GROUNDWATER QUALITY ASSESSMENT

FOR THE

PHASE V DEVELOPMENT OF THE ARROYO GRANDE OIL FIELD

SAN LUIS OBISPO COUNTY, CALIFORNIA

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for the
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the Arroyo Grande Oil Field
San Luis Obispo County, California

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EXECUTIVE SUMMARY

Freeport-McMoRan Oil & Gas (FM O&G) (formerly Plains Exploration and Production Company [PXP]) proposes to expand its existing operations at the 1,480-acre Arroyo Grande Oil Field (AGOF) through a Phase V Development Plan. The purpose of this groundwater quality assessment report is to assess the potential for the proposed Phase V Development Plan (Project) to adversely impact groundwater quality in the Project area.

The details and daily operations of the proposed Phase V development activities are consistent with historical and current oil and gas activities being conducted for the development of the AGOF. Fresh water will be obtained from onsite water supply wells and utilized during drilling activities for new wells, as well as grounds maintenance. This water is documented to be of better quality that groundwater encountered during oil and gas well installation.

After new wells have been completed and are producing oil and gas, extracted production water will continue to be treated at the water reclamation facility (WRF) and replenished into the AGOF through steam injection or at an appropriately permitted injection well site. The treated production water that is being reintroduced into the ground has been historically documented to be of better quality than that prior to treatment through the WRF. Excess production water not utilized during operations, after appropriate WRF treatment, will be discharged to Pismo Creek in accordance with the current National Pollutant Discharge Elimination System (NPDES) permit conditions. Active water quality monitoring will continue to verify that discharged water quality is equal to or better than the water quality of Pismo Creek.

Historical data and studies document the naturally occurring conditions of affected water quality in the Project area. Water quality is affected by the natural oil seeps and springs along the Pismo Creek and Price Canyon area, and has been documented since early historical record keeping time.

In addition, historical data and studies document that the development activities of the AGOF have not significantly impacted surface or groundwater quality. The proposed Phase V Development Project outlines that the Project activities will be consistent with previously approved development activities and these development activities have not affected surface or groundwater quality. Therefore, the proposed Phase V development activities are not anticipated to affect surface or groundwater quality.

SECTION 1.0
INTRODUCTION

Freeport-McMoRan Oil & Gas (FM O&G) (formerly Plains Exploration and Production Company [PXP]) proposes to expand its existing operations at the 1,480-acre Arroyo Grande Oil Field (AGOF) through a Phase V Development Plan.

The purpose of this groundwater quality assessment report is to assess the potential for the proposed Phase V Development Plan (Project) to adversely impact groundwater quality in the Project area.

The proposed Project, to commence following the completion of Phase IV development of the AGOF (Conditional Use Permit [CUP] D010386D), includes the following principal activities over a period of approximately 10 years:

- Addition of 8 new well pads (with access roads) and modification of 33 existing well pads
- Drilling of approximately 450 wells (approximately 45 per year)
- An increase in production of marketable quality crude oil
- Abandonment of wells no longer capable of production or operation
- Installation of three 85-million-British-thermal-units-per-hour (MMBtu/hr) steam generators
- Installation of additional production and steam lines to support Phase V production, including two areas that would involve jack and boring underneath the Union Pacific Railroad (UPRR) and Price Canyon Road
- Expansion of the existing electrical power system/lines
- Replacement of one existing pipe bridge over Pismo Creek (near existing well pad Signal 113A: herein referred to as the Northern Pipe Bridge)

The AGOF has been developed in phases, and the objective of the Phase V project is to increase the marketable produced crude oil from the AGOF. The increased production of crude oil proposed under Phase V is consistent with the overall goals for the long-term phased development of the field. The permitted production levels under the Phase IV Development Plan for AGOF were approximately 5,000 barrels of oil per day (bopd) (as evaluated in the Phase IV Environmental Impact Report [EIR] [Padre 2004: page 2-1]) (Conditional Use Permit [CUP] D010386D). The actual production levels during the Phase IV implementation are 1,500 bopd. The Phase V project is anticipated to result in increased production levels to approximately 10,000 bopd.

1.1 PROJECT LOCATION

The AGOF is a State-designated Oil Field located in Price Canyon approximately three miles northeast of Pismo Beach in San Luis Obispo County (SLO County), California (Figure 1). The Project site is located on both the east and west sides of Price Canyon Road near the intersection of Ormonde Road, between Highways 101 and 227. The Phase V project lies entirely within the Price Canyon Unit as defined by the California Division of Oil, Gas & Geothermal Resources (DOGGR) (Figure 2).

1.2 BACKGROUND

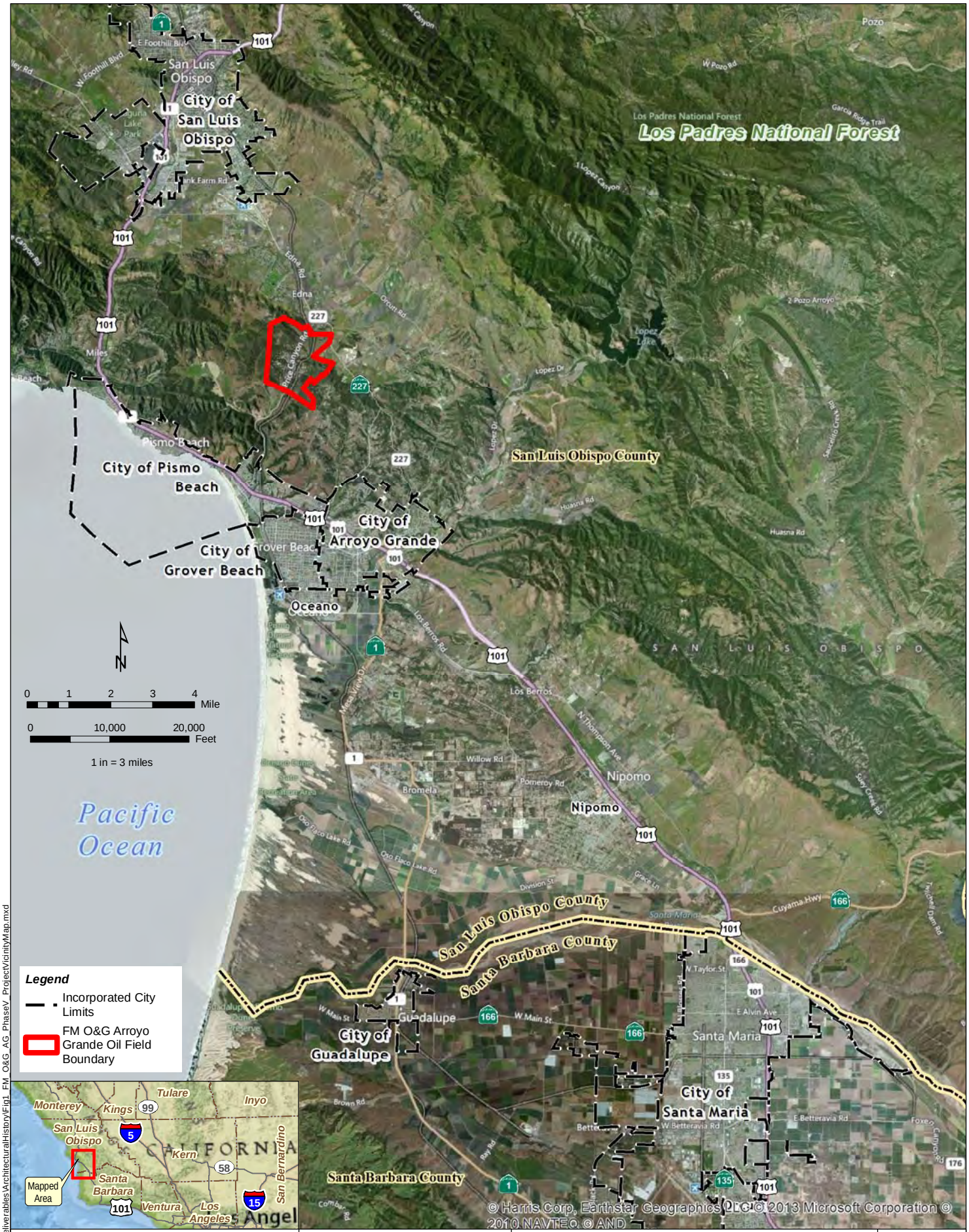
According to historical records that pre-date DOGGR records, the AGOF has been an actively producing field since 1906. DOGGR records officially began recording oil and gas wells for the area in 1919. Since 1919, over 560 wells were drilled in the AGOF. The current facilities, well pads and access roads occupy over 80 acres of disturbed/graded land.

In 1978, Teal Production obtained approval from the SLO County Planning Commission (Planning Commission) for the expansion of oil field operations (Phase I) which included drilling of 54 wells and the installation of associated equipment. Teal was absorbed by Grace Petroleum (Grace) shortly thereafter.

Grace proposed a Phase II expansion. The EIR for this Phase considered the potential environmental effects of the entire AGOF. In 1982, the Planning Commission certified the EIR and approved a Phase II project consisting of 40 wells and one steam generator. At that time, the Planning Commission conceptually approved an additional 160 wells and three steam generators.

The conceptual approval included a delineation of Phases III, IV, and V and the facilities that would be added during each phase; the areas that would be developed during each of these phases were not designated at that time. Subsequently, Grace was acquired by Shell Western Exploration and Petroleum, Inc. (Shell).

In 1994, Shell received approval from the Planning Commission for a Development Plan to allow expansion of the oil field by drilling 65 additional producing wells and to install three steam generators and accessory facilities with an extended phasing schedule (Phase III). In 1997, the AGOF was acquired by Stocker Resources, Inc. (Stocker). In 1998, Stocker underwent a change of name to PXP who operated the AGOF until May 31, 2013. On May 31, 2013, PXP became FM O&G.



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FM O&G AG Phase V Project **FM O&G AG Oil Field** **San Luis Obispo County** URS Corporation	**Source:** [1] Bing Maps Aerial Imagery Web Mapping Service - (c) 2010 Microsoft Corporation and its data suppliers (Image Date: May 8 2010).	**Figure 1.** FM O&G ARROYO GRANDE OIL FIELD PHASE V PROJECT VICINITY MAP	2013

EDNA VALLEY

Edna Valley Fault Zone

Edna Valley Fault Zone

Indian Knob fault

Boundary modified from WZI (2007) and URS (2013) field assessment of alluvial deposits.

PISMO VALLEY

Legend

Groundwater Basins

- EDNA VALLEY
- PISMO VALLEY

FM O&G Arroyo Grande Oil Field Boundary

Geologic Symbols

Contact
Dashed where approximately located; queried where inferred; dotted where concealed

Fault
Dashed where approximately located; queried where inferred, dotted where concealed

"Thrust fault"
Dashed where approximately located; saw-teeth on upper plate; dip of fault plane between 30° and 80°

Anticline
Showing trace of axial surface. Dashed where approximately located

Syncline
Showing trace of axial surface. Dashed where approximately located.

46
Strike and dip of bed
Inclined

Strike and dip of bed
Vertical

X 5285
Megafossil locality - U.C.L.A. locality number

Geologic mappable bed symbols
Sandstone
Siltstone
Conglomerate
Tuff

Horizontal 30 Inclined 90 Vertical
Strike and dip of beds

0 0.25 0.5 Mile
0 1,000 2,000 Feet

Geologic Units

QUATERNARY Holocene

Qal

Alluvial deposits
Qal, unconsolidated pebbles, sand, silt, and clay. Locally includes older alluvial deposits and beach sand.

QUATERNARY Pleistocene

Qt

Terrace deposits
Unconsolidated sand, silt, clay, pebbles. Deposits on marine and stream terraces.

TERTIARY Miocene U Miocene - L Pliocene

pm_2 Tmpm

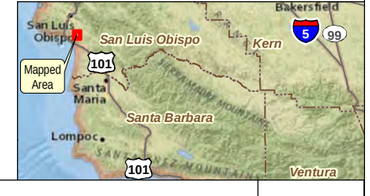
Miguelito Member*
Tmpm, brown clay and silt, becoming more diatomaceous and with cherty or opaline shale beds in west, $Tmpm_2$, diatomaceous siltstone, siltstone, or sandy siltstone

Tmpe

Edna Member*
Tmpe, bituminous quartz sandstone, locally with pebbles at base, $Tmpe_2$, nonbituminous arkosic or quartz sandstone, Tmpec, conglomerate, locally with chert, tuff, or dacite clasts, $Tmpe_3$, coarse-grained quartz sandstone, Tmped, dolomitic hard gray sandstone, $Tmpe_4$, hard buff to gray sandstone * - New stratigraphic names

Tmmc

Monterey Formation
Tmmb, siltstone or chert and blocky weathering dolomitic claystone or silt.; Tmmts, tuffaceous silt.; Tmmc, opaline or cherty shale, some dolomite; Tmmd, diatomite, some blue tuff, locally interbedded with opaline shale and sandstone (Tmms, sandstone loc. dolomitic or tuffaceous); Tmmsh, siliceous siltstone and claystone with *Pecten discus*; Tmmt, white or blue vitric tuff, locally includes some tuff ss.; Tmmsl, claystone and siltstone.



FM O&G AG Phase V Project **FM O&G AG Oil Field** **San Luis Obispo County** URS Corporation	**Source:** [1] Geology of the Arroyo Grande 15' quadrangle, San Luis Obispo County, CA (Map Sheet 24, 1:48,000), by Clarence A. Hall, 1973, CA Div. of Mines & Geology; [2] Groundwater Basins: San Luis Obispo County, Master Water Report, Volume II, May 2012.	**Figure 2.** GEOLOGIC MAP OF PROJECT AREA	2013

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In 2005, PXP received approval for the Phase IV Development Plan to allow expansion of the oil field by drilling 95 additional producing wells and 30 injection wells, and by installing associated facilities including three steam generators with an extended phasing schedule. Five water disposal wells were subsequently approved under the Phase IV plan as Addenda to the EIR. In 2008, PXP received approval from the Planning Commission to install a Water Reclamation Facility (WRF) to treat produced water from the AGOF (CUP DRC2005-00252). As of May 2013, the WRF has been constructed and is operational.

1.3 CURRENT OPERATIONS

The following is a description of current operations at AGOF as they relate to water quality.

1.3.1 Production and Drilling

FM O&G currently operates between 85 and 100 active producing wells and between 37 and 40 active injectors in the AGOF. Production of the field employs thermally enhanced oil recovery via steam injection. The current oil and gas production facilities, well pads, and lease access roads occupy over 80 acres of disturbed/graded land. More wells are being drilled in accordance with the County-approved Phase IV Development Plan. Other wells are formally plugged and abandoned with DOGGR when they no longer are capable of commercial production levels or if mechanical well conditions preclude their future use.

AGOF production facilities include a tank battery (including a dehydration unit), a gas plant, above-ground pipelines, five steam generators, and “steam headers” that distribute steam to the steam injection wells.

Fifty of the 95 production wells and 18 of 30 injection wells, approved in Phase IV, have been drilled. Drilling the remaining new wells under the approved Phase IV project is still planned under Phase IV (Table 1). The maximum number of wells drilled in any given year was 36 in 2007. In addition, current operations include routine well workovers to maintain and/or repair existing wells to maintain mechanical integrity, assure safety, and/or maintain or optimize the level of production.

1.3.2 Steam Injection

The primary method of steam injection utilized at the AGOF is “steam flooding” (with some supplemental cyclic steaming). During steam flooding, steam (obtained from the produced water, described in Section 1.3.3) is injected into dedicated steam injection wells to raise the reservoir temperature, decrease the oil viscosity, and increase oil migration to associated oil production wells. Steam injection has been used as an enhanced oil recovery technique at AGOF since 1978.

This procedure reduces the oil viscosity, allows the oil and water mixture to flow and be pumped from the production wells more efficiently and facilitates recovery of a higher percentage of the original oil-in-place than would otherwise be possible.

Hydraulic fracturing is not conducted at AGOF and is not proposed as part of Phase V development of AGOF.

1.3.3 Produced Water

Producing wells produce an oil-water mixture as well as casing gas. Produced water is a mix of the condensed steam pumped into the producing formations and naturally occurring reservoir water.

The tank battery facilities are used to separate the heavy crude oil from produced water (dehydration) and to store the oil until sold. Approximately 80 percent of the produced water is removed from the oil and then sent to the WRF. The remaining oil and water mixture flows to the gas-fired heater treater where the mixture is heated and remaining water is gravity separated and pumped to the WRF, while the oil is transferred to the storage tanks. Produced water is treated at the WRF according to the strict requirements of a NPDES Permit issued by the Central Coast Regional Water Quality Control Board (RWQCB). Treated produced water is sent to the steam generators to generate steam, and a maximum of 20,000 barrels (bbls) (approximately 0.84 million gallons per day) is discharged to Pismo Creek. Waste brine from the water reclamation process is also injected into approved water disposal wells that are regulated under DOGGR's Underground Injection Control (UIC) program. All of the water needed for steam production is treated produced water from the WRF.

1.3.4 Groundwater Use

There are a total of three groundwater wells located in the northeastern portion of the AGOF that have historically been used to provide freshwater to the field. Only water from on-site groundwater well SW-1 is currently used. The water is utilized for drilling and well maintenance, landscape irrigation, flushing toilets, and dust suppression and other miscellaneous uses. Water from this well is also temporarily stored in two stock ponds lined with a bentonite clay liner totaling 30,000 bbls on AGOF. Bottled water is used as drinking water at AGOF.

