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REPORTS

DATE:

6/28/2005

Basin Environmental Service Technologies, LLC

P. O. Box 301
Lovington, New Mexico 88260
kdutton@basinenv.com
Office: (505) 396-2378 Fax: (505) 396-1429

Effective Solutions

PRELIMINARY SITE INVESTIGATION REPORT
and
REMEDIATION PLAN

PLAINS MARKETING, L.P.
Frisco-Skelly # 1
Lea County, New Mexico
Plains EMS # 2004-00196
UNIT P (SE/SE), Section 36, Township 16 South, Range 36 East
Latitude 32°, 52', 20.0" North, Longitude 103°, 18', 12.2" West

1R-457

Prepared For:

Plains Marketing, L.P.
333 Clay Street
Suite 1600
Houston, Texas 77002

Prepared By:
Basin Environmental Service Technologies, LLC
P. O. Box 301
Lovington, New Mexico 88260

28 June 2005

Ken Dutton
Basin Environmental Service Technologies, LLC

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INTRODUCTION

Basin Environmental Service Technologies, LLC (Basin), responded to a pipeline release for Plains Marketing, L.P. (Plains), located on the Frisco Skelly 4-inch Gathering Pipeline on 20 September 2004. The Frisco Skelly 4-inch Gathering Pipeline was clamped and the impacted soils were excavated and stockpiled on a 6-mil poly liner.

This site is located in Unit P (SE/SE), Section 36, Township 16 South, Range 36 East, in Lea County, New Mexico (topographic Site Location Map is attached as Figure 1). The latitude is 32°, 52', 20.0" North, and longitude is 103°, 18', 12.2" West. The site is characterized by a right-of-way for the pipeline in a pasture. The visually stained area includes the release point covering an area approximately 42 feet long by 44 feet wide. Approximately 25 barrels of crude oil were released from the Plains pipeline and 0 barrels were recovered.

An Emergency One-Call was initiated 20 September 2004 and all responding companies either cleared or marked their respective lines. Subsequent renewals of the one-call were accomplished as required.

Mr. Larry Johnson, New Mexico Oil Conservation Division (NMOCD), Hobbs, New Mexico District 1 was verbally notified of the release on 20 September 2004. The City of Lovington, New Mexico, is the landowner and was notified on 20 September 2004. In accordance with the City of Lovington Ordinance # 449, a permit application was submitted 23 September 2004.

SUMMARY OF FIELD ACTIVITIES

On 20 September 2004, Basin arrived at the Frisco Skelly 4" Gathering pipeline release to repair and contain the crude oil pipeline release under the direction of Plains operations personnel. After the release had been contained utilizing a pipeline repair clamp, excavation of the impacted soil was initiated. The impacted soil was placed on a 6-mil poly liner adjacent to the release. The visually stained area is approximately 42 feet long by 44 feet wide.

On 21 September 2004, Basin began extended excavation at the release point area to a depth of 14 feet below ground surface (bgs) attempting to delineate the vertical and horizontal extent of crude oil impacted soil at the release point (see Site Map, Figure 2). Photoionization Detector (PID) readings indicate elevated concentrations of Volatile Organic Compounds (VOC) remain in place. Further excavation of the site continued based on elevated PID readings to a depth of approximately 15 feet bgs. The Frisco Skelly 4" Gathering pipeline was de-oiled and rendered inactive in October 2004. Due to pipeline integrity and safety concerns, a Pure Resource high-pressure saltwater injection pipeline (1600-psi) was relocated to the south of the excavation and is adjacent to the south bench wall. A Pure Resources 2-inch flow-

line was also re-routed to the south of the excavation to allow benching requirements be met. A 10-inch Navajo high-pressure (300-psi) gas line remains in place adjacent to the east bench wall of the excavation (see Digital Photo of Site, Pipeline Locations, Figure 4). Excavation of the site continued and approximately 14, 566 cubic yards have been stockpiled on-site. The excavation site is approximately 190 feet wide by 280 feet long and 18 feet deep.

On 01 November 2004, Basin installed a soil boring, utilizing Straub Corporation, Stanton, Texas, at the release point in order to determine the vertical extent of crude oil impacted soil (see Site Map, Figure 2). The soil boring was installed to a depth of 55 feet bgs (soil boring log is attached as Appendix D) and soil samples were collected at 5-foot intervals. Each sample was screened in the field with a PID, which was calibrated on 01 November 2004. The selected soil samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), and total petroleum hydrocarbons – gasoline range organics/diesel range organics (TPH-GRO/DRO).

