AP - 010

STAGE 1 & 2 WORKPLANS

DATE:

Oct. 14, 1999

Higgins and Associates, LLC

October 14, 1999

Mr. Anthony "Tony" C. Walker
Staff Environmental Scientist
Phillips Pipe Line Company
3811 Adams Building
Bartlesville, Oklahoma 74004

RE: Work Plan for Line NM-1-1 Site
Phillips Pipe Line Company
Hobbs, New Mexico

Dear Mr. Walker:

Higgins and Associates, L.L.C. (Higgins and Associates) has prepared the following work plan for additional assessment activities and pilot testing of remedial options for the Line NM-1-1 site located in Hobbs, New Mexico. The work plan has been developed based on the subsurface hydrogeologic assessment results documented in the Comprehensive Report dated September 15, 1999. This work plan is considered a continuation of the Stage I Abatement plan. As per the letter from Oil Conservation Division (OCD) dated July 2,1999, OCD approval of the Stage I Abatement Plan did not limit PPL to the proposed scope of work should the investigation actions fail to adequately define the extent of contamination. Therefore, it is our understanding that regulatory approval is not required for these activities but will be required for implementation of a Stage II Abatement Plan.

Summary of Comprehensive Report's Conclusions

The assessment activities at the site identified three primary phases of petroleum impact; adsorbed phase hydrocarbons, liquid phase hydrocarbons, and dissolved phase hydrocarbons. The lateral extent of each hydrocarbon phase is summarized below.

The migration of crude oil in the adsorbed phase appears to have occurred in two primary geologic units. A caliche unit which extends from the surface to a depth of 20 to 26 feet in depth and a sand unit which underlies the caliche and extends to a depth of at least 40 feet. The lateral migration of crude oil in the caliche unit appears to have been limited in aerial extent and does not appear to extend more than 50 to 100 feet on either side of the current limits of the excavation. The adsorbed phase impacts in the sand unit are much greater in aerial extent but are confined primarily within the capillary fringe and the upper limits of the saturated zone. The analytical data shows soil impacts are defined to the north by MW-2 and to the south and east by borings MW-3, MW-9, and MW-10. Lateral soil impacts have not been defined west and southwest of borings MW-4 and MW-6.

On July 16, 1999, liquid phase hydrocarbons (LPH) were detected in wells MW-5, MW-6, MW-7, and MW-8. Well MW-1 was not measured due to the deployment of the PetroXtractor product recovery system. The LPH thickness ranged from 0.35 feet in MW-6 to 6.08 feet in MW-5. The LPH plume appears to have been defined. As of September 10, 1999, a total of approximately 2,249 gallons (53.5 barrels) of crude oil have been recovered either by hand bailing or the product recovery system.

The lateral extent of the dissolved phase hydrocarbons have been defined to the north (MW-2), to the east (MW-3), and to the south/southeast (MW-9 and MW-10). The only portion of the site which dissolved phase hydrocarbons have not been defined is to the west/southwest (MW-4). Monitoring wells MW-1 and MW-5 through MW-8 were not sampled due to the presence of LPH. Of the wells absent of LPH, only MW-4 shows dissolved phase hydrocarbons above the New Mexico action levels for benzene and toluene.

Due to the petroleum impacts detected in the soil and groundwater, a Stage II Abatement Plan is expected to be required by the OCD. The following scope of work has been prepared to complete the Stage I Abatement Plan process and to provide the information necessary to prepare the Stage II Abatement Plan as per Rule 19.E.4(b).

Work Plan

Higgins and Associates has prepared the following work plan to complete the definition of petroleum impacts in the subsurface and to evaluate various remedial technologies for addressing the crude oil impacts detected in the subsurface.

The Work Plan will include:

- Additional assessment activities to define the lateral extent of petroleum impacts to the west of borings MW-4 and MW-6.
- Installation of wells for conducting remedial pilot tests.
- Description of the proposed remedial pilot tests.

Additional Well Installations

The known phases of petroleum impacts associated with this site are adsorbed phase hydrocarbons, dissolved phase hydrocarbons, and liquid phase hydrocarbons. The lateral extent of petroleum impacts to the soil and groundwater have been defined to the north, south, and east. The lateral extent of petroleum impacts have not been fully defined to the west. Proposed wells MW-11 and MW-12 are to assist in defining the lateral extent of petroleum impacts to the west of wells MW-4 and MW-6. Well MW-11 is proposed to be located 120 feet southwest of MW-4 and well MW-12 will be located 200 feet southwest of MW-6. The drilling activities will be accomplished utilizing a truck mounted air rotary drill rig. Grab soil samples will be collected at two foot intervals. Due to poor core recovery and difficult drilling from the previous drilling event, continuous coring is not recommended.