1.4 PROPOSED PHASE V ACTIVITIES

The following is a description of the proposed Phase V activities and these activities related to water quality.

1.4.1 Phase V Drilling Activities

The existing on-site water well would continue to be used for drilling and well maintenance activities. Approximately 1,000 bbls of fresh water total per well would be required for drilling activities. Drill cuttings and waste muds would be mostly recycled and reused on site reducing waste and traffic. Liquids would be separated from solids through a dewatering and centrifugation process and injected into an approved waste disposal well. The solid part of the muds and cuttings, if non-hazardous, would be used on site for berm construction (as a means of secondary containment) and any excess solids would be disposed of offsite.

1.4.2 Production and Injection

If all approved wells are drilled, oil production is expected to increase to approximately 10,000 bopd from the new producing wells. The existing tank battery and WRF have adequate capacity to handle this increase in production.

Currently, 6 bbls of steam are required to produce 1 bbl of oil. FM O&G would continue to inject steam generated with treated produced water to utilize enhanced oil recovery; therefore, with the increased number of producing wells, demand for steam would increase. Because FM O&G would continue to improve the steam injection oil recovery methods, aimed at reducing the amount of steam required per barrel of oil produced, the demand for steam is not likely to increase proportionately to the oil production increase.

1.4.3 Groundwater Use and Fresh Water Supply

Under Phase V, groundwater uses would continue for the same applications as current activities (i.e., drilling and well maintenance, landscaping, toilet flush water, fugitive dust, and other miscellaneous uses). At least one of the additional two water wells may be rehabilitated for use as well. Bottled water is currently proposed to continue to be used as the only source of drinking water for onsite personnel at AGOF.

SECTION 2.0
GEOLOGIC SETTING

The Site is located in the southern Coast Ranges geomorphic province of California, which is a province that extends from the Oregon border in the north to Point Arguello in the south and varies from 20 to 80 miles in width from the coastal areas of California to inland. The Coast Ranges geomorphic province is bounded by the Klamath Ranges geomorphic province to the north, the Central Valley geomorphic province to the east, the Pacific Ocean to the west, and the Transverse Ranges to the south.

The Coast Ranges geomorphic province is characterized by northwest trending mountain ranges and valleys, often bounded by faults or paralleled by geologic structures such as synclines and anticlines. Geologic units range in age from Jurassic (approximately 208 million years ago) to recent and include metamorphic, igneous, and sedimentary rocks.

The Site is located in Price Canyon in the southern portion of the San Luis range of the Coast Ranges geomorphic province. The Jurassic age Franciscan formation forms the basement complex of rocks underlying the Site and is comprised of greywacke sandstone, as well as shale, limestone, altered submarine volcanics, and chert. Overlying the Franciscan basement complex are geologic rock units from the Miocene age (23.7 to 5.3 million years ago) Obispo formation, Miocene age Monterey formation, and Miocene age to early Pliocene age (5.3 to 3.4 million years ago) Pismo formation. Holocene to Recent age (10,000 years ago to the present) colluvial and alluvial deposits provide limited cover over the bedrock units.

2.1 GEOLOGIC UNITS

Although the Obispo formation does not outcrop in the study area nor is penetrated by oil wells, regional geologic relationships indicate that the approximately 1,500 to 2,000 feet thick formation is likely present below the overlying and younger Monterey formation. The Obispo formation is comprised almost entirely of interbedded tuff and minor shale, and is not an oil producing formation.

Overlying the Obispo formation is the younger Monterey formation. Although the Monterey formation is not exposed at the surface at the Site, surface outcrops of the Monterey formation are present to the south in Price Canyon and historical oil wells have penetrated the geologic unit within the Arroyo Grande field. The Monterey formation is comprised of diatomaceous shale, siliceous shale, and porcelaneous shale with some interbedded dolomite and limestone, chert, and volcanic ash.

The Pismo formation overlies the Monterey formation in the study area and is the youngest bedrock unit exposed at the ground surface. The Pismo formation is the principle oil producing unit in the study area and consists of five geologic members, of which only the

Edna Member is exposed in outcrop at the Site. Hall (1973) mapped the Edna Member in the site vicinity as comprising three distinct units: a) Tmpe – bituminous sandstone; b) Tmpe2&3 – quartz sandstone; and c) Tmpec – pebbly conglomeritic sandstone (Figure 2 – Geologic Map). The bituminous sandstone (Tmpe) subunit of the Edna Member is believed to be the primary source for petroleum production in the Arroyo Grande field and naturally occurring tar seeps at the ground surface throughout Price Canyon have been well documented (Hall 1973; Dames & Moore 1986; Entrix 1997, 2006a; WZI 2007b).

Overlying the bedrock outcrops of the Site are Holocene to Recent age (10,000 years and younger) sediments of colluvium and alluvial deposits. Observed during site reconnaissance of the Site as part of this study, colluvium is largely distributed on the hillside slopes and in relatively constricted locations within Price Canyon near Pismo Creek, and is comprised of coarse to fine grained sediments derived from bedrock sources. Limited locations within the study area were observed to have a thin veneer (up to several meters), though laterally limited in areal extent, of alluvial deposits near Pismo Creek. These alluvial deposits are comprised of coarse-grained cobbles, pebbles, and sand sediments in stream channels with fine-grained silt and clay over-bank and low flow deposits.

In 2005, as a result of an appeal of the Phase IV Development Plan of the AGOF due to claims of impacts on an alluvial aquifer, groundwater sentry monitoring wells were installed in portions of Price Canyon where alluvium was historically mapped (Hall 1973). Based on a groundwater sentry monitoring well report (Entrix 2006), it was determined that the alluvium was not as extensive as previously mapped and that there was geologic and hydrogeologic separation between alluvium mapped in the north to Edna Valley and from the south in the Pismo Valley Subbasin. WZI also conducted a study, entitled the *Pismo Creek Alluvial Evaluation* (2007a), to evaluate the presence of alluvium in the AGOF and potential to host as an aquifer. As part of WZI's study (2007a), geologic mapping was conducted over a three day period and lithologies were recorded at 54 outcrop locations. The findings and conclusions of the WZI (2007a) investigation indicated that alluvium was not extensive or continuous through the portions of Pismo Creek through the AGOF and that Pismo Creek was incised into bedrock, with numerous crude oil seeps, of the Edna Member of the Pismo formation. WZI (2007a) concluded that "no alluvial aquifer appears to be present within the Pismo Creek drainage in the area of (FM O&G's) property."

As part of this study, geologic reconnaissance of the project site was conducted by a Certified Engineering Geologist (URS) during a one day period to verify the observations described in the study conducted by WZI (2007a). URS observed that alluvium within the AGOF of Price Canyon is not laterally extensive and not continuous. In addition, URS observed that Pismo Creek has incised several meters into Edna Member bedrock of the Pismo formation and naturally occurring oil seeps are present along Pismo Creek. URS is in agreement with the findings of WZI (2007a) that historical mapping of alluvium in Price Canyon is not accurate and an alluvial aquifer through the AGOF does not exist.

2.2 GEOLOGIC STRUCTURE

Geologic structure throughout the Price Canyon area is complex with the structural grain generally trending northwest-southeast and comprised of faults and folded beds (Hall 1973). The AGOF is located on the north limb of the Pismo Syncline and regionally the bedding dips to the southwest (Hall 1973). The Edna fault zone provides a structural boundary between the Edna Valley Groundwater Basin to the north and the Price Canyon entrance to the south (Figure 2 – Geologic Map). The northwest-southeast trending Indian Knob fault is another structural feature located just to the north of the Project area and marks the location of the water gap, formed from Pismo Creek, where alluvial sediments are lacking in part due to the constrained portion of Price Canyon.

SECTION 3.0
HYDROLOGIC SETTING

The following is a discussion of the hydrologic setting affecting the groundwater sources and availability in the vicinity of the Site.

3.1 PISMO CREEK WATERSHED

The Pismo Creek Watershed can be divided into three distinct geologic blocks that are separated by the Huasna fault zone, located far north of the study area, and the Edna fault zone, located near the northern entrance to Price Canyon (Balance Hydrologics 2008). Watershed headwaters north of the Edna fault zone replenish the Edna Groundwater Basin and the Edna fault zone is a structural separation from aquifers replenished by Pismo Creek to the south (Balance Hydrologics 2008).

3.2 HYDROGEOLOGY

Geologic structure controls the hydrogeologic conditions of the study area and vicinity. As previously noted, the Edna Valley Groundwater Basin is separated from groundwater replenishment and basins located to the south by the Edna fault zone. Excess surface flow and possible upwelling groundwater from the Edna Valley provides surface water that flows into Price Canyon by Pismo Creek (Balance Hydrologics 2008).

WZI (2007a) evaluated the presence of the extension of the Pismo Valley Subbasin alluvial aquifer extension into Price Canyon through the AGOF and concluded that the alluvial aquifer did not extend into the AGOF, as well as documenting the numerous naturally occurring oil seeps that affect Pismo Creek and groundwater quality in the area (refer to Appendix B). As part of this current study, URS conducted a field reconnaissance of the Price Canyon Holocene to Recent age deposits along Pismo Creek and also observed the naturally occurring oil seeps that are in direct contact with Pismo Creek.

Pismo Creek is directly incised into bedrock and there is a lack of continuous alluvium through the AGOF (WZI 2007b; Balance Hydrologics 2008; this study). Pismo Creek effectively has limited to some infiltration to recharge bedrock groundwater through portions of Price Canyon until reaching the northern extents of the Pismo Creek Valley Subbasin (of the Santa Maria Basin), which is located in the northern portions of Pismo Creek Valley (southern opening to Price Canyon) (CA DWR 2002). Figure 2 depicts the locations of the hydrogeologic basins of the project area and vicinity. The Pismo Creek Valley Subbasin boundaries in the project vicinity coincide with mapped alluvial sediment extents which are located south of the Site area (CA DWR 2002; WZI 2007a; this study).

SECTION 4.0
WATER QUALITY

Water quality data has been collected in Price Canyon and provided in multiple of historical reports, including but not limited to:

- *Final Geologic, Hydrogeologic and Environmental Assessment, Arroyo Grande Field and Vicinity, San Luis Obispo County, California* (Dames & Moore 1986)
- *Investigation of the Naturally-Occurring Price Canyon/Arroyo Grande Oil Seeps* (Entrix 1997)
- *Revised Hydrologic, Water Quality, and Biological Characterization of Pismo Creek* (Entrix 2006a)
- *Reasonable Potential Analysis and Options Analysis, Plains Exploration and Production Company, Produced Water Reclamation Facility, 1821 Price Canyon Road, Pismo Beach, California* (Entrix 2007)
- *Surface and Groundwater Phase IV Issues, Arroyo Grande Field, San Luis Obispo County, California* (WZI 2007b)
- *Hydrology and Geology Assessment of the Pismo Creek Watershed, San Luis Obispo County, California* (Balance Hydrologics 2008)
- *Planning Area Constraint Study (for the Price Canyon Specific Plan update)* (Fugro West 2009)
- *San Luis Obispo County Public Works Department Hydrologic Reports* (San Luis Obispo County 2012)
- *California Groundwater Bulletin 118 – San Luis Obispo Valley Groundwater Basin* (DWR 2003)

In addition to the direct studies of water quality in Price Canyon, prior Environmental Impact Reports were prepared for the Phase IV Development Plan, as well as the Water Reclamation Facility then proposed by PXP. Summaries of the existing water quality and potential impacts from the respective projects are provided in those documents. Poor existing and naturally-occurring water quality conditions are also summarized in the Environmental Impact Reports, and as discussed in more detail below.

4.1 SURFACE WATER QUALITY

Historical studies of the Pismo Creek Watershed, and the included location of Pismo Creek that traverses through the AGOF, have documented poor water quality conditions. Entrix (2006a) conducted a study of Pismo Creek that focused on the surface water conditions

within the AGOF and nearby area. Entrix collected water samples from Pismo Creek within the AGOF and approximately 2,000 feet upstream and water quality parameters were similar between samples with the AGOF and upstream. From the laboratory analyses of the collected samples, 75 priority pollutants and water quality constituents were detected out of the total suite investigated. Entrix (2006b) reported detections of metals, semi-volatile organic compounds (SVOC), volatile organic compounds (VOCs), pesticides, and inorganic compounds. However, out of the 75 constituents that were detected, only the heavy metals selenium, iron, and zinc were detected at concentrations that exceeded the Basin Plan water quality objectives. Entrix (2006b) concluded, and subsequent testing as part of the NPDES permit for the approved WRF confirmed, that discharge of treated water from the WRF does not significantly impact water quality.

Naturally occurring oil seeps have been documented in the Price Canyon area and notably in the lower elevations of Price Canyon in Pismo Creek. The naturally occurring oil seeps have previously been documented in the report titled: *Investigation of the Naturally-Occurring Price Canyon/Arroyo Grande Oil Seeps*, prepared by Entrix (1997), and the report is included in Appendix A. As previously discussed, URS conducted a reconnaissance of the AGOF along Pismo Creek as part of this study and also observed naturally-occurring oil seeps and sheens in the waters of Pismo Creek that could also result in detections of total petroleum hydrocarbons.

4.2 GROUNDWATER QUALITY

Groundwater within the AGOF overlies a naturally occurring oil-bearing formation and oil regularly migrates naturally upward from depth through groundwater and to the ground surface. Groundwater sampling conducted by Entrix (2006b) demonstrated no change in analyzed water quality parameters from sampling conducted by Dames & Moore (1986) and the comparison of that data was concluded to indicate that ongoing steam or wastewater injection activities did not have a significant impact to groundwater quality (Padre 2008).

Groundwater quality studies have documented elevated concentrations of several constituents in the Price Canyon area. Sampling conducted by Dames & Moore (1986) detected elevated iron and manganese concentrations above Secondary Drinking Water Standards. Sentry well monitoring conducted by PXP as part of the Phase IV EIR implementation indicated that naturally occurring petroleum hydrocarbons were detected during the installation and sampling of the sentry groundwater monitoring wells (Entrix 2006b). Field observations during sampling indicated petroleum sheen on the groundwater and laboratory analyses results during the installation detected TPH at concentrations indicating both dissolved phase and free-phase hydrocarbons in the gas, diesel, and motor-oil range (Entrix 2006b). Subsequent groundwater quality monitoring of the sentry wells is consistent with the initial sentry well installation data (Entrix 2006b; URS 2012).

In addition to the site-specific groundwater quality studies, the California Department of Water Resources (2002) reports that the Pismo Creek Valley Subbasin does not meet drinking water standards for total dissolved solids, chloride, and sulfate concentrations, as well as having elevated concentrations of nitrates.

SECTION 5.0
CONCLUSIONS

The proposed Phase V development activities are consistent with historical and current oil and gas activities being conducted for the development of the AGOF. Groundwater extracted for use in drilling and site operations will continue to be supplied from freshwater supply wells. Production water removed during oil and gas well pumping will continue to be treated at the WRF and discharged to Pismo Creek under the current NPDES permit conditions. Active water quality monitoring will continue to verify that discharged water quality is equal to or better than the water quality of Pismo Creek. The additional release of this treated water adds supply to any groundwater recharge through Pismo Creek infiltration and into the Pismo Creek Groundwater Subbasin.

Historical data and studies have well documented the naturally occurring conditions of affected water quality in the Project area. Water quality is affected by the natural oil seeps and springs along the Pismo Creek and Price Canyon area, and has been documented since early historical records.

In addition, historical data and studies document that the development activities of the AGOF have not significantly impacted surface or groundwater quality. The proposed Phase V Development Project outlines that the Project activities will be consistent with previously approved development activities and these development activities have not affected surface or groundwater quality. Therefore, the proposed Phase V development activities are not anticipated to affect surface or groundwater quality.

SECTION 6.0
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APPENDIX A
INVESTIGATION OF THE NATURALLY-OCCURRING PRICE CANYON/ARROYO GRANDE OIL SEEPS

INVESTIGATION OF THE NATURALLY-OCCURRING PRICE CANYON/ARROYO GRANDE OIL SEEPS

Prepared for:

STOCKER RESOURCES, INC.
5640 South Fairfax Avenue
Los Angeles, California 90056

Prepared by:

ENTRIX, Inc.
411 North Central Avenue, Suite 210
Glendale, California 91203

Project No. 686112

September 18, 1997

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Appendix A Laboratory Report

Stocker Resources, Inc.
Investigation of the Naturally-Occurring
Price Canyon/Arroyo Grande
Oil Seeps

This report has been prepared by ENTRIX, Inc. under the professional supervision of the Principal(s) and/or staff whose signature(s) appear hereon.

The findings, interpretations, recommendations, specifications or professional opinions are presented, within the limits prescribed by the client, in accordance with generally accepted professional geologic practice. There is no other warranty either expressed or implied.

