		Atterberg limits plot above "A": line and plasticity index greater than 7
Fine-Grained Soil (≥50% passing #200 sieve)	**Silts & Clays**	Silts & Clays LL≤50%	ML	Inorganic silts, very find sands, rock flour, silty or clayey fine sands	Above or Below the "A" line		Check plasticity chart L = low plasticity H = high plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Above the "A" line		
			OL	Organic silts and organic silty clays of low plasticity	Below the "A" line		
		Silts and Clays LL>50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	Below the "A" line		
			CH	Inorganic clays of high plasticity, fat clays	Above the "A" line		
			OH	Organic clays of medium to high plasticity	Below the "A" line		
Highly organic soils			Pt	Peat, muck and other highly organic soils			Fibrous organic matter; will char, burn or glow

Notes: #200 sieve has 0.074 mm (0.0029 inch) mesh openings, & #4 sieve has 4.76 mm (0.187 inch) mesh openings
C_U & C_Z, indicate the uniformity coefficient
D_{10}, D_{30} & D_{60} indicate the particle diameter corresponding to the 10%, 30%, and 60% percent finer by weight
LL indicates liquid limits, which is the water content between the plastic and liquid states
PL indicates plastic limit, which is the water content between the semi-solid and plastic states
PI indicates plasticity index, which is the numerical difference of the liquid and plastic limits
"A" line defined on chart of plasticity index (y-axis) v.s. liquid limit (x-axis) at PI = 0.73 (LL-20)

FIGURE 5. SOIL / WASTE SAMPLE LOG
Ciniza Refinery, Gallup New Mexico

Sample Identification: ______________ Logged by: ______________
Sample Location: ______________ Project/Job#: ______________
Date: ______________ Samplers: ______________
Time: ______________ Associated Test Pit: ______________
Weather: ______________ If Duplicate List Original Source: ______________
Site Description: ______________
Photographs: ______________ Coordinates(x,y,z): ______________

Composite Sample Description

Sampling Method: [_] Direct Push [_] Scoop [_] Auger
[_] Other (Describe): ______________
Sample Type: Soil / Waste
USCS Group: ______________
Color: ______________
Texture: ______________
Moisture Content: Dry / Moist / Wet
Density Characterisitcs (Stiffness / Plasticity, Cementation and Hardness): ______________

____
Grain Size and Shape: ______________
Analysis Required: ______________
Number of Sample Bottles: ______________
Notes: ______________

____
____
____

Discreet Soil Interval Description

Graphic Log

0'

6'

12'

Depth (in / ft)	PID/FID Reading (ppm)	Description

FIGURE 6. TEST PIT LOG
Ciniza Refinery, Gallup, New Mexico

Project/Job#: ____________ Logged By: ____________ Date: ____________
Contractor: ____________ Operator: ____________ Test Pit: ____________
Location: ____________ Elevation: ____________ Equipment: ____________
Photographs: ____________ Coordinates(x,y,z): ____________

0 12

0

12

Graphic Log

Field Measures

Depth	TOV	pH

Depth to Water/ Liquid	
Depth	Type

Depth	Description

Figure 7
TRIHYDRO CORPORATION
FIELD BORING LOG

Sheet _____ of _____ Sheets

Project & Project Number:	Date:
Project Location/Address:	Drilling Company:
Client:	Driller:
Weather:	Rig Type / Method:
Logged by:	Sample Method (circle one): Direct Push Split Spoon Shelby Tube Other:
	Surface Elevation: Casing Elevation: GE Elevation:
Logger's Signature:	Equipment List:

BORING ID: **Boring Location:**

Interval (ft bgs)	Texture - Grain Size Major	Minor	Color Major	Modifier	Plasticity	Consistency	Moisture	Odor	PID Interval/Reading	Additional Comments (Odor descriptor, sheen, nodules, structure, vegitation, etc.)
	GVL - F M C Sand - F M C Silt Clay	Grvlly Sandy Silty Clayey	Black Gray - L M D Brn - L M D Red - L M D Other	Red Brown Gray Green Rust Yellow Other %	High Moderate Low Non --	Very Soft Soft Firm Hard Very Hard	Dry Moist Saturated -- --	Strong Moderate Slight None Noted --		
	GVL - F M C Sand - F M C Silt Clay	Grvlly Sandy Silty Clayey	Black Gray - L M D Brn - L M D Red - L M D Other	Red Brown Gray Green Rust Yellow Other %	High Moderate Low Non --	Very Soft Soft Firm Hard Very Hard	Dry Moist Saturated -- --	Strong Moderate Slight None Noted --		
	GVL - F M C Sand - F M C Silt Clay	Grvlly Sandy Silty Clayey	Black Gray - L M D Brn - L M D Red - L M D Other	Red Brown Gray Green Rust Yellow Other %	High Moderate Low Non --	Very Soft Soft Firm Hard Very Hard	Dry Moist Saturated -- --	Strong Moderate Slight None Noted --		
	GVL - F M C Sand - F M C Silt Clay	Grvlly Sandy Silty Clayey	Black Gray - L M D Brn - L M D Red - L M D Other	Red Brown Gray Green Rust Yellow Other %	High Moderate Low Non --	Very Soft Soft Firm Hard Very Hard	Dry Moist Saturated -- --	Strong Moderate Slight None Noted --		
	GVL - F M C Sand - F M C Silt Clay	Grvlly Sandy Silty Clayey	Black Gray - L M D Brn - L M D Red - L M D Other	Red Brown Gray Green Rust Yellow Other %	High Moderate Low Non --	Very Soft Soft Firm Hard Very Hard	Dry Moist Saturated -- --	Strong Moderate Slight None Noted --		
	GVL - F M C Sand - F M C Silt Clay	Grvlly Sandy Silty Clayey	Black Gray - L M D Brn - L M D Red - L M D Other	Red Brown Gray Green Rust Yellow Other %	High Moderate Low Non --	Very Soft Soft Firm Hard Very Hard	Dry Moist Saturated -- --	Strong Moderate Slight None Noted --		
	GVL - F M C Sand - F M C Silt Clay	Grvlly Sandy Silty Clayey	Black Gray - L M D Brn - L M D Red - L M D Other	Red Brown Gray Green Rust Yellow Other %	High Moderate Low Non --	Very Soft Soft Firm Hard Very Hard	Dry Moist Saturated -- --	Strong Moderate Slight None Noted --		