Basin researched and obtained the City of Lovington water well location data from the New Mexico Environmental Department, New Mexico Drinking Water Bureau annual drinking water report, conducted in October 2004. The physical locations and recorded depth to groundwater of the water wells were plotted on a topographical map utilizing global positioning system (gps) obtained from the New Mexico Drinking Water Bureau report depicting the Frisco Skelly release site and the City of Lovington water well locations (see City of Lovington Water Well Locations, Figure 5).

On 20 January 2005, Plains personnel met with Mr. Pat McMahon, legal counsel for the City of Lovington and Mr. Eddie Seay, Environmental Consultant for the City of Lovington, at Mr. McMahon's office. Plains proposed several remediation scenarios to the City of Lovington representatives. Mr. McMahon and Mr. Seay stated that they would consider the proposals; however, the City of Lovington board would be the final approval authority.

New Mexico Oil Conservation Division (NMOCD) Soil Classification

A search of the New Mexico State Engineers database revealed water depth information for that section averaged 116 feet bgs; however, research of the City of Lovington water wells indicates that Water Well # 13, located approximately 3500 feet northwest, has a depth to groundwater of 90 feet bgs. Based on the soil boring analytical results, the indicated impacted soil was 40 feet bgs, therefore, 50 feet of non-impacted soil remains between the last known impacted soil depth and groundwater. There are no surface water bodies or water wells within 1000 feet of the release site. Based on this data, the site has an NMOCD Ranking Score of >19, which sets the remediation levels at:

Benzene: 10 ppm

BTEX: 50 ppm

TPH: 100 ppm

Distribution of Hydrocarbons in the Unsaturated Zone

The release point area has been excavated to a depth of approximately 18 feet (bgs) and evidence of crude oil impact still exists on the floor of the excavation. PID readings indicate elevated concentrations of VOC's remain in place. Analytical results indicate that impacted soil exists at 40 feet bgs. Analytical results indicate the four sidewalls of the excavation are below NMOCD regulatory standards for concentrations of BTEX and TPH. BTEX concentrations were not detected above the laboratory method detection limits for the four sidewalls. TPH concentrations were not detected above the laboratory method detection limits for the south and north sidewall. The TPH concentrations for the east and west sidewall were 89.2 mg/kg and 55.1 mg/kg, respectively. Approximately 14,566 cubic yards of impacted soil and segregated clean overburden are stockpiled on-site.

On 01 November 2004, a drill rig was utilized to delineate the vertical extent of crude oil impacted soil at the release point (see Figure 2). Soil samples were collected in the subsurface from the soil boring at 5 feet intervals. No visual observations of free phase hydrocarbons were encountered during the installation of the soil boring (as depicted on Appendix C) or excavation of the site. PID field screenings were utilized to determine which soil samples were to be submitted to the laboratory for analysis. Soil samples were analyzed for concentrations of BTEX and TPH. Laboratory data sheets and chain-of-custody forms are attached (Appendix B).

Soil Boring 1, as depicted on the Site Map (Figure 2), was installed at the excavation floor release point, which was 15 feet bgs. Samples collected at the 5, 10, 15, 20, 25, 30, 35 and 40 feet bgs were analyzed. The soil boring was installed to a total subsurface depth of 55 feet bgs. Analytical results indicated that BTEX concentrations were below NMOCD regulatory standards at 5, 10, 15, 20, and 25 feet bgs. Analytical results were not detected above the laboratory method detection limits for BTEX concentrations at 30, 35 and 40 feet bgs. Analytical results indicated that TPH concentrations exceeded NMOCD regulatory standards at 5, 10, 15, 20, and 25 feet bgs with TPH concentrations of 5100 mg/kg, 5540 mg/kg, 6700 mg/kg, 3068 mg/kg, and 2610 mg/kg, respectively. Analytical results indicated that TPH concentrations were below NMOCD regulatory standards at 5, 30, 35 and 40 feet bgs with TPH concentrations of 78.1 mg/kg, 10.1 mg/kg and 16.9 mg/kg, respectively.