Daniel R. Tormey, Ph.D.
California Registered Geologist No. 5927

9/18/97
September 18, 1997

Oil and gas seeps are active in California along the Pacific Coast (both onshore and offshore), in the coastal mountain ranges, and in the central and western valleys (C.D.O.G., 1987). Observations of naturally-occurring seeps were made along Price Canyon Road and in the Arroyo Grande Oil Field in San Luis Obispo County (Figure 1). Stocker Resources, Inc. authorized ENTRIX, Inc. to document the occurrence and composition of these seeps, and to evaluate their historic persistence. This report provides the findings of the evaluation, and is organized as follows:

- Section 2.0 provides information from historical and literature sources regarding the Price Canyon/Arroyo Grande Oil Seeps.
- Section 3.0 describes their occurrence in more detail based on field observations made in this study.
- Section 4.0 provides a description and quantification of the geochemistry of the oil emanating from the seeps, and compares them to oil from the deeper production zones, and from areas of former oil leaks on the field.
- Section 5.0 summarizes the findings of this report.

2.0

PREVIOUS STUDIES OF THE PRICE CANYON/ARROYO GRANDE OIL SEEPS

The Price Canyon/Arroyo Grande oil seeps have been present since the first written records of the area. They have been used by the Native American (Chumash) residents to caulk boats and water containers, and were observed by the earliest Spanish explorers in the region. More recently, they have been mined for asphalt, and evaluated as an unconventional source of oil in the 1940's. This section summarizes some of these previous observations and studies.

2.1 EARLY DESCRIPTIONS BY SPANISH EXPLORERS

The Spanish explorer Portola describes the Price Canyon seeps in a journal entry (quoted in Gibson, 1992):

> *On May 12, 1770, we left these canyons and arroyo of San Ladislao and the rancheria of the Buchon and continued to the north, northeast. The stream of this canyon doesn't run but is a marsh. In 1/4 league* [1 league = 2.6 miles] *of walking we arrived at a group of hills very big and wide, and we crossed their slope and there were many outcrops of melted tar or chapopote, and we had to throw 200 sticks into the tar and then we crossed forward and in a league turned north in this broad canyon* [Edna Valley].

The explorer Pedro Fages described the Price Canyon Seeps in his 1775 summary report of the Portola expedition (quoted in Gibson, 1992):

> *At a distance of many leagues from this mission [San Luis Obispo], there are as many as eight springs of bitumen or thick black resin which they call chapopote; it is used chiefly by these natives for caulking their small water craft, and to pitch the vases and pitchers which the women make for holding water. This black liquid springs from the ground and runs amid the water of the streams without commingling with it or giving it a bad flavor; I observed that, on the contrary, the water of such supplies was most excellent. The source or spring of this bitumen is four leagues farther up, in a canyon which runs east and west, in which it is seen collected in pools arising from different sources and running together with the water, like that of the springs farther down.*

The oil and asphaltum from deposits such as this were used by early settlers of the area to pave roads, fuel lamps, grease wagon axles, and oil machinery (C.D.O.G., 1987). The historical record suggests that the extent of surficial oil and asphaltum at the site was considerable, and perhaps greater than that observed today.

2.2 PREVIOUS STUDIES OF THE PRICE CANYON/ARROYO GRANDE SEEPS

Surface seeps have led to the discovery of nearly every petroliferous province in the world, including the Arroyo Grande Oilfield in 1906 (Link, 1952). An oil or gas seep forms where oil or natural gas emerges at the surface from a subsurface source. Seeps may reach the surface by migration along fractures, joints, fault planes, unconformities, or bedding planes, or through the porosity of the rock (C.D.O.G., 1987). Large seeps may be deposits of nearly pure oil, asphaltum, or semisolid bitumens; usually, however, the deposits are mixed with different amounts of sand, sticks, clay, leaves, peat, animal bones, and debris (C.D.O.G., 1987).

The Price Canyon seeps are probably the largest surface occurrence of tar sand in California (Hallmark, 1982). The surface deposits were mined for over 28 years beginning in 1887, with approximately 150,000 tons removed for use as paving material (Dames and Moore, 1987). The following description in this paragraph is taken from Hallmark, 1982. The tar sands are part of the Pismo Formation (early Pliocene and late Miocene). Outcrops occur sporadically throughout a large area, and the beds are underlain by the petroliferous Monterey shales. Previous estimates of the resource potential of the seeps have been concerned with their strip mining potential (Shea and Higgins, 1945), and the studies considered no deeper than 250 feet. The deposit actually extends to much greater depths, where the tar becomes fluid and is produced by wells from depths of 500 to 1,500 feet. Tests conducted on the shallow deposits yielded 9 to 16 percent bitumens by weight, with an average content of 11 percent. This corresponds to about 26 gallons per ton. The total reserve, estimated to a depth of 250 feet, was about 283 million tons, or about 175 million barrels of oil in-place. The total resources in-place may be many times greater than this estimate because more recent wells have penetrated as much as 1,200 feet of tar sand (Adams and Beatty, 1962).

The occurrence of seeps in the Arroyo Grande Oilfield was mapped in September, 1997. The surface expression was mapped on a USGS 7.5' quadrangle map (Figure 2). A regional map of the occurrence of surficial tar sands, taken from Hallmark (1982), is provided in Figure 3.

The deposits occur in several forms (see photographs, Figure 4). Most pervasive is a slightly or moderately bituminous gray sandstone, clearly distinguishable from the native tan color of the sandstone. As the percentage of oil increases in the sandstone, the rock becomes black in color, and eventually flows as a highly viscous mass. There are numerous landslides in the bituminous sands that represent sloughing off of the material as it becomes oil-rich enough to flow. The seeps also occur as oil emanating from fractures in the sandstone. Some of these fracture-hosted seeps produce small pools of oil at the surface. There are many occurrences of seeps in Pismo Creek's channel, as noted earlier by the Portola expedition. At the northern portion of the field, a sheen was observed on Pismo Creek adjacent to a flowing seep. In the central portion of the field, a gas seep was observed bubbling near the thalweg of the creek.

The seeps are pervasive throughout the oilfield. The greatest concentration of occurrences are in the central and eastern portion of the field. Seeps are observed at the topographically lowest portions of the field (in the channel of Pismo Creek) as well as at higher elevations.

Several samples were collected to characterize the background hydrocarbon concentration at the oilfield due to the seeps. The following describes the samples; the locations are plotted on Figure 2:

- Seep 1: Weathered outcrop north of main entrance
- Seep 2: Flowing oil from seep near main entrance
- Seep 3: Bituminous sand near Edna dehydrator units; sloughing
- Seep 4: Weathered oil near reported steam breakout
- Seep 5: Sediment and water samples from seep flowing into Pismo Creek
- Crude Oil 1, Crude Oil 2: Oil from the shallow portions of the production zone, well Tiber 68

The samples were analyzed for total petroleum hydrocarbons (TPH) by a modified EPA method 8015 utilizing a GC/MS combination. The chromatogram of each sample is also provided in order to characterize (fingerprint) the material. The samples were also analyzed for volatile organic compounds (VOCs) by EPA method 8240. The complete laboratory report, including chromatograms, is included in Appendix A.

The direct seep samples (Seep 1, 2, and 3) show a relatively weathered chromatogram; all have two humps at 15 minutes and 22 minutes. Seep 1 and Seep 2, primarily oil, have a composition in the range C_{10} to C_{36}. The chromatogram for Seep 1 has a more weathered appearance than Seep 2, consistent with the field observations of these two occurrences. The bituminous sand, Seep 3, is more depleted in low carbon-number compounds, and has a composition in the range C_{12} to C_{36}.

The direct seep samples are clearly distinguishable from the produced oil from Tiber 68. Oil 1 and Oil 2 have compositions in the range C_{10} to C_{34}, with a much higher abundance in the low carbon-number range than the seep samples. The characteristic weathered appearance of the seep sample chromatograms is absent from the chromatograms for the produced oil.

The sample from near the reported steam breakout, Seep 4, is not clearly distinguishable from the samples Seep 1, Seep 2, or Seep 3. The Seep 4 chromatogram most closely resembles that for Seep 2, the sample from the flowing oil seep. The Seep 4 chromatogram displays a weathered pattern, and the composition is in the range C_{12}-C_{36}.

The sediment and water samples from Pismo Creek contained relatively high amounts of TPH. The sediment samples range from not detected to 3,600 mg/kg. The water samples ranged from 270 to 700 µg/l. The water had a visible sheen on the surface near the sample location. These samples represent a measure of the background composition of soil and water in the area in the vicinity of seeps, but not from the seeps themselves.

None of the samples contained detectable VOCs. The samples Oil 1 and Oil 2 were not analyzed for VOCs.

The following summarizes the main conclusions of this report:

- The Price Canyon/Arroyo Grande Oil Seeps have been active since the first Spanish explorers recorded them, and archaeological records indicate prior use by Native Americans (Chumash).
- The seeps were extensively mined for over 28 years beginning in 1887, with approximately 150,000 tons removed for use as paving material.
- Early estimates (1945) of the petroleum reserves in the seeps and shallow tar sands were about 283 million tons, or about 175 million barrels of oil in-place.
- The seeps are pervasive throughout the Arroyo Grande Oilfield, with a greater concentration of locations towards the eastern portion of the field. The seeps produce a very high background (that is, unrelated to oil production) concentration of TPH in the local environment.
- Seeps occur in the channel of Pismo Creek, resulting in high, naturally-occurring, TPH concentrations in sediment (up to 3,600 mg/kg) and water (up to 700 µg/l). Sheens were apparent on Pismo Creek as a result of the naturally-occurring seeps.
- The seeps are compositionally distinct from the oil produced from deeper levels (750 to 1,500 feet). The chromatograms from the seeps show a more weathered pattern, and compositionally they are richer in the long-chain hydrocarbons than the produced oil.
- The seeps are compositionally similar to surficial oil collected near the reported location of a steam breakout.

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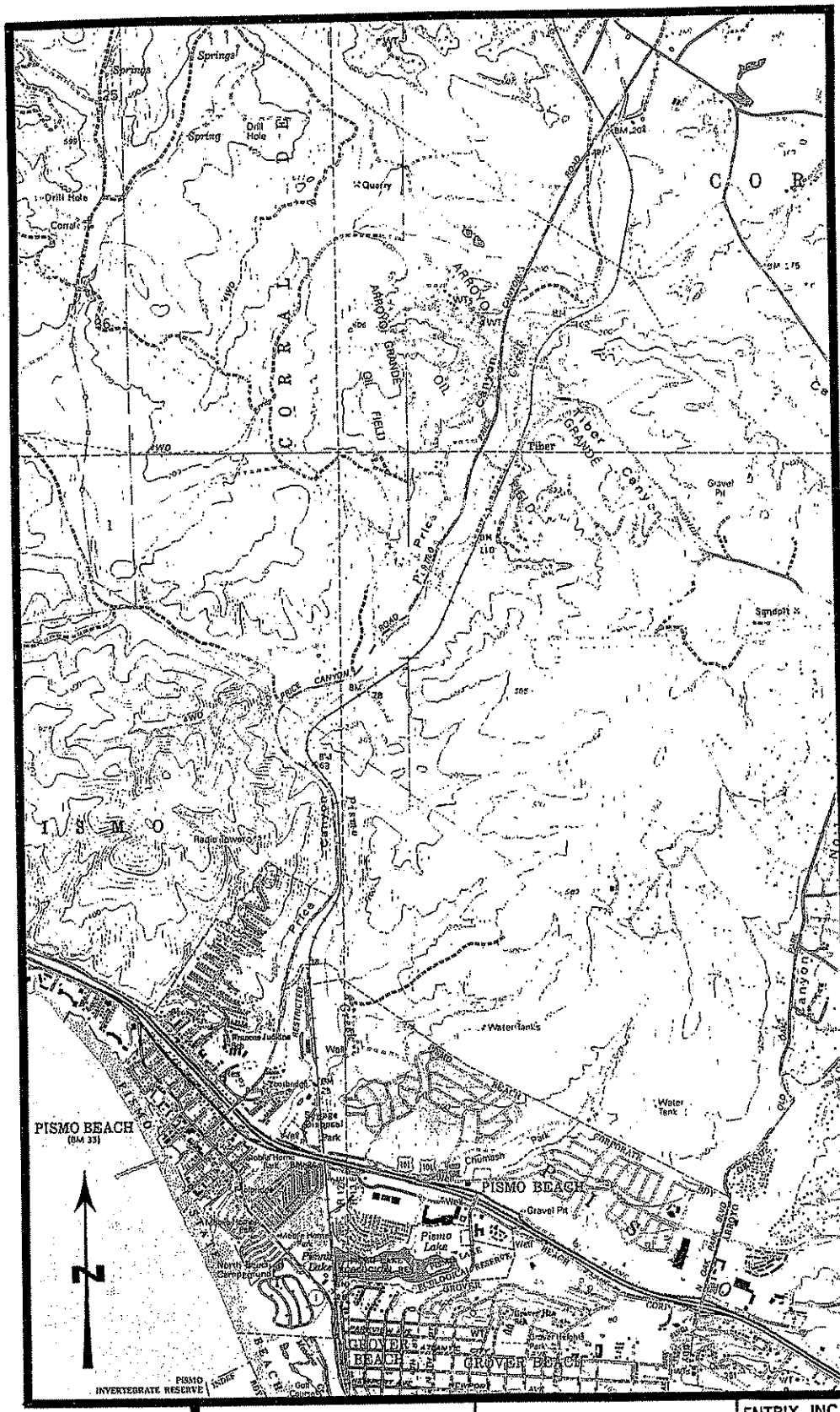
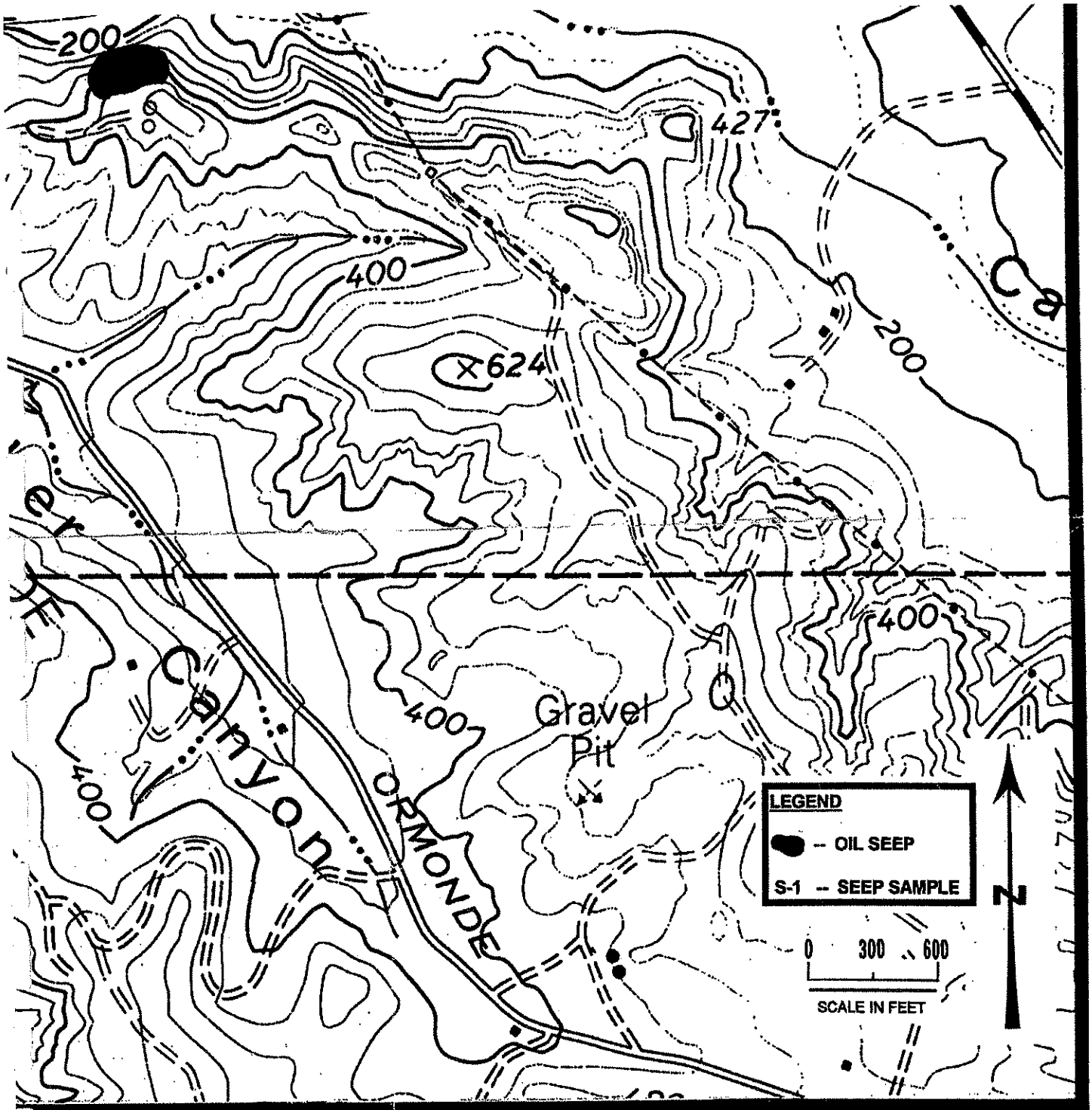
FIGURES



PROJECT NO. 686112	FIGURE 1	ENTRIX, INC. GLENDALE CALIFORNIA
STOCKER RESOURCES, INC. ARROYO GRANDE FIELD	SITE LOCATION MAP	



PROJECT NO. 686112	FIGURE 2	ENTRIX, INC. GLENDALE CALIFORNIA
STOCKER RESOURCES, INC. ARROYO GRANDE FIELD	LOCATIONS OF NATURAL OIL SEEPS	

