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**SOIL AND
GROUNDWATER
INVESTIGATION
WORKPLAN**

**DATE:
11/09/2011**



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Soil and Groundwater Investigation
Workplan
Enterprise Products Company
Jacquez Gas Com F#1 Pipeline Release
NW¼, SW¼, Section 4, T29N, R9W