Samples will be split into representative portions. One sample will be placed in the appropriate laboratory containers and placed on ice for possible analysis. The remaining portion of the sample will be screened with a photoionization detector as outlined in the OCD guidance document. Two soil samples from each boring, including one sample from the water table interface, will be submitted for laboratory analysis of benzene, toluene, ethlybenzene, and total xylenes (BTEX) by EPA Method 8021, and total petroleum hydrocarbons (TPH) by EPA Method 8015 Modified. The soil samples will be shipped on ice to Pinnacle Laboratories in Albuquerque, New Mexico under chain-of-custody.

Proposed monitoring wells MW-11 and MW-12 are to be constructed to a depth of 40 feet utilizing 2-inch diameter schedule 40 PVC screen and casing. The wells are anticipated to be screened from 20 to 40 feet utilizing 0.020 inch slotted screen. The well annulus will be backfilled with 10/20 silica sand to two feet above the screen. Bentonite and cement will be placed above the sand pack in the well annulus. A locking steel protective riser will be installed on each monitoring well to a height of three feet. Each well will have a fitted J-plug water tight cap and secured with a brass lock.

In order to facilitate pilot testing of applicable remedial technologies at the site, four wells are being installed. Two wells will be installed to a depth of twenty feet and will be completed in the caliche. The other two wells will be constructed across the water table interface and are anticipated to be completed to a depth of 40 feet. One shallow well and one deep well will be constructed utilizing two inch diameter schedule 40 PVC screen and casing. The other two wells will be constructed utilizing four inch diameter PVC screen and casing. The shallow wells will be screened from 10 to 20 feet beneath ground surface. The deep wells will be screened from 10 feet to total depth (estimated at 40 feet).

Following the installation of the proposed wells, each well absent of liquid phase hydrocarbons (LPH) will be developed by bailing and surging with a bailer. Purged groundwater will be collected in 55-gallon drums.

Well Surveying

Following completion of the drilling activities, the wells will be surveyed and tied into the existing survey in order to determine the groundwater elevation and gradient.

Pilot Testing

Two remedial technologies will be evaluated under this scope of work; soil vapor extraction and enhanced aerobic bioremediation through bioventing. Each technology will be evaluated in the caliche and in the sand units.

The SVE pilot test will be conducted using a 5.5 HP Gast blower manifolded first to the shallow four inch diameter well and then to the deep vapor extraction well. Each SVE test will be performed in a stepped approach. Various applied vacuums and/or air flows will be used. Air flow and VOC emission data will be

collected using a air velocity meter and a PID. From this data the VOC emissions will be calculated. Magnehelic gauges will be used to measure applied vacuum at the vapor extraction well and induced vacuum at surrounding wells. Oxygen and CO_2 readings will also be collected from the monitoring points.

Insitu respiration tests will be conducted to evaluate bioventing at the site. The tests will be conducted both in the caliche and in the sand units. The tests will be conducted by injecting a mixture of air and helium (1-2%) into the designated injection wells for up to 24 hours to increase oxygen levels in the vadose zone to a steady state condition. In the caliche, the air is anticipated to be injected utilizing an air compressor. In the sand unit, air will be supplied utilizing a diaphragm compressor. Both tests will be conducted simultaneously. Following reaching steady state conditions in the vadose zone, the air flow will be turned off and measurements of O_2, CO_2, helium and total hydrocarbons in the soil gas will be collected from each monitoring point periodically over time. Before a reading is taken, the monitoring point will be purged with a sampling pump for 1 to 2 minutes until the CO_2 and O_2 readings remain constant. Initial readings will be collected every 2 hours and then progressively over 4- to 8-hour intervals. The test is usually terminated when the O_2 concentrations in the soil gas are about 5 percent or after 4 to 5 days of sampling. The information obtained from this test will be used to determine the biodegradation rates at the site.

Groundwater Monitoring and Sampling

Following completion of the drilling activities, groundwater samples will be collected from all wells absent of LPH. 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.

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:

- Soil sampling equipment will be decontaminated between borings. Down hole drilling equipment will be decontaminated utilizing a high pressure washer.

- 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 soil and 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.

Reporting

Following completion of this scope of work, a Stage II Abatement plan will be prepared as per the OCD requirements. The Work Plan will summarize the assessment activities, pilot test results, groundwater analytical data, and a present the conceptual remedial system design for addressing the petroleum impacts at the site.

Higgins and Associates is pleased to provide environmental consulting services for Phillips Pipe Line Company. If you have any questions or comments regarding the following report please call me at (303) 708-9846.

Sincerely,
Higgins and Associates, L.L.C.

Chris Higgins
NMUSTB Certified Scientist #234
President