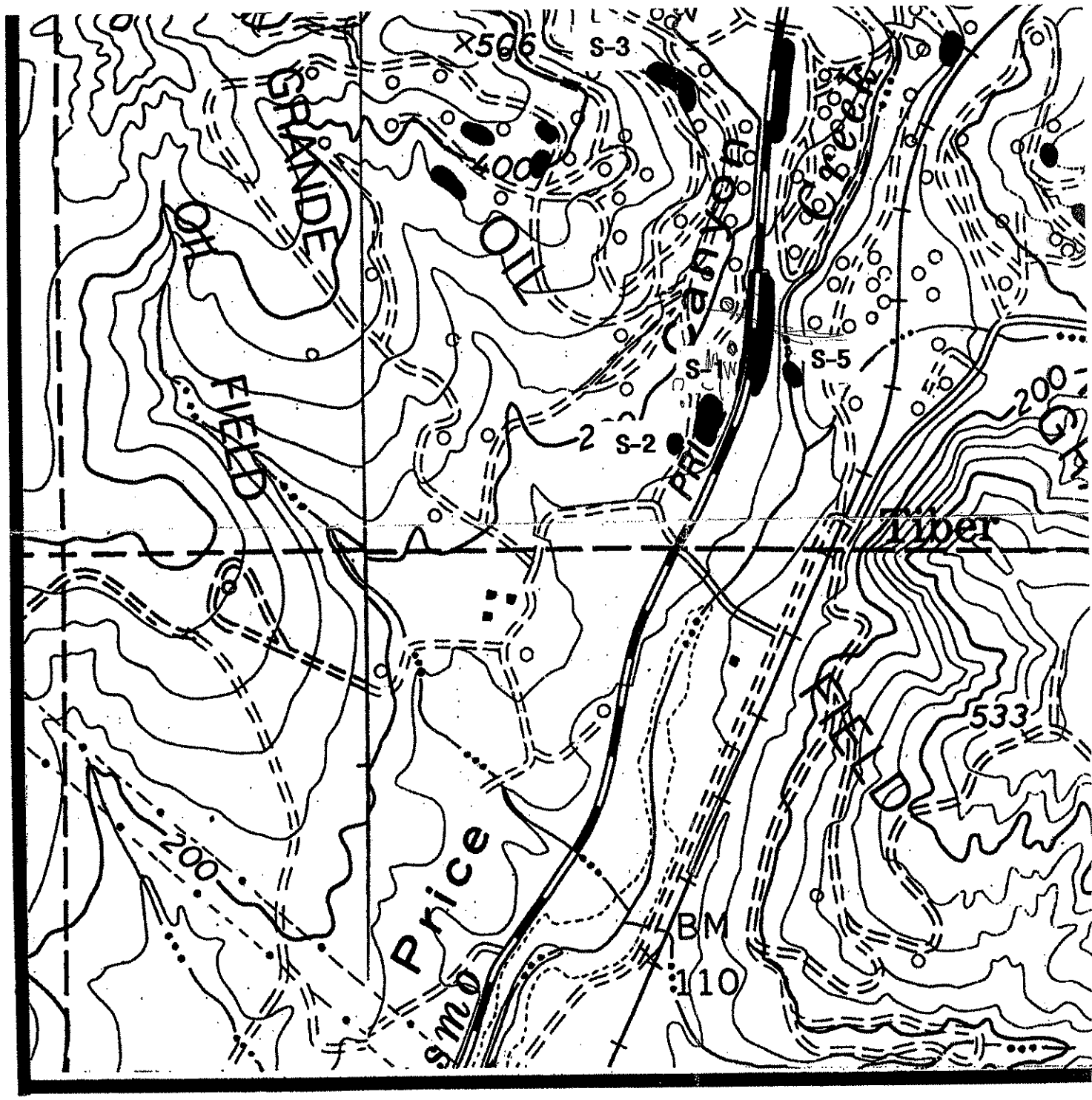

GRANDE
OIL
FIELD
OIL
Canyon
Creek
Creek
S-3
S-5
S-1
S-2
2
400
506
200
200
Upper
533
Price
BM
110

Figure 2a

Figure 2b

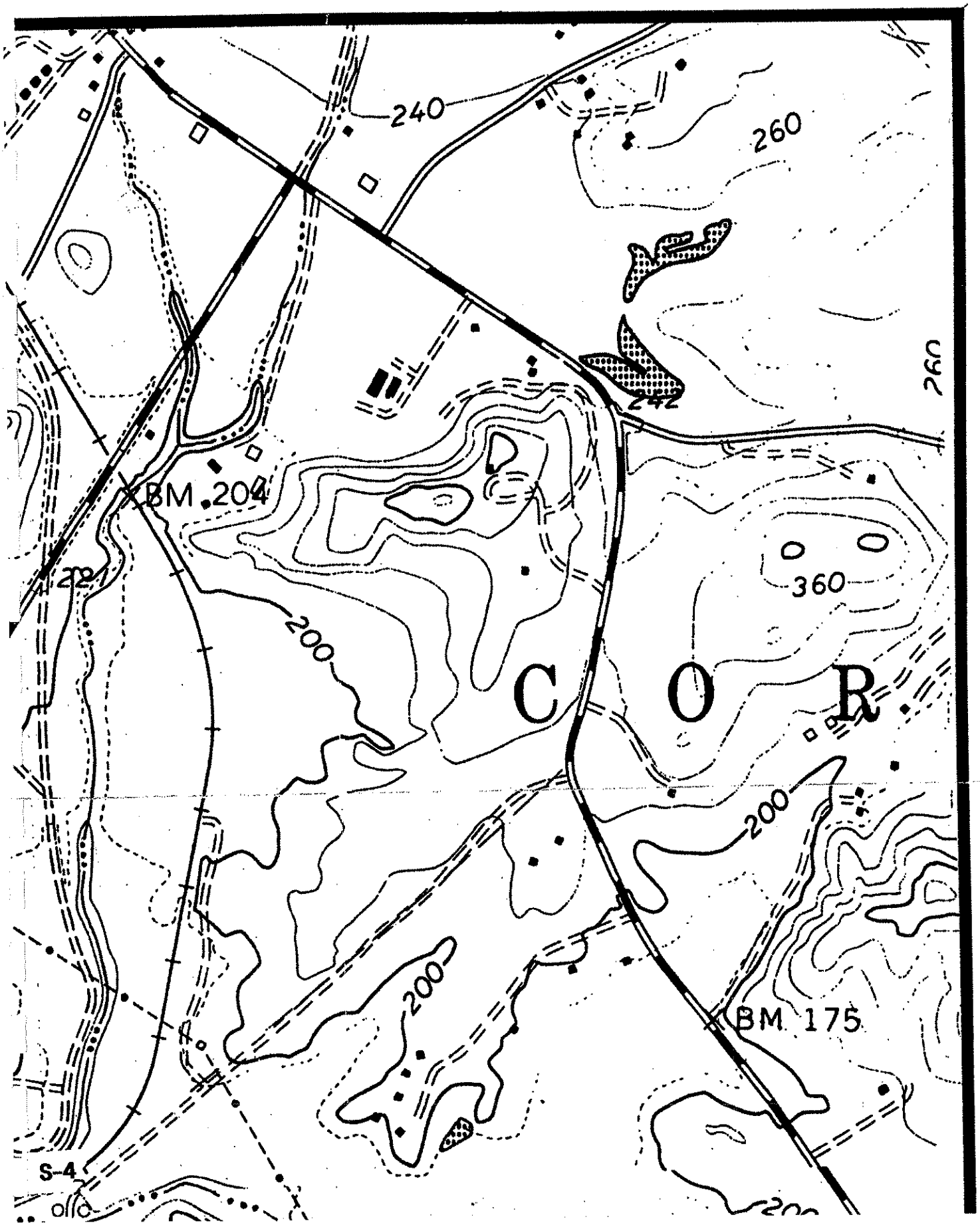
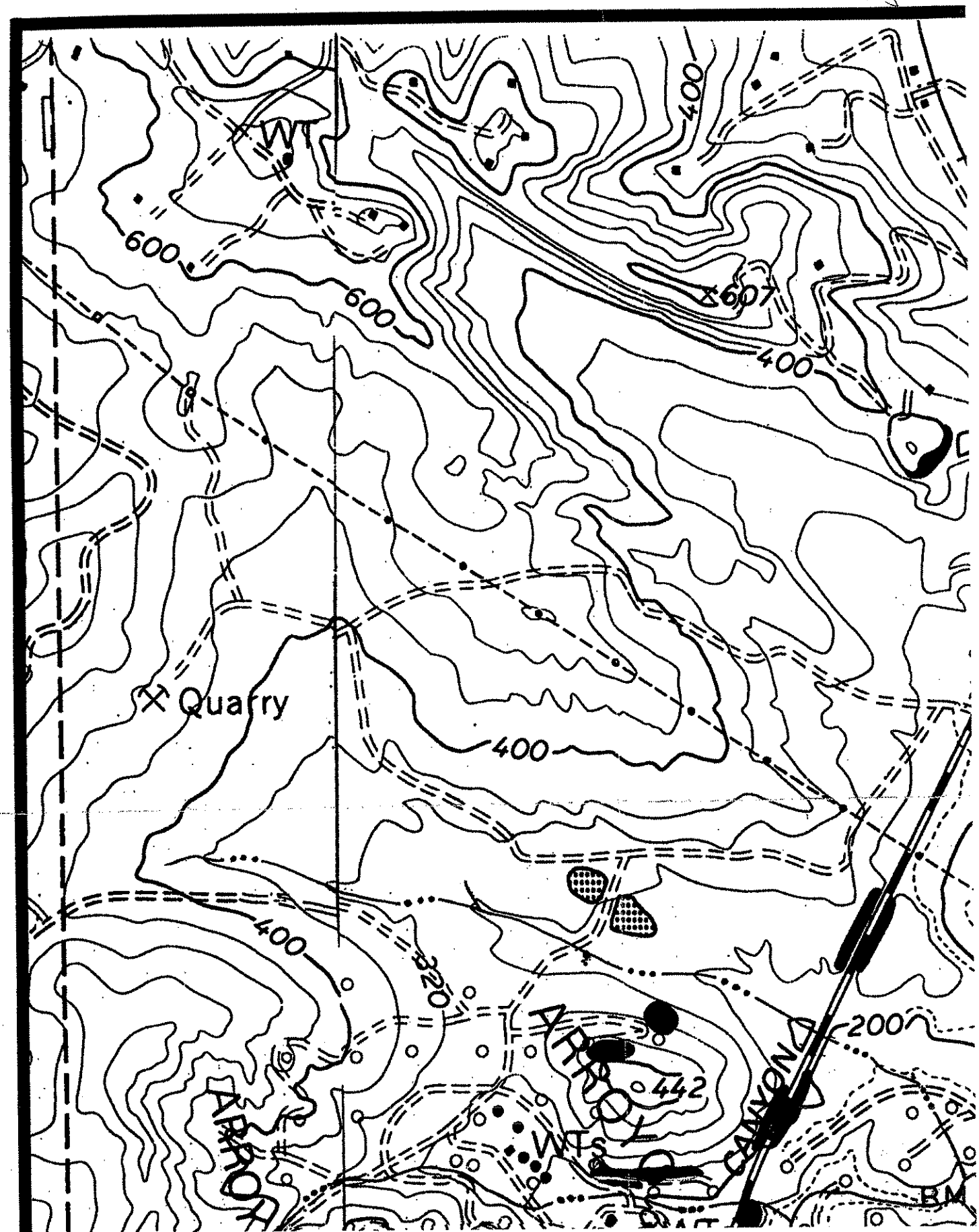
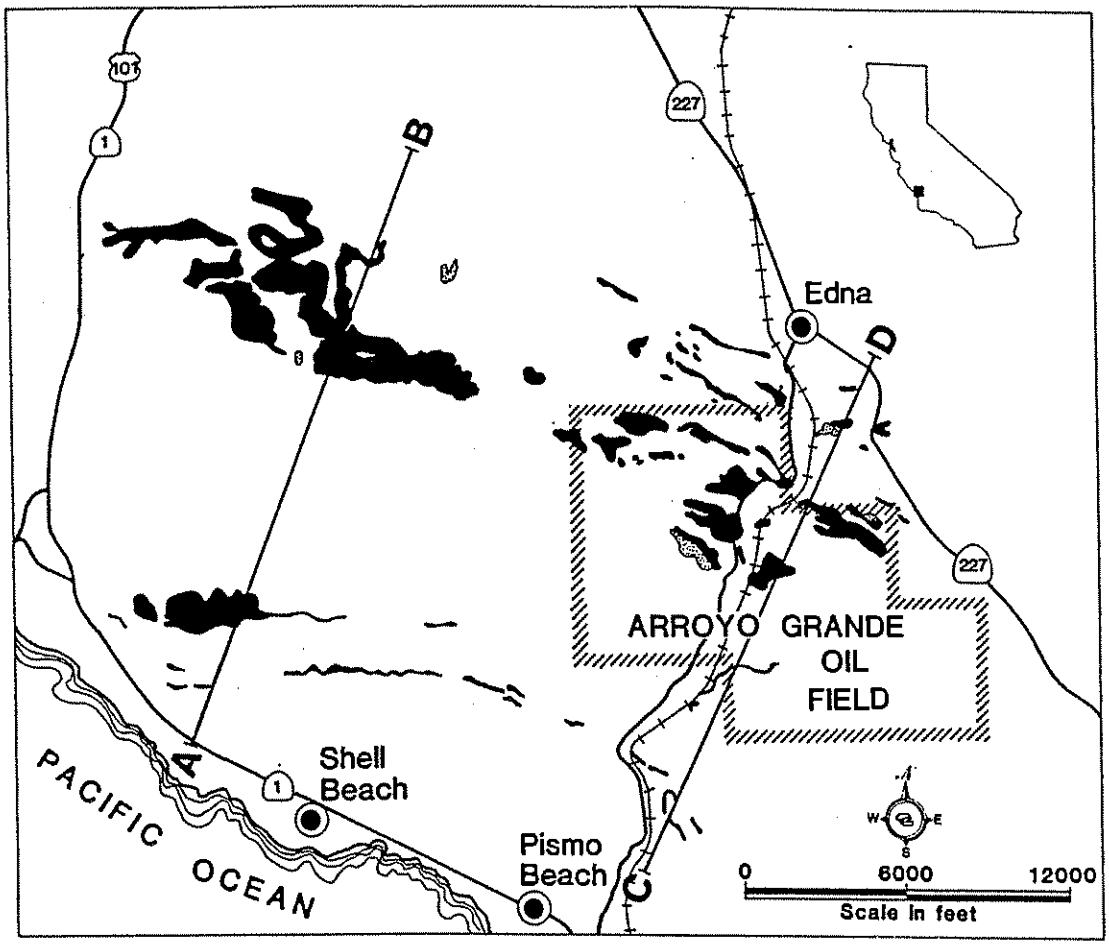


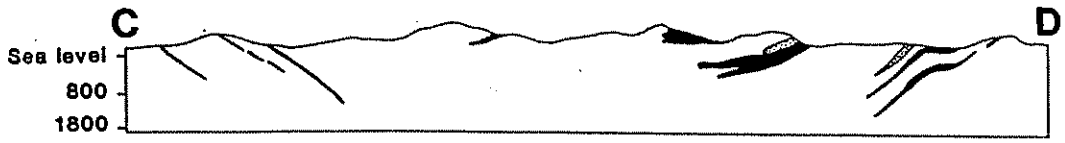
Figure 2c


WT
600
600
607
400
400
Quarry
400
400
320
200
ARROYO
442
WTs
CANYON
BM



MODERATELY BITUMINOUS SANDSTONE

SLIGHTLY BITUMINOUS SANDSTONE



0 2000 4000 8000

Scale in feet

N

ENTRIX

Figure 3

Regional occurance of surficial tar sands taken from hallmark (1982). Stocker Resources, Inc. Arroyo Grande Oil Field