RECOMMENDATIONS FOR DELINEATION/REMEDIATION

In an effort to further delineate the extent of soil impacts and evaluate groundwater, Plains proposes to install 4 soil borings consisting of one boring in each corner of the excavation floor utilizing an air rotary drill rig to delineate the horizontal and vertical hydrocarbon impact of the site (see Figure 3, proposed Soil Boring/Monitor Well locations). Soil boring soil samples will be collected at 5 feet intervals; field screened with a PID, and selected samples will be delivered to a certified laboratory for

analysis. The soil samples will be analyzed for BTEX and TPH-GRO/DRO. The soil borings will be plugged with cement at total depth, filled with bentonite chips and water to the excavation floor surface.

Additionally, Plains proposes installation of three monitor wells, one up gradient and two down gradient, outside the excavation (see Figure 3, proposed Soil Boring/Monitor Well locations). Soil samples will be collected during installation of the monitor wells at 5 feet intervals; field screened with a PID, and selected samples will be delivered to a certified laboratory for analysis. The samples will be analyzed for BTEX and TPH-GRO/DRO. The groundwater monitor wells will be sampled on a quarterly basis to evaluate the quality of groundwater. Groundwater samples will be delivered to a certified laboratory and analyzed for BTEX.

EVALUATION OF SOIL REMEDIATION ALTERNATIVES

Both Basin and Plains have evaluated the site conditions related to use of the surrounding land, soil types, laboratory data results, depth to groundwater, and potential risk to human health and the environment. Based on this information, several remedial alternatives were evaluated. These remedial alternatives include the following:

- Alternative #1 - Excavation to 45 feet bgs, disposal of the impacted soil, and backfill.
- Alternative #2 - Partial excavation to 20 feet bgs, installation of an impermeable liner on the floor of the excavation at 20 feet bgs to isolate the impacted soil from continued vertical migration (risk-based closure); and backfilling of the excavation using treated stockpiled soil exhibiting a TPH concentration less than 1,000 mg/Kg.
- Alternative #3 - Partial excavation to 18 feet bgs, installation of a soil vapor extraction system to remediate the impacted soil below 18 feet bgs, installation of an impermeable liner on the floor of the excavation to isolate the soil from continued vertical migration, and backfilling of the excavation with excavated soil which will also be treated in place with a soil vapor extraction system.

Each alternative is discussed in detail below and includes a discussion of the "pros and cons" of each alternative.

Alternative #1 – Excavation, Disposal and Backfilling

This alternative was selected to be evaluated because Mr. McMahon, representative for the City of Lovington, indicated this would be the preferred alternative if at all feasible.

Based on the results of the initial soil boring installed through the floor of the excavation, it appears that soil impacts above the NMOCD standards are present down to between 40 and 45 feet bgs. Excavation to this depth requires adhering to

OSHA Trenching and Shoring regulations and will require a significant expansion of the excavation. A professional engineer from Pettigrew and Associates was consulted and four (4) excavation scenarios at depths of 23, 28, 38 and 45 feet bgs depicting OSHA Trenching and Shoring requirements requested. Excavation to 23 feet bgs from the present 18 feet bgs level would not require the high pressure Pure Resources pipelines to be relocated, but would dictate significant additional benching and a significant amount of soil be excavated. Excavation to the 28, 38 and 45 feet bgs scenarios would require relocation of the Pure Resources pipelines, significant additional benching and a significant amount of soil to be excavated. Excavating to the 38 and 45 feet bgs scenario would expand the site into the existing east to west caliche lease road south of the excavation. As illustrated on attached Figure 4, several pipelines are located immediately adjacent to the excavation. Significant excavation around these pipelines will present a safety concern with the current locations of the high-pressure 10" Navajo Gas Pipeline (300-psi) and Pure Resources 1600-psi saltwater injection pipeline. Excavation to the 45 feet bgs (78.1 mg/kg TPH) would require the site to more than double the present dimensions. Relocating the Pure Resources pipeline would require an application to deviate from their present pipeline right-of-way from the New Mexico State Land Office and shutting in lines and the wells affected. Logistically and operationally, relocating the Pure Resources injection line is not a feasible alternative and presents an unacceptable risk to the company involved.