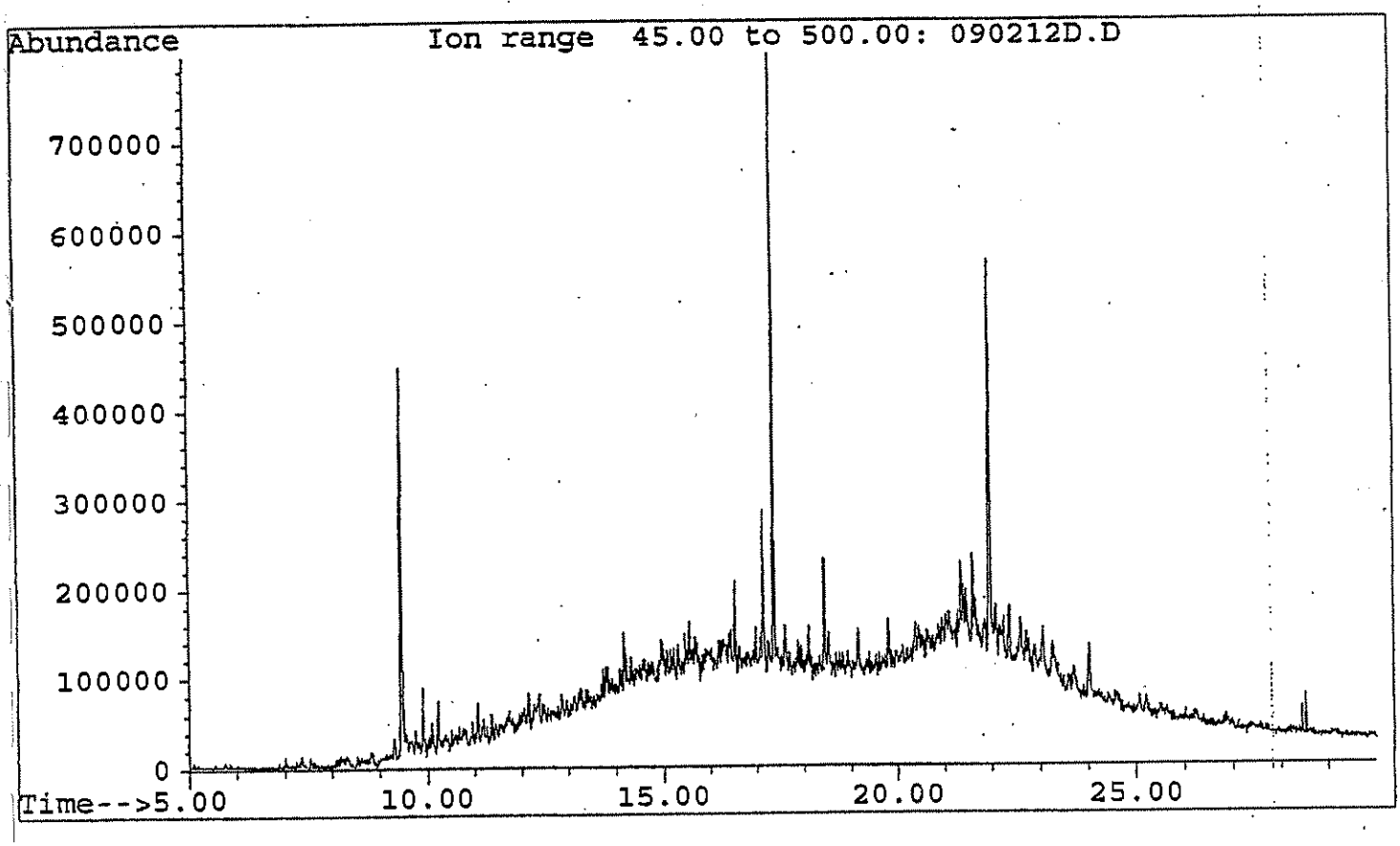
PROJ. NO: 686112	CK: SMS	DATE: 9/18/97

Figure 4a **Naturally-Occurring Flowing Seeps**

Figure 4b **Naturally-Occurring Seeps/Sheen in Pismo Creek**

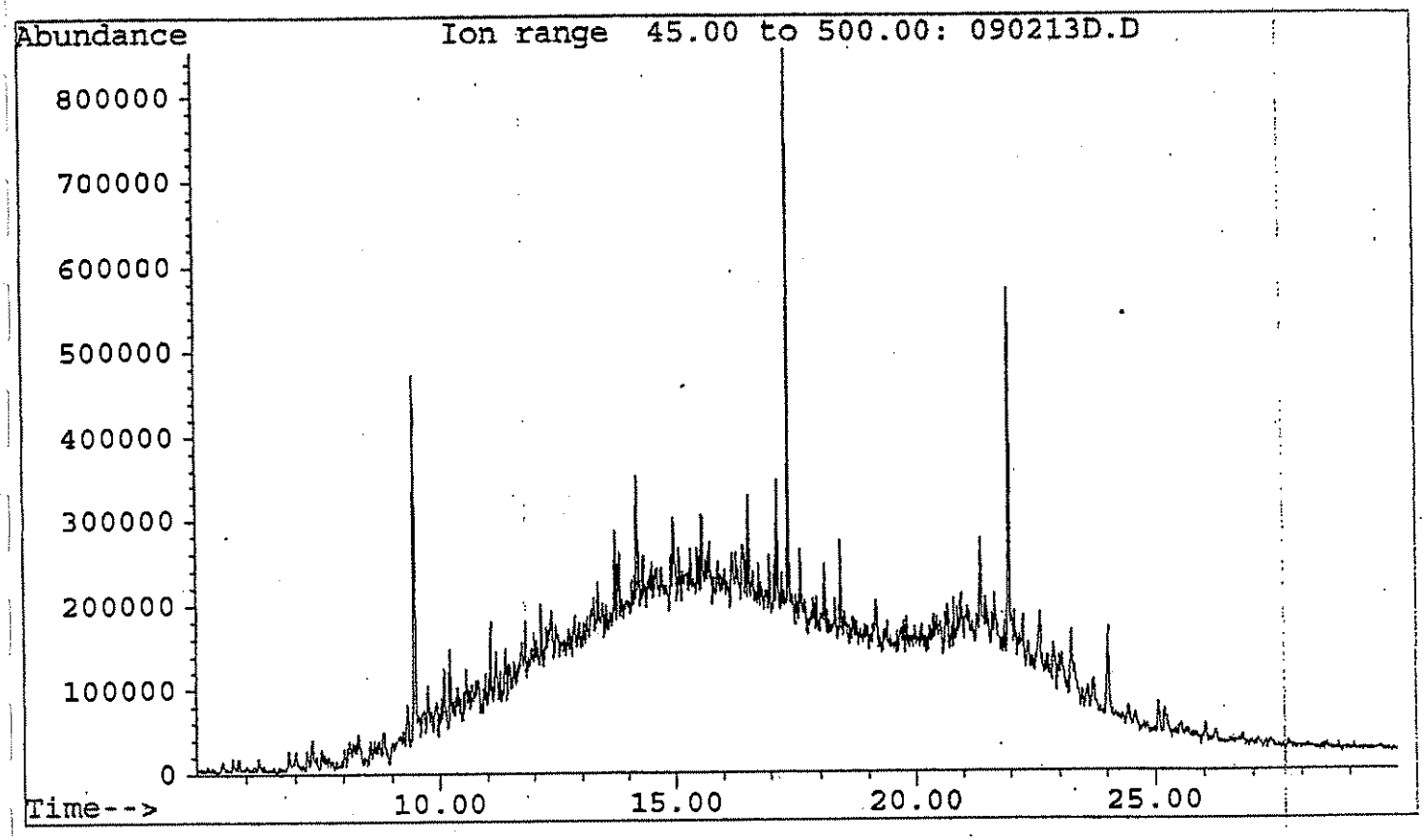
APPENDIX A
LABORATORY REPORT

File : U:\STOCKER\090212D.D
Operator : J.Collins
Acquired : 3 Sep 97 1:51 am using AcqMethod TPH-CRD
Instrument : MSD#4
Sample Name: 12062-1 Entrix/Stocker
Misc Info : 1uL,25g [1:10] Seep 1
Vial Number: 12



File : U:\STOCKER\090213D.D
Operator : J.Collins
Acquired : 3 Sep 97 2:40 am using AcqMethod TPH-CRD
Instrument : MSD#4
Sample Name: 12062-2 Entrix/Stocker
Misc Info : 1uL,25g [1:10] Seep 2
Vial Number: 13

ZymaX



File : U:\STOCKER\083133D.D
Operator : K.Haendel
Acquired : 1 Sep 97 4:49 pm using AcqMethod TPH-CRD
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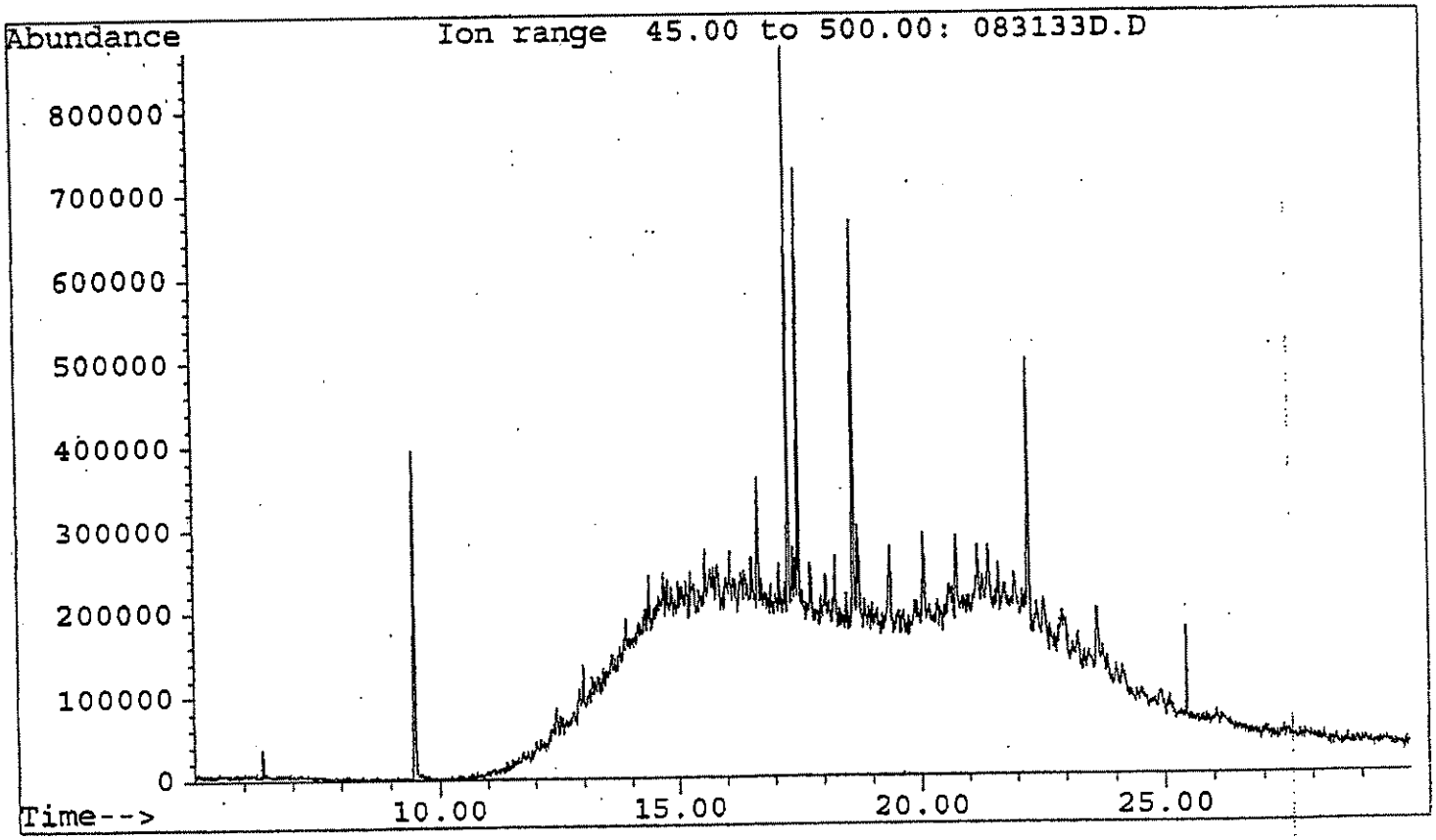
Vial Number: 29



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Operator : J.Collins
Acquired : 3 Sep 97 3:29 am using AcqMethod TPH-CRD
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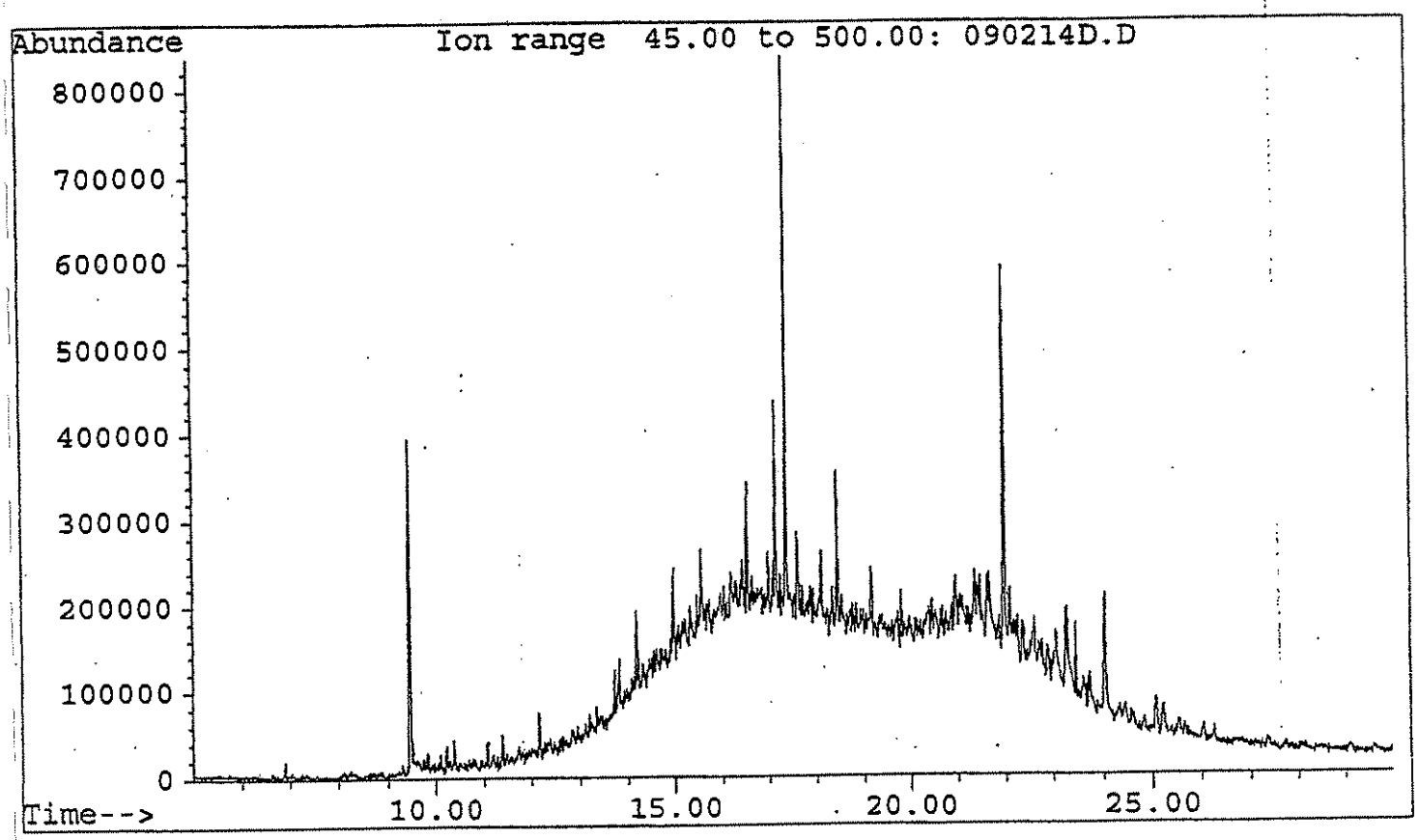
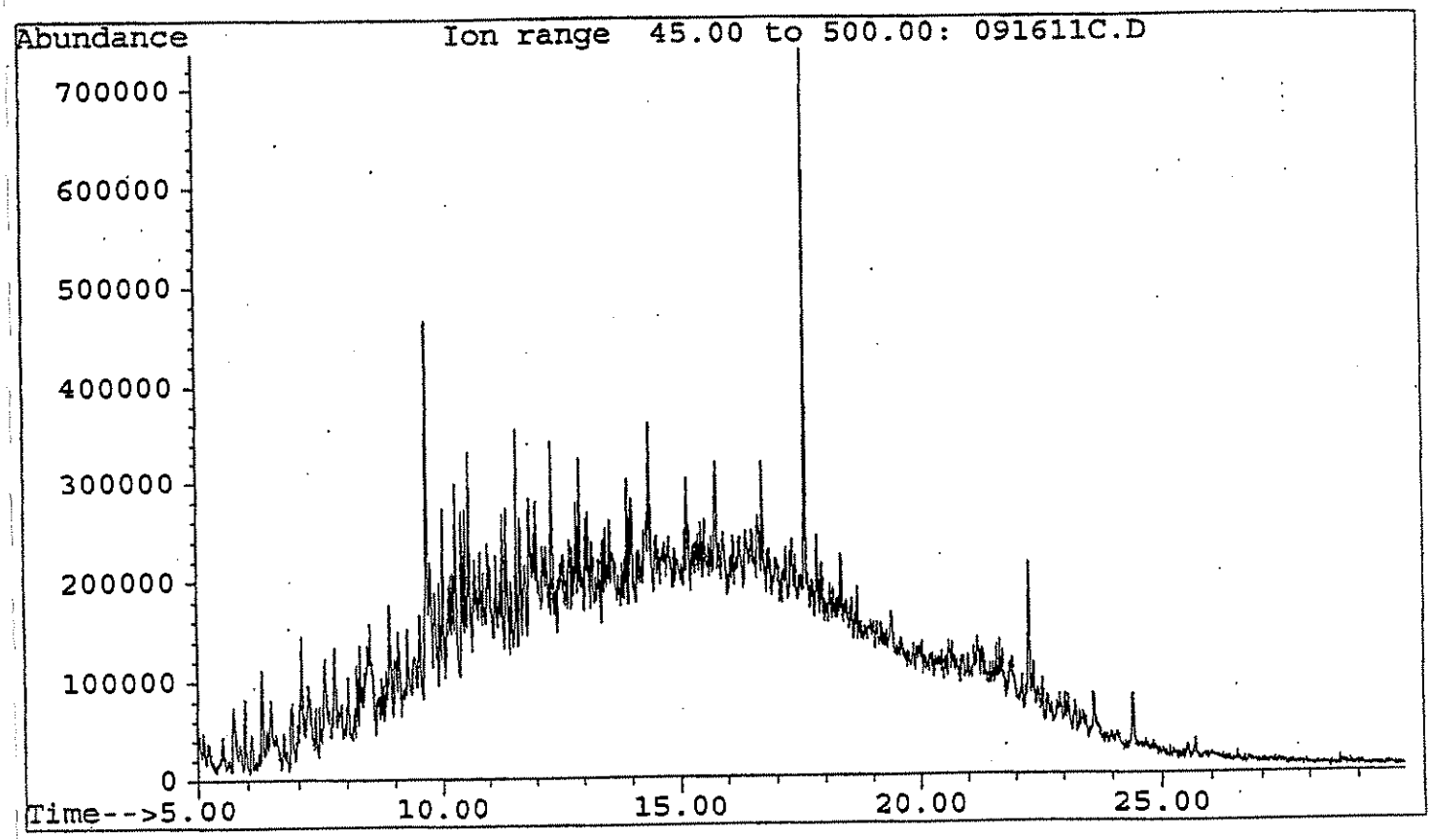
Sample Name: 12062-9 Entrix/~~Stocker~~
Misc Info : 1uL,25g [1:10] Seep 4
Vial Number: 14



File : U:\STOCKER\091611C.D
Operator : S. Korzeniowski
Acquired : 17 Sep 97 4:54 am using AcqMethod TPH-CRD
Instrument : MSD#3
Sample Name: 12196-1 ENTRIX
Misc Info : 1uL, 1g/25ml (1:10), Crude Oil 1 Tiber 68
Vial Number: 11

ZymaX



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Acquired : 17 Sep 97 5:43 am using AcqMethod TPH-CRD
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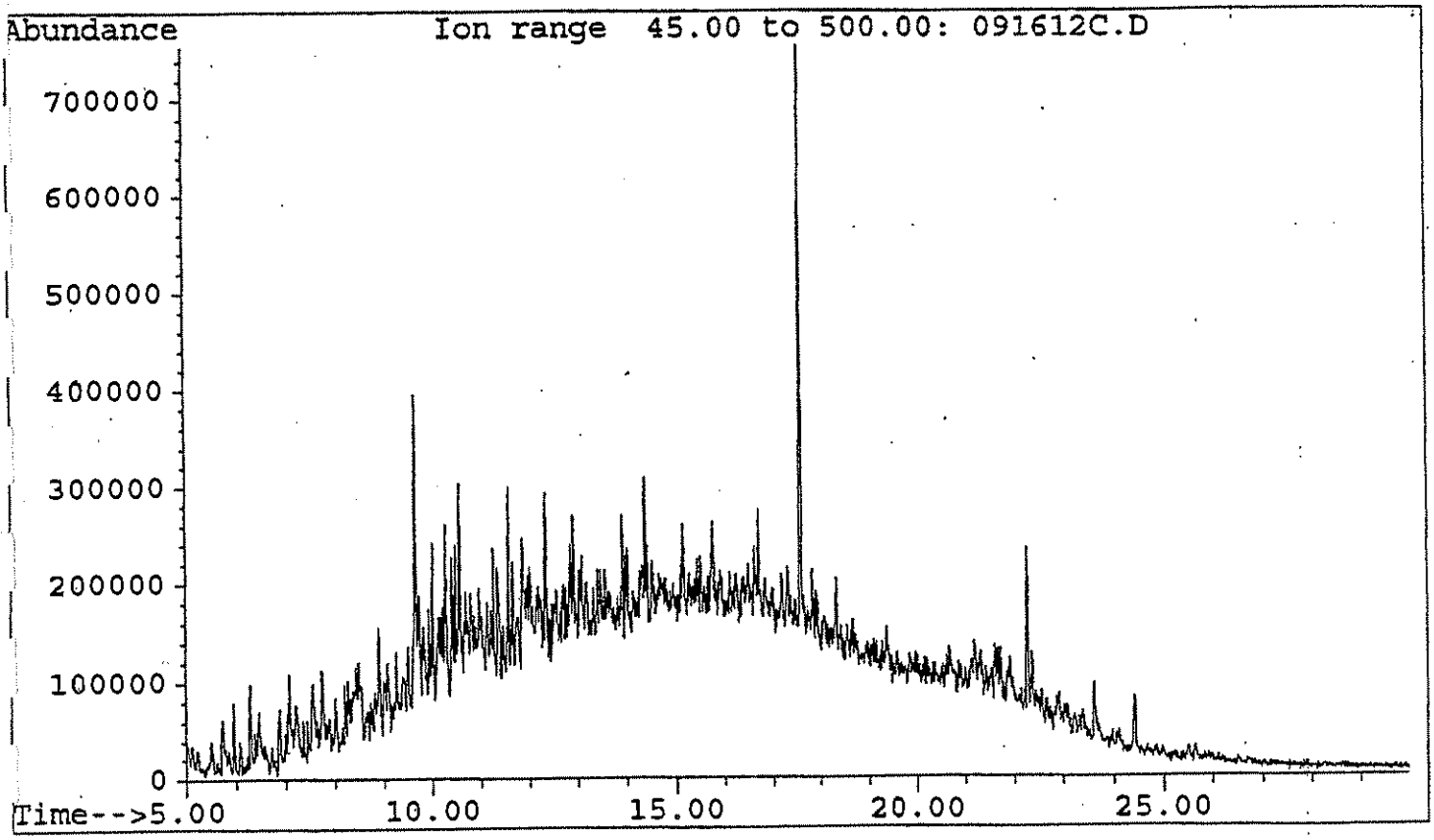
Vial Number: 12

ZymaX



ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Dan Tormey ENTRIX 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	See Below
Collected:	08/23/97 - 08/28/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	See Below
Analyzed:	09/01/97 - 09/03/97
Method:	See Below

TOTAL PETROLEUM HYDROCARBONS

LAB NUMBER	SAMPLE DESCRIPTION	PQL* mg/kg	RESULT** mg/kg	HYDROCARBON RANGE	SURROGATE RECOVERY
12062-1	Seep 1	25000.	310000.	C10-C36	***
12062-2	Seep 2	25000.	480000.	C10-C36	***
12062-3	Seep 3	4000.	24000.	C12-C36	***
12062-5	CK-U/S	10.	110.	C11-C36	61
12062-7	CK-D/S	10.	59.	C12-C36	74
12062-8	CK-D/S (2)	100.	3600.	C14-C36	***
12062-9	Seep 4	25000.	390000.	C12-C36	***
12062-11	Seep 5 U/S	10.	15.	C12-C34	66
12062-12	Seep 5 D/S	10.	ND	N/A	68

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
***Surrogate not detected due to dilution.

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3550 on 08/30/97.
Note: Analytical range is C8-C40.
Note: TPH quantitated against crude oil.

SS1165
MSD #4
12062ts.xls
JMM/jgt/dz/jc/tn

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

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San Luis Obispo, California 93401
e-mail: zymax@ZymaXusa.com
fax 805.544.8226
tel 805.544.4696

ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

Client:	Dan Tormey ENTRIX 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	See Below
Collected:	08/25/97 - 08/28/97
Received:	08/28/97
Matrix:	Aqueous
Sample Description:	See Below
Analyzed:	09/01/97
Method:	See Below

TOTAL PETROLEUM HYDROCARBONS

LAB NUMBER	SAMPLE DESCRIPTION	PQL* ug/L	RESULT** ug/L	HYDROCARBON RANGE	SURROGATE RECOVERY
12062-4	CK-U/S	100.	700.	C16-C34	91
12062-6	CK-D/S	100.	390.	C16-C34	75
12062-10	Seep 5	100.	270.	C16-C34	67

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

*PQL - Practical Quantitation Limit

**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3510 on 08/29/97.
Note: Analytical range is C8-C40.
Note: TPH quantitated against crude oil.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

SA810
MSD #3
12062ta.xls
JMM/jgt/dz/tn

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ZymaX envirotechnology

REPORT OF ANALYTICAL RESULTS

lient:	Dan Tormey ENTRIX 411 N. Central Ave., Ste. 210 Glendale, CA 91203
roject:	Stocker Resources Arroyo Grande
roject Number:	686112
ollected by:	Bren C. Randolph

Lab Number:	See Below
Collected:	09/16/97
Received:	09/16/97
Matrix:	Product
Sample Description:	See Below
Analyzed:	09/17/97
Method:	See Below

TOTAL PETROLEUM HYDROCARBONS

LAB NUMBER	SAMPLE DESCRIPTION	PQL* mg/kg	RESULT** mg/kg	HYDROCARBON RANGE	SURROGATE RECOVERY
12196-1	Crude Oil #1	25000.	510000.	C10-C34	***
12196-2	Crude Oil #2	25000.	410000.	C10-C34	***

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*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.
***Surrogate not detected due to dilution.

ote: Analyzed by GC/MS Combination.
ote: Extracted by EPA 3580 on 09/16/97.
Note: Analytical range is C8-C40.
ote: TPH quantitated against crude oil.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

S1165
MSD #3
2196ts.xls
MM/jgt/dz/sk/ap

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-1
Collected:	08/23/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 1
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.1	ND
Bromodichloromethane	0.1	ND
Bromoform	0.1	ND
Bromomethane (Methyl Bromide)	0.1	ND
Carbon Tetrachloride	0.1	ND
Chlorobenzene	0.1	ND
Chloroethane (Ethyl Chloride)	0.1	ND
2-Chloroethylvinyl Ether	0.2	ND
Chloroform	0.1	ND
Chloromethane (Methyl Chloride)	0.1	ND
Dibromochloromethane	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND
1,4-Dichlorobenzene	0.1	ND
Dichlorodifluoromethane	0.1	ND
1,1-Dichloroethane	0.1	ND
1,2-Dichloroethane (EDC)	0.1	ND
1,1-Dichloroethene	0.1	ND
cis-1,2-Dichloroethene	0.1	ND
trans-1,2-Dichloroethene	0.1	ND
1,2-Dichloropropane	0.1	ND
cis-1,3-Dichloropropene	0.1	ND
trans-1,3-Dichloropropene	0.1	ND
Ethylbenzene	0.1	ND
Methylene Chloride	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-1.xls
JMM/jgt/mh/mb

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-1
Collected:	08/23/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 1
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.1	ND
Tetrachloroethene (PCE)	0.1	ND
Toluene	0.1	ND
1,1,1-Trichloroethane (TCA)	0.1	ND
1,1,2-Trichloroethane	0.1	ND
Trichloroethene (TCE)	0.1	ND
Trichlorofluoromethane (freon 11)	0.1	ND
Vinyl Chloride	0.1	ND
Xylenes (total)	0.1	ND
Percent Surrogate Recovery		106

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-1.xls
JMM/jgt/mh/mb

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-2
Collected:	08/23/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 2
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.1	ND
Bromodichloromethane	0.1	ND
Bromoform	0.1	ND
Bromomethane (Methyl Bromide)	0.1	ND
Carbon Tetrachloride	0.1	ND
Chlorobenzene	0.1	ND
Chloroethane (Ethyl Chloride)	0.1	ND
2-Chloroethylvinyl Ether	0.2	ND
Chloroform	0.1	ND
Chloromethane (Methyl Chloride)	0.1	ND
Dibromochloromethane	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND
1,4-Dichlorobenzene	0.1	ND
Dichlorodifluoromethane	0.1	ND
1,1-Dichloroethane	0.1	ND
1,2-Dichloroethane (EDC)	0.1	ND
1,1-Dichloroethene	0.1	ND
cis-1,2-Dichloroethene	0.1	ND
trans-1,2-Dichloroethene	0.1	ND
1,2-Dichloropropane	0.1	ND
cis-1,3-Dichloropropene	0.1	ND
trans-1,3-Dichloropropene	0.1	ND
Ethylbenzene	0.1	ND
Methylene Chloride	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-2.xls
JMM/jgt/mh/mb

Client:	Dan Tormey
	Entrix
	411 N. Central Ave., Ste. 210
	Glendale, CA 91203

Lab Number:	12062-2
Collected:	08/23/97
Received:	08/28/97
Matrix:	Solid

Project:	Stocker Resources
	Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Sample Description:	
	Seep 2
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.1	ND
Tetrachloroethene (PCE)	0.1	ND
Toluene	0.1	ND
1,1,1-Trichloroethane (TCA)	0.1	ND
1,1,2-Trichloroethane	0.1	ND
Trichloroethene (TCE)	0.1	ND
Trichlorofluoromethane (freon 11)	0.1	ND
Vinyl Chloride	0.1	ND
Xylenes (total)	0.1	ND
Percent Surrogate Recovery		104

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

MSD #2
12062-2.xls
JMM/jgt/mh/mb

John MacMurphey
Laboratory Director

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-4
Collected:	08/25/97
Received:	08/28/97
Matrix:	Aqueous
Sample Description:	CK-U/S
Analyzed:	09/03/97
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.5	ND
Bromodichloromethane	0.5	ND
Bromoform	0.5	ND
Bromomethane (Methyl Bromide)	0.5	ND
Carbon Tetrachloride	0.5	ND
Chlorobenzene	0.5	ND
Chloroethane (Ethyl Chloride)	0.5	ND
2-Chloroethylvinyl Ether	1.0	ND
Chloroform	0.5	ND
Chloromethane (Methyl Chloride)	0.5	ND
Dibromochloromethane	0.5	ND
1,2-Dichlorobenzene	0.5	ND
1,3-Dichlorobenzene	0.5	ND
1,4-Dichlorobenzene	0.5	ND
Dichlorodifluoromethane	0.5	ND
1,1-Dichloroethane	0.5	ND
1,2-Dichloroethane (EDC)	0.5	ND
1,1-Dichloroethene	0.5	ND
cis-1,2-Dichloroethene	0.5	ND
trans-1,2-Dichloroethene	0.5	ND
1,2-Dichloropropane	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
trans-1,3-Dichloropropene	0.5	ND
Ethylbenzene	0.5	ND
Methylene Chloride	0.5	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-4.xls
JMM/jgt/mh/jd

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-4
Collected:	08/25/97
Received:	08/28/97
Matrix:	Aqueous
Sample Description:	CK-U/S
Analyzed:	09/03/97
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Toluene	0.5	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND
Trichlorofluoromethane (freon 11)	0.5	ND
Vinyl Chloride	0.5	ND
Xylenes (total)	0.5	ND
Percent Surrogate Recovery		99

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-4.xls
JMM/jgt/mh/jd

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-3
Collected:	08/23/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 3
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane (Methyl Bromide)	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane (Ethyl Chloride)	0.005	ND
2-Chloroethylvinyl Ether	0.010	ND
Chloroform	0.005	ND
Chloromethane (Methyl Chloride)	0.005	ND
Dibromochloromethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Ethylbenzene	0.005	ND
Methylene Chloride	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-3.xls
JMM/jgt/mh/jd

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-3
Collected:	08/23/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 3
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND
Trichlorofluoromethane (freon 11)	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes (total)	0.005	ND
Percent Surrogate Recovery		93

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-3.xls
JMM/jgt/mh/jd

Client:	Dan Tormey
	Entrix
	411 N. Central Ave., Ste. 210
	Glendale, CA 91203

Lab Number:	12062-5
Collected:	08/25/97
Received:	08/28/97
Matrix:	Solid

Project:	Stocker Resources
	Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Sample Description:	
	CK-U/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane (Methyl Bromide)	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane (Ethyl Chloride)	0.005	ND
2-Chloroethylvinyl Ether	0.010	ND
Chloroform	0.005	ND
Chloromethane (Methyl Chloride)	0.005	ND
Dibromochloromethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Ethylbenzene	0.005	ND
Methylene Chloride	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-5.xls
JMM/jgt/mh/mb

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-5
Collected:	08/25/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	CK-U/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND
Trichlorofluoromethane (freon 11)	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes (total)	0.005	ND
Percent Surrogate Recovery		100

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-5.xls
JMM/jgt/mh/mb

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-6
Collected:	08/25/97
Received:	08/28/97
Matrix:	Aqueous
Sample Description:	CK-D/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.5	ND
Bromodichloromethane	0.5	ND
Bromoform	0.5	ND
Bromomethane (Methyl Bromide)	0.5	ND
Carbon Tetrachloride	0.5	ND
Chlorobenzene	0.5	ND
Chloroethane (Ethyl Chloride)	0.5	ND
2-Chloroethylvinyl Ether	1.0	ND
Chloroform	0.5	ND
Chloromethane (Methyl Chloride)	0.5	ND
Dibromochloromethane	0.5	ND
1,2-Dichlorobenzene	0.5	ND
1,3-Dichlorobenzene	0.5	ND
1,4-Dichlorobenzene	0.5	ND
Dichlorodifluoromethane	0.5	ND
1,1-Dichloroethane	0.5	ND
1,2-Dichloroethane (EDC)	0.5	ND
1,1-Dichloroethene	0.5	ND
cis-1,2-Dichloroethene	0.5	ND
trans-1,2-Dichloroethene	0.5	ND
1,2-Dichloropropane	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
trans-1,3-Dichloropropene	0.5	ND
Ethylbenzene	0.5	ND
Methylene Chloride	0.5	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-6.xls
JMM/jgt/mh/jd

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-6
Collected:	08/25/97
Received:	08/28/97
Matrix:	Aqueous
Sample Description:	CK-D/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Toluene	0.5	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND
Trichlorofluoromethane (freon 11)	0.5	ND
Vinyl Chloride	0.5	ND
Xylenes (total)	0.5	ND
Percent Surrogate Recovery		102

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

MSD #2
12062-6.xls
JMM/jgt/mh/jd

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-7
Collected:	08/25/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	CK-D/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane (Methyl Bromide)	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane (Ethyl Chloride)	0.005	ND
2-Chloroethylvinyl Ether	0.010	ND
Chloroform	0.005	ND
Chloromethane (Methyl Chloride)	0.005	ND
Dibromochloromethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Ethylbenzene	0.005	ND
Methylene Chloride	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-7.xls
JMM/jgt/mh/jd

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-7
Collected:	08/25/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	CK-D/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND
Trichlorofluoromethane (freon 11)	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes (total)	0.005	ND
Percent Surrogate Recovery		99

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-7.xls
JMM/jgt/mh/jd

Zaca Lane
Luis Obispo, California 93401
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tel 805.544.4696

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-8
Collected:	08/25/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	CK-D/S (2)
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane (Methyl Bromide)	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane (Ethyl Chloride)	0.005	ND
2-Chloroethylvinyl Ether	0.010	ND
Chloroform	0.005	ND
Chloromethane (Methyl Chloride)	0.005	ND
Dibromochloromethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Ethylbenzene	0.005	ND
Methylene Chloride	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-8.xls
JMM/jgt/mh/jd

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-8
Collected:	08/25/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	CK-D/S (2)
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND
Trichlorofluoromethane (freon 11)	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes (total)	0.005	ND
Percent Surrogate Recovery		81

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-8.xls
JMM/jgt/mh/jd

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-9
Collected:	08/26/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 4
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.1	ND
Bromodichloromethane	0.1	ND
Bromoform	0.1	ND
Bromomethane (Methyl Bromide)	0.1	ND
Carbon Tetrachloride	0.1	ND
Chlorobenzene	0.1	ND
Chloroethane (Ethyl Chloride)	0.1	ND
2-Chloroethylvinyl Ether	0.2	ND
Chloroform	0.1	ND
Chloromethane (Methyl Chloride)	0.1	ND
Dibromochloromethane	0.1	ND
1,2-Dichlorobenzene	0.1	ND
1,3-Dichlorobenzene	0.1	ND
1,4-Dichlorobenzene	0.1	ND
Dichlorodifluoromethane	0.1	ND
1,1-Dichloroethane	0.1	ND
1,2-Dichloroethane (EDC)	0.1	ND
1,1-Dichloroethene	0.1	ND
cis-1,2-Dichloroethene	0.1	ND
trans-1,2-Dichloroethene	0.1	ND
1,2-Dichloropropane	0.1	ND
cis-1,3-Dichloropropene	0.1	ND
trans-1,3-Dichloropropene	0.1	ND
Ethylbenzene	0.1	ND
Methylene Chloride	0.1	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-9.xls
JMM/jgt/mh/mb

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-9
Collected:	08/26/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 4
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.1	ND
Tetrachloroethene (PCE)	0.1	ND
Toluene	0.1	ND
1,1,1-Trichloroethane (TCA)	0.1	ND
1,1,2-Trichloroethane	0.1	ND
Trichloroethene (TCE)	0.1	ND
Trichlorofluoromethane (freon 11)	0.1	ND
Vinyl Chloride	0.1	ND
Xylenes (total)	0.1	ND
Percent Surrogate Recovery		101

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-9.xls
JMM/jgt/mh/mb

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-10
Collected:	08/28/97
Received:	08/28/97
Matrix:	Aqueous
Sample Description:	Seep 5
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.5	ND
Bromodichloromethane	0.5	ND
Bromoform	0.5	ND
Bromomethane (Methyl Bromide)	0.5	ND
Carbon Tetrachloride	0.5	ND
Chlorobenzene	0.5	ND
Chloroethane (Ethyl Chloride)	0.5	ND
2-Chloroethylvinyl Ether	1.0	ND
Chloroform	0.5	ND
Chloromethane (Methyl Chloride)	0.5	ND
Dibromochloromethane	0.5	ND
1,2-Dichlorobenzene	0.5	ND
1,3-Dichlorobenzene	0.5	ND
1,4-Dichlorobenzene	0.5	ND
Dichlorodifluoromethane	0.5	ND
1,1-Dichloroethane	0.5	ND
1,2-Dichloroethane (EDC)	0.5	ND
1,1-Dichloroethene	0.5	ND
cis-1,2-Dichloroethene	0.5	ND
trans-1,2-Dichloroethene	0.5	ND
1,2-Dichloropropane	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
trans-1,3-Dichloropropene	0.5	ND
Ethylbenzene	0.5	ND
Methylene Chloride	0.5	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
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MSD #2
12062-10.xls
JMM/jgt/mh/jd

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-10
Collected:	08/28/97
Received:	08/28/97
Matrix:	Aqueous
Sample Description:	Seep 5
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Toluene	0.5	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND
Trichlorofluoromethane (freon 11)	0.5	ND
Vinyl Chloride	0.5	ND
Xylenes (total)	0.5	ND
Percent Surrogate Recovery		99

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MSD #2
12062-10.xls
JMM/jgt/mh/jd

Submitted by,
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Laboratory Director

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-11
Collected:	08/28/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 5 U/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane (Methyl Bromide)	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane (Ethyl Chloride)	0.005	ND
2-Chloroethylvinyl Ether	0.010	ND
Chloroform	0.005	ND
Chloromethane (Methyl Chloride)	0.005	ND
Dibromochloromethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Ethylbenzene	0.005	ND
Methylene Chloride	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-11.xls
JMM/jgt/mh/jd

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-11
Collected:	08/28/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 5 U/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND
Trichlorofluoromethane (freon 11)	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes (total)	0.005	ND
Percent Surrogate Recovery		100

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*PQL - Practical Quantitation Limit
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Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-11.xls
JMM/jgt/mh/jd

Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-12
Collected:	08/28/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 5 D/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane (Methyl Bromide)	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane (Ethyl Chloride)	0.005	ND
2-Chloroethylvinyl Ether	0.010	ND
Chloroform	0.005	ND
Chloromethane (Methyl Chloride)	0.005	ND
Dibromochloromethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Ethylbenzene	0.005	ND
Methylene Chloride	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

***PQL - Practical Quantitation Limit**

****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
12062-12.xls
JMM/jgt/mh/jd

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Client:	Dan Tormey Entrix 411 N. Central Ave., Ste. 210 Glendale, CA 91203
Project:	Stocker Resources Arroyo Grande
Project Number:	686112
Collected by:	Matt Carpenter

Lab Number:	12062-12
Collected:	08/28/97
Received:	08/28/97
Matrix:	Solid
Sample Description:	Seep 5 D/S
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND
Trichlorofluoromethane (freon 11)	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes (total)	0.005	ND
Percent Surrogate Recovery		99

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
12062-12.xls
JMM/jgt/mh/jd

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
SPIKE RESULTS

Client: ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	Lab Number: QS SS1165 Collected: Received: Matrix: Soil
Project: Project Number: Collected by:	Sample Description: Quality Assurance Spike Analyzed: 08/31/97 Method: See Below

CONSTITUENT	Amount Spiked mg/kg	Amount Recovered mg/kg	Percent Recovery
TOTAL PETROLEUM HYDROCARBONS			
Total Petroleum Hydrocarbons (C10-C36)	160.	114.	71
Percent Surrogate Recovery			79

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3550 on 08/30/97.
Note: Analytical range is C8-C40.
Note: Spiked with crude oil.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #4
SS1165t.xls
JMM/jgt/dz/jc/tn

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
SPIKE DUPLICATE RESULTS

Client:
ZymaX envirotechnology, inc.
71 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Lab Number: QSD SS1165
Collected:
Received:
Matrix: Soil

Project:

Project Number:
Collected by:

Sample Description:
Quality Assurance Spike Duplicate
Analyzed: 08/31/97
Method: See Below

CONSTITUENT	Amount Spiked mg/kg	Amount Recovered mg/kg	Percent Recovery	Relative Percent Difference*
TOTAL PETROLEUM HYDROCARBONS				
Total Petroleum Hydrocarbons (C10-C36)	160.	122.	76	7
Percent Surrogate Recovery			83	

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*Relative Percent Difference of the spike and spike duplicate

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3550 on 08/30/97.
Note: Analytical range is C8-C40.
Note: Spiked with crude oil.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #4
SS1165t.xls
JMM/jgt/dz/jc/tn

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
BLANK RESULT

Client: ZymaX envirotechnology, Inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	Lab Number: BLK SS1165 Collected: Received: Matrix: Soil
Project: Project Number: Collected by:	Sample Description: Method Blank Analyzed: 08/31/97 Method: See Below

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
TOTAL PETROLEUM HYDROCARBONS		
Total Petroleum Hydrocarbons	10.	ND
Percent Surrogate Recovery		68

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3550 on 08/30/97.
Note: Analytical range is C8-C40.
Note: TPH quantitated against crude oil.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #4
SS1165t.xls
JMM/jgt/dz/jc/tn

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
SPIKE RESULTS

Client:	ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401
Project:	
Project Number:	
Collected by:	

Lab Number:	QS SA810
Collected:	
Received:	
Matrix:	Aqueous
Sample Description:	Quality Assurance Spike
Analyzed:	08/31/97
Method:	See Below

CONSTITUENT	Amount Spiked ug/L	Amount Recovered ug/L	Percent Recovery
TOTAL PETROLEUM HYDROCARBONS			
Total Petroleum Hydrocarbons (C10-C36)	4000.	2850.	71
Percent Surrogate Recovery			86

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3510 on 08/29/97.
Note: Analytical range is C8-C40.
Note: Spiked with crude oil.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #3
SA810ta.xls
JMM/jgt/dz/tn

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
SPIKE DUPLICATE RESULTS

Client: ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Lab Number:** QSD SA810 **Collected:** **Received:** **Matrix:** Aqueous
Project: **Project Number:** **Collected by:**	**Sample Description:** Quality Assurance Spike Duplicate **Analyzed:** 08/31/97 **Method:** See Below

CONSTITUENT	Amount Spiked ug/L	Amount Recovered ug/L	Percent Recovery	Relative Percent Difference*
TOTAL PETROLEUM HYDROCARBONS				
Total Petroleum Hydrocarbons (C10-C36)	4000.	3060.	77	7
Percent Surrogate Recovery			90	

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*Relative Percent Difference of the spike and spike duplicate

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3510 on 08/29/97.
Note: Analytical range is C8-C40.
Note: Spiked with crude oil.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #3
SA810ta.xls
JMM/jgt/dz/tn

Zaca Lane
Luis Obispo, California 93401
e-mail: zymax@ZymaXusa.com
fax 805.544.8226
tel 805.544.4696

ZymaX envirotechnology

QUALITY ASSURANCE REPORT
BLANK RESULT

Client: ZymaX envirotechnology, Inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	Lab Number: BLK SA810 Collected: Received: Matrix: Aqueous
Project: Project Number: Collected by:	Sample Description: Method Blank Analyzed: 08/30/97 Method: See Below

CONSTITUENT	PQL* ug/L	RESULT** ug/L
TOTAL PETROLEUM HYDROCARBONS		
Total Petroleum Hydrocarbons	100.	ND
Percent Surrogate Recovery		76

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Note: Analyzed by GC/MS Combination.
Note: Extracted by EPA 3510 on 08/29/97.
Note: Analytical range is C8-C40.
Note: TPH quantitated against crude oil.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #3
SA810ta.xls
JMM/jgt/dz/tn

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
SPIKE RESULTS

Client:	ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401
Project:	
Project Number:	
Collected by:	

Lab Number:	QS 09/04/97
Collected:	
Received:	
Matrix:	Soil
Sample Description:	Quality Assurance Spike
Analyzed:	09/04/97
Method:	EPA 8260

CONSTITUENT	Amount Spiked mg/kg	Amount Recovered mg/kg	Percent Recovery
Benzene	0.080	0.092	115
Chlorobenzene	0.080	0.089	111
1,1-Dichloroethene	0.080	0.089	111
Toluene	0.080	0.090	113
Trichloroethene (TCE)	0.080	0.093	116
Percent Surrogate Recovery			95

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
q0904ps2.xls
JMM/jgt/mh/jd

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
SPIKE DUPLICATE RESULTS

Client:
ZymaX envirotechnology, inc.
71 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Lab Number: QSD 09/04/97
Collected:
Received:
Matrix: Soil

Project:

Project Number:
Collected by:

Sample Description: Quality Assurance Spike Duplicate
Analyzed: 09/04/97
Method: EPA 8260

CONSTITUENT	Amount Spiked mg/kg	Amount Recovered mg/kg	Percent Recovery	Relative Percent Difference
Benzene	0.080	0.086	108	7
Chlorobenzene	0.080	0.082	103	8
1,1-Dichloroethene	0.080	0.084	105	6
Toluene	0.080	0.086	108	5
Trichloroethene (TCE)	0.080	0.089	111	4
Percent Surrogate Recovery			97	

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
q0904ps2.xls
JMM/jgt/mh/jd

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
BLANK RESULTS (Page 1 of 2)

Client:
ZymaX envirotechnology, inc.
71 Zaca Lane, Suite 110
San Luis Obispo, CA 93401

Project:

Project Number:
Collected by:

Lab Number: BLK 09/04/97
Collected:
Received:
Matrix: Soil

Sample Description: Instrument Blank
Analyzed: 09/04/97
Method: EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.005	ND
Bromodichloromethane	0.005	ND
Bromoform	0.005	ND
Bromomethane (Methyl Bromide)	0.005	ND
Carbon Tetrachloride	0.005	ND
Chlorobenzene	0.005	ND
Chloroethane (Ethyl Chloride)	0.005	ND
2-Chloroethylvinyl Ether	0.010	ND
Chloroform	0.005	ND
Chloromethane (Methyl Chloride)	0.005	ND
Dibromochloromethane	0.005	ND
1,2-Dichlorobenzene	0.005	ND
1,3-Dichlorobenzene	0.005	ND
1,4-Dichlorobenzene	0.005	ND
Dichlorodifluoromethane	0.005	ND
1,1-Dichloroethane	0.005	ND
1,2-Dichloroethane (EDC)	0.005	ND
1,1-Dichloroethene	0.005	ND
cis-1,2-Dichloroethene	0.005	ND
trans-1,2-Dichloroethene	0.005	ND
1,2-Dichloropropane	0.005	ND
cis-1,3-Dichloropropene	0.005	ND
trans-1,3-Dichloropropene	0.005	ND
Ethylbenzene	0.005	ND
Methylene Chloride	0.005	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

MSD #2
b0904ps2.xls
JMM/jgt/mh/mb

Client: ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Lab Number:** BLK 09/04/97 **Collected:** **Received:** **Matrix:** Soil
Project: **Project Number:** **Collected by:**	**Sample Description:** Instrument Blank **Analyzed:** 09/04/97 **Method:** EPA 8260

CONSTITUENT	PQL* mg/kg	RESULT** mg/kg
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.005	ND
Tetrachloroethene (PCE)	0.005	ND
Toluene	0.005	ND
1,1,1-Trichloroethane (TCA)	0.005	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethene (TCE)	0.005	ND
Trichlorofluoromethane (freon 11)	0.005	ND
Vinyl Chloride	0.005	ND
Xylenes (total)	0.005	ND
Percent Surrogate Recovery		99

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*PQL - Practical Quantitation Limit
**Results listed as ND would have been reported if present at or above the listed PQL.