Alternative #2 – Partial Excavation and Risk-Based Closure

Based on the results of the initial soil boring investigation, it appears that soil impacts are present down to 40 to 45 feet bgs and groundwater is present at approximately 90 feet bgs. A majority of the source material (impacted soil) has been removed and the remaining portion of the soil impacts appears to be limited in extent. Excavation to 20 feet bgs from the present 18 feet bgs level would not require the high pressure Pure Resources pipelines to be relocated nor additional benching. Since the majority of the source material has been removed and there is approximately 50 feet of non-impacted soil between the top of the groundwater and the lower most soil impacts, this site is a prime candidate for risk-based closure. Plains has worked with the NMOCD and conducted several risk-based closures similar to this site in Lea County. Risk-based closure involves isolating the remaining in-place source material from continued vertical migration of precipitation and natural attenuation of the source material. An impermeable 1-foot clay liner is installed in the base of the excavation and generally extends 3 to 5 feet beyond the horizontal limits of the soil impacts. Stockpiled soil will be treated onsite by blending and aeration techniques until TPH concentrations are less than 1,000 mg/Kg. Once the soil is treated it will be placed and compacted back in the excavation and the remaining soil impacts will naturally attenuate over time. The groundwater monitor wells will continue to be monitored on a regular basis and confirmation soil borings to measure the effectiveness of natural attenuation will also be completed on a regular basis.

Alternative #3 – Partial Excavation and SVE

Based on the results of the initial soil boring investigation, it appears that soil impacts are present down to 40 to 45 feet bgs and groundwater is present at approximately 90 feet bgs. A majority of the source material (impacted soil) has been removed and the remaining portion of the soil impacts appears to be limited in extent. Another feasible alternative to address the deeper impacted soil is Soil Vapor Extraction (SVE), also known as "soil venting" or "vacuum extraction". SVE is an in situ remedial technology that reduces concentrations of volatile constituents in petroleum products absorbed to soils in the unsaturated (vadose) zone. In this technology, a vacuum is applied through wells in the source of contamination in the soil. Volatile constituents of the contaminant mass "evaporate" and the vapors are drawn toward the extraction wells. Extracted vapor is then treated as necessary (commonly with carbon absorption) before being release to the atmosphere. The increased airflow through the subsurface can also stimulate biodegradation of some of the contaminants, especially those that are less volatile. Wells may be either vertical or horizontal. The array of SVE wells will include the appropriate number of extractions wells to address the deeper soil impacts. In addition, during backfilling of the excavation with the stockpiled soils, an array of extraction wells will be placed in the backfill so that once the backfill is complete there will be a sufficient number of wells to remediate the backfill soils separately from the deeper in-situ soils. The groundwater monitor wells will continue to be monitored on a regular basis and confirmation soil borings to measure the effectiveness of SVE system will also be completed on a regular basis.

Application of this technology has been proven effective in reducing concentrations of volatile organic compounds (VOCs) and certain semi-volatile organic compounds (SVOCS) found in petroleum products. SVE is generally more successful when applied to lighter (more volatile) petroleum products.

Operationally, a vacuum is applied to the contaminated soil matrix through extraction wells, which creates a negative pressure gradient that causes movement of vapors towards these wells. Volatile constituents in the vapor phase are readily removed from the subsurface through the extraction wells. The extracted vapors are then treated, as necessary, and discharged to the atmosphere or possibly reinjected to the subsurface (if permitted by applicable state laws).

Some of the factors that determine the effectiveness of SVE are:

- Permeability of the soil,
- Soil structure and stratification,
- Soil moisture, and
- Depth to groundwater.

The permeability of the soils affects the rate of airflow and vapor movement through the soil; the higher the permeability of the soil, the faster the movement and (ideally) the greater the amount of vapors that can be extracted.

Soil structure and stratification are important to SVE effectiveness because they can affect how and where soil vapors will flow within the soil matrix under extraction conditions.

High moisture content in soils can reduce soil permeability and, consequently, the effectiveness of SVE by restricting the flow of air through soil pores. Fine-grained soils create a thicker capillary fringe than coarse-grained soils.

SVE is generally not effective in treating soils below the top of the capillary fringe unless water table depression pumps are used to draw down the water table. In the vicinity of the extraction wells the water table responds to the vacuum by rising, or "upwelling", which can cause the well screen to become submerged thereby reducing airflow.