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
SPIKE RESULTS

Client: ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Lab Number:** QS 09/03/97 **Collected:** **Received:** **Matrix:** Aqueous
Project: **Project Number:** **Collected by:**	**Sample Description:** Quality Assurance Spike **Analyzed:** 09/03/97 **Method:** EPA 8260

CONSTITUENT	Amount Spiked ug/L	Amount Recovered ug/L	Percent Recovery
Benzene	16.0	14.6	91
Chlorobenzene	16.0	15.0	94
1,1-Dichloroethene	16.0	17.2	108
Toluene	16.0	15.1	94
Trichloroethene (TCE)	16.0	15.8	99
Percent Surrogate Recovery			94

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
q0903pa2.xls
JMM/jgt/mh/jd

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ZymaX envirotechnology

QUALITY ASSURANCE REPORT
SPIKE DUPLICATE RESULTS

Client: ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Lab Number:** QSD 09/03/97 **Collected:** **Received:** **Matrix:** Aqueous
Project: **Project Number:** **Collected by:**	**Sample Description:** Quality Assurance Spike Duplicate **Analyzed:** 09/03/97 **Method:** EPA 8260

CONSTITUENT	Amount Spiked ug/L	Amount Recovered ug/L	Percent Recovery	Relative Percent Difference
Benzene	16.0	15.3	96	5
Chlorobenzene	16.0	16.2	101	8
1,1-Dichloroethene	16.0	15.6	98	10
Toluene	16.0	14.9	93	1
Trichloroethene (TCE)	16.0	15.5	97	2
Percent Surrogate Recovery			98	

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
q0903pa2.xls
JMM/jgt/mh/jd

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tel 805.544.4696

Client: ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	Lab Number: BLK 09/03/97 Collected: Received: Matrix: Aqueous
Project: Project Number: Collected by:	Sample Description: Instrument Blank Analyzed: 09/03/97 Method: EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
PRIORITY POLLUTANT VOLATILE ORGANICS		
Benzene	0.5	ND
Bromodichloromethane	0.5	ND
Bromoform	0.5	ND
Bromomethane (Methyl Bromide)	0.5	ND
Carbon Tetrachloride	0.5	ND
Chlorobenzene	0.5	ND
Chloroethane (Ethyl Chloride)	0.5	ND
2-Chloroethylvinyl Ether	1.0	ND
Chloroform	0.5	ND
Chloromethane (Methyl Chloride)	0.5	ND
Dibromochloromethane	0.5	ND
1,2-Dichlorobenzene	0.5	ND
1,3-Dichlorobenzene	0.5	ND
1,4-Dichlorobenzene	0.5	ND
Dichlorodifluoromethane	0.5	ND
1,1-Dichloroethane	0.5	ND
1,2-Dichloroethane (EDC)	0.5	ND
1,1-Dichloroethene	0.5	ND
cis-1,2-Dichloroethene	0.5	ND
trans-1,2-Dichloroethene	0.5	ND
1,2-Dichloropropane	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
trans-1,3-Dichloropropene	0.5	ND
Ethylbenzene	0.5	ND
Methylene Chloride	0.5	ND

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

MSD #2
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JMM/jgt/mh/mb

Client: ZymaX envirotechnology, inc. 71 Zaca Lane, Suite 110 San Luis Obispo, CA 93401	**Lab Number:** BLK 09/03/97 **Collected:** **Received:** **Matrix:** Aqueous
Project: **Project Number:** **Collected by:**	**Sample Description:** Instrument Blank **Analyzed:** 09/03/97 **Method:** EPA 8260

CONSTITUENT	PQL* ug/L	RESULT** ug/L
PRIORITY POLLUTANT VOLATILE ORGANICS		
1,1,2,2-Tetrachloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Toluene	0.5	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND
Trichlorofluoromethane (freon 11)	0.5	ND
Vinyl Chloride	0.5	ND
Xylenes (total)	0.5	ND
Percent Surrogate Recovery		98

ZymaX envirotechnology, inc. is certified by CA Department of Health Services: Laboratory #1717
***PQL - Practical Quantitation Limit**
****Results listed as ND would have been reported if present at or above the listed PQL.**

Submitted by,
ZymaX envirotechnology, inc.

John MacMurphey
Laboratory Director

MSD #2
b0903pa2.xls
JMM/jgt/mh/mb

APPENDIX B
PISMO CREEK ALLUVIAL EVALUATION

WZI INC.

Plains Exploration & Production Company

Pismo Creek Alluvial Evaluation
Arroyo Grande Oil Field
San Luis Obispo County, California

February 2007

Submitted to:
Plains Exploration & Production Company
1200 Discovery Drive, Suite 500
Bakersfield, California 93309

Prepared by:
WZI Inc.
1717 28th Street
Bakersfield, California 93301

TABLE OF CONTENTS

Introduction 1

Geologic Setting 1

Investigation Methodology 1

Investigation Results and Conclusions 2

References 3

EXHIBITS

Exhibit 1 Location Map

Exhibit 2 2005 Pacific Geotechnical Associates, Inc. Cross Section

Exhibit 3 Transect Location Map

APPENDICES

Appendix 1 Photographs

Introduction

Plains Exploration & Production Company (PXP) recently received a conditional use permit (CUP) from San Luis Obispo County for their Phase IV drilling project at the Arroyo Grande (AG) Oil Field located along Price Canyon Road in San Luis Obispo County, California (Location Map, **Exhibit 1**). An additional CUP is currently being sought for a water treatment plant to support the Phase IV operations.

As a result of the Phase IV permitting process, several issues concerning the potential impact of the project on surface and groundwater resources in the area were identified. Previous geologic mapping of the area (Hall, 1973) indicated the presence of a fresh water alluvial aquifer that extends along Pismo Creek.

As a requirement of San Luis Obispo County for approval of the Phase IV drilling project, four sentry monitoring wells were installed along Pismo Creek in October 2005 to monitor shallow groundwater within the alluvium. Based on the results of the sentry well installations, it was determined that the actual extent of the alluvium in the area was not as depicted on the published geologic map of the area. Consequently, field mapping of the contact between the alluvium and underlying Pismo Formation were conducted to better define the actual extent of the alluvium in the area of the PXP's property. The following presents the methodology utilized to evaluate the extent of alluvium along Pismo Creek and the results of the field investigation.

Geologic Setting

A geologic map of the area was published by the California Division of Mines and Geology in 1973 on the Arroyo Grande 15' Quadrangle (Hall, 1973). According to the 1973 map, surface geology in the area of the Arroyo Grande Oil Field consists primarily of hard sandstones, pebbly sands, and conglomerates of the Edna Member of the Pismo Formation. The Edna member grades to the southwest of the Arroyo Grande Oil Field into brown clays and silts of the Meguelito Member of the Pismo Formation.

An area containing Quaternary age alluvium was mapped along the drainage of Pismo Creek and adjacent tributaries. It was interpreted that the veneer of alluvium provided a fresh water aquifer in the area which could potentially be impacted by the Phase IV oil and gas operations. The published extent of the alluvium was later utilized in a report on the geologic separation of the Price Canyon oil development from the fresh water aquifer (Pacific Geotechnical Associates, Inc., 2005). A cross section depicting the interpretation of the distribution of alluvium along Pismo Creek from the 2005 Pacific Geotechnical Associates, Inc. report presented as **Exhibit 2**.

Investigation Methodology

In order to evaluate the extent of alluvium along Pismo Creek a total of three days were spent conducting a field mapping program. The area along Pismo Creek was initially observed by vehicle and on foot. The field mapping program was then conducted which consisted of making a series of eight transects across the Pismo Creek drainage, recording lithologies at 54 outcrop locations, recording field observations, and photographing the Pismo Creek drainage. The

California State Plane coordinates for each outcrop location were recorded using a Magelan Meridian Series GPS unit. The coordinates were then plotted on a geo-referenced air photo. An air photo map depicting the transects and the individual outcrop locations observed is included as **Exhibit 3**.

Investigation Results and Conclusions

During the field investigation, the Pismo Creek drainage was observed to be incised directly into the Edna Member of the Pismo Formation bedrock. A soil profile of decomposed Pismo Formation is present in the vegetated areas adjacent to the creek but no extensive or continuous alluvial deposits are present along the Pismo Creek drainage through the PXP property.

The Edna Member of the Pismo Formation is characterized by gray sandstone containing natural crude oil stain and seepage at many of the outcrop locations observed along Pismo Creek. The observed outcrop lithologies and crude oil seepage appear to be consistent with formation conditions encountered in the 4 sentry wells located along Pismo Creek. **Appendix 1** contains a series of representative photographs that show the Pismo Creek drainage incised directly into the Edna Member of the Pismo Formation.

Based on the results of the field investigation, it was determined that the previously mapped distribution of alluvium within the Pismo Creek drainage and tributaries was incorrect. Consequently, no alluvial aquifer appears to be present within the Pismo Creek drainage in the area of PXP's property.

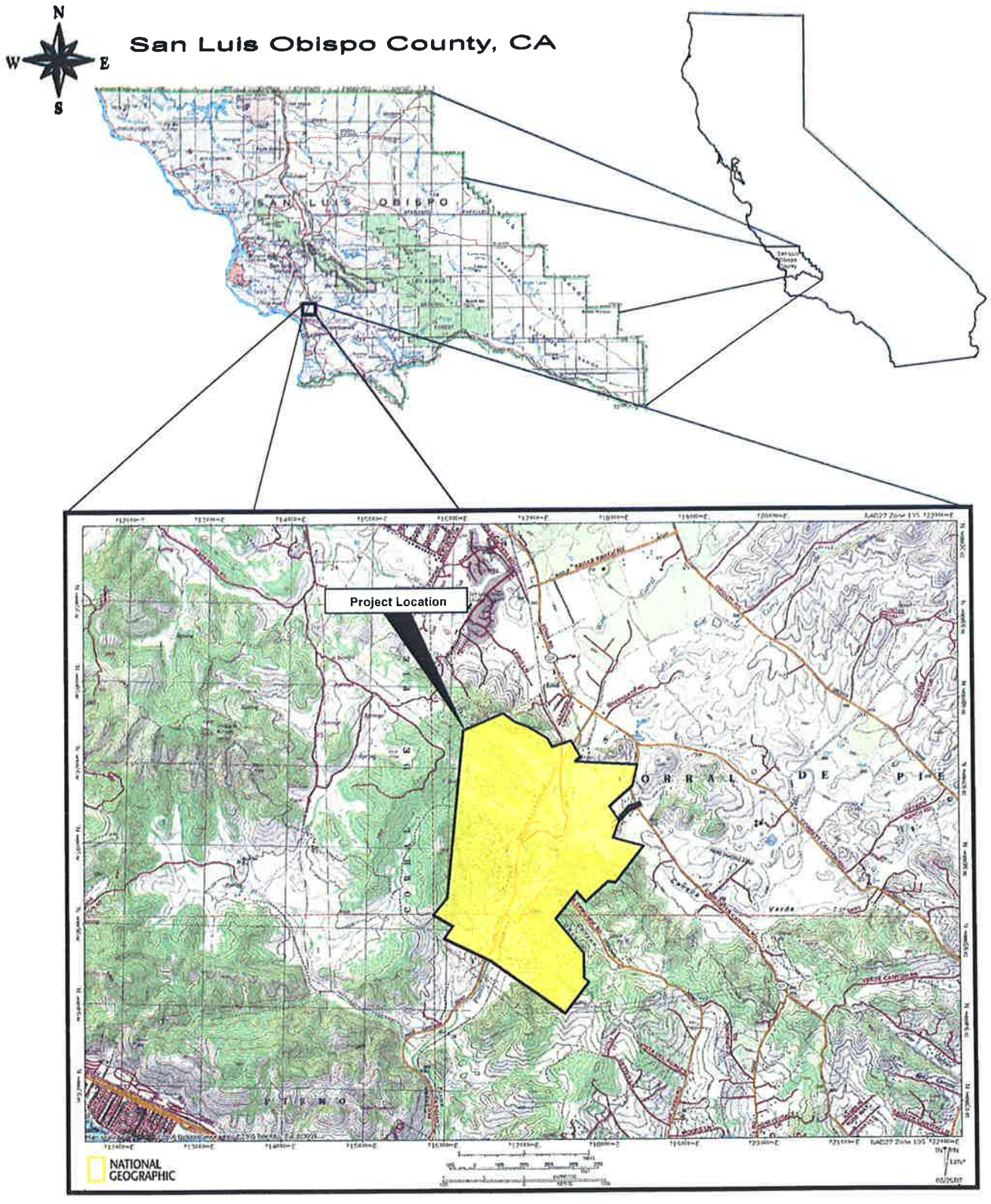
References

Entrix, Inc., 2006, *Sentry Well Groundwater Monitoring Installation and Initial Sampling, Arroyo Grande Oil Field 1821 Price Canyon Road, San Luis Obispo, California*, consulting report prepared by Entrix, Inc. for Plains Exploration & Production Company.

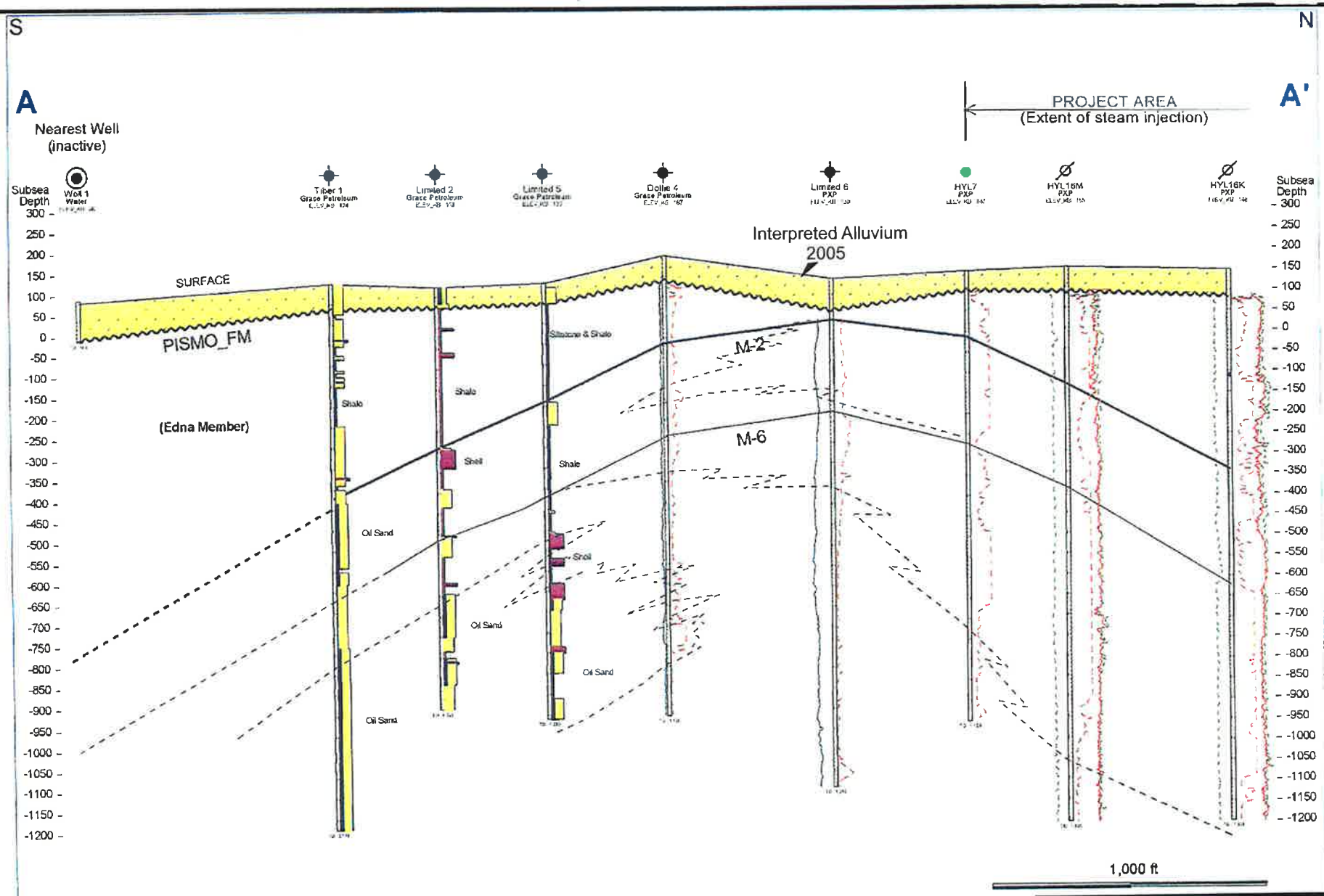
Hall, C.A., 1973, *Geology of the Arroyo Grande 15' Quadrangle, San Luis Obispo County, California*, California Division of Mines and Geology Arroyo Grande 15' Quadrangle map sheet 24.

Pacific Geotechnical Associates, Inc., 2005, *Analysis of Geological Separation of Price canyon Oil Development From the Fresh Water Aquifer, Price canyon, Arroyo Grande, San Luis Obispo County,* consulting report prepared for Plains Exploration & Production Company.

EXHIBITS



WZI INC. BAKERSFIELD, CALIFORNIA	
Plains Exploration & Production Co.	
Location Map	
DATE 2/07	1601000010 EXHIBIT 1



WZI INC.
BAKERSFIELD, CALIFORNIA

Plains Exploration & Production Co.

Cross Section A-A'
Pismo Creek Alluvium Interpretation
Pacific Geotechnical Associates 2005

DATE		EXHIBIT
2/07	1601000010	2

W-2
W-1
W-3
A
A'
N

Legend

- FIELD POINTS (10/25/06)
- FIELD POINTS 2 (11/10/06)
- PXP Water Wells
- Sentry Wells (Entrix, 2006)
- Photo Locations
- Pismo Creek
- X-Section A-A' (Pacific Geotecnical, 2005)
- Transect Lines
- Alluvium (Hall, 1973)

0 390 780 1,170 1,560 Feet

WZI INC.
BAKERSFIELD, CALIFORNIA

Plains Exploration & Production Co.

Site Plan Map with
Transects and Field Points

DATE		EXHIBIT
2/07	1601000010	3

APPENDIX

Pismo Creek Photo Location #5

Appendix 1

Pismo Creek Photo Location #9

Appendix 1

Pismo Creek Photo Location #15

Appendix 1

Poso Creek Photo Location #20

Appendix 1

Pismo Creek Photo Location #22

Appendix 1

Pismo Creek Photo Location #23

Appendix 1

Pismo Creek Photo Location #33

Appendix 1

Appendix 1

Pismo Creek Photo Location #34

Pismo Creek Photo Location #48

Appendix 1

Pismo Creek Photo Location #6

Appendix 1

Poso Creek Photo Location #19

Appendix 1