Design Radius of Influence (ROI) is the most important parameter to be considered in the design of an SVE system. The ROI is defined as the greatest distance from an extraction well at which a sufficient vacuum and vapor flow can be induced to adequately enhance volatilization and extraction of the contaminants in the soil. Extraction wells should be placed so that the overlap in their radii of influence completely cover the area of contamination.

Surface seals might be included in an SVE system design to prevent surface water infiltration that can reduce air flow rates, reduce emissions of fugitive vapors, prevent vertical short-circuiting of air flow, or increase the design ROI. These results are accomplished because surface seals force fresh air to be drawn from a greater distance from the extraction wells.

Based on both Basin and Plains assessment of the available and viable remediation technologies, it appears Alternative # 2 (Partial Excavation and Risk-Based Closure) and groundwater monitoring are the most suitable for the conditions present at the site.

QA/QC PROCEDURES

Soil Sampling

Soil samples will be delivered to Environmental Lab of Texas, Inc. in Odessa, Texas for BTEX, TPH analyses using the methods described below. Soil samples will be analyzed for BTEX, TPH-GRO/DRO within fourteen days following the collection date.

The soil samples will be analyzed as follows:

- BTEX concentrations in accordance with EPA Method 8021B, 5030
- TPH concentrations in accordance with modified EPA Method 8015M GRO/DRO

Groundwater Sampling

The groundwater monitoring wells will be developed utilizing the Environmental Protection Agency (EPA) protocol of approximately nine well volumes of groundwater or until the monitoring wells are dry using an electrical Grundfos Pump. Within forty-eight hours of development, the monitoring wells will be measured and purged of approximately three well volumes utilizing an electrical Grundfos Pump. Groundwater samples will be collected using a disposable Telfon sampler and the groundwater samples will be stored in clean, glass containers provided by the laboratory and placed on ice in the field. Purge water will be collected in a polystyrene tank and disposed of at a licensed New Mexico disposal facility. Groundwater samples will be delivered to Environmental Lab of Texas, Odessa, Texas for analysis of BTEX concentrations using the method described below. All samples will be analyzed within approved holding times following the collection date.

- BTEX concentrations in accordance with EPA Method 8260B/5030

Decontamination Of Equipment

Cleaning of the sampling equipment will be the responsibility of the environmental technician. Prior to use, and between each sample, the sampling equipment will be cleaned with Liqui-Nox® detergent and rinsed with distilled water.

Laboratory Protocol

The laboratory will be responsible for proper QA/QC procedures after signing the chain-of-custody form. These procedures will be either transmitted with the laboratory reports or are on file at the laboratory.

LIMITATIONS

Basin Environmental Service Technologies, LLC, has prepared this Preliminary Investigation Report and Work Plan to the best of its ability. No other warranty, expressed or implied, is made or intended.

Basin Environmental Service Technologies, LLC, has examined and relied upon documents referenced in the report and has relied on oral statements made by certain individuals. Basin Environmental Service Technologies, LLC, has not conducted an independent examination of the facts contained in referenced materials and statements. We have presumed the genuineness of the documents and that the information provided in documents or statements is true and accurate. Basin

Environmental Service Technologies, LLC, has prepared this report in a professional manner, using the degree of skill and care exercised by similar environmental consultants. Basin Environmental Service Technologies, LLC, also notes that the facts and conditions referenced in this report may change over time and the conclusions and recommendations set forth herein are applicable only to the facts and conditions as described at the time of this report.

This report has been prepared for the benefit of Plains Marketing, L.P. The information contained in this report including all exhibits and attachments, may not be used by any other party without the express consent of Basin Environmental Service Technologies, LLC, and Plains Marketing, L.P.

DISTRIBUTION

Copy 1:
Jeff Dann
Plains All American
333 Clay Street
Suite 1600
Houston, Texas 77002
jpdann@paalp.com

Copy 2:
Camille Reynolds
Plains All American
3112 W. Highway 82
Lovington, New Mexico 88260
cjreynolds@paalp.com

Copy 3:
Mr. Ed Martin
New Mexico Energy, Minerals and Natural Resources
Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 88240
ed.martin@state.nm.us

Copy 4:
City of Lovington
Mr. Pat Wise
City Manager
214 South Love
Lovington, NM 88260

Copy 5:
Basin Environmental Service Technologies LLC
P. O. Box 301
Lovington, New Mexico 88260
kdutton@basinenv.com

Copy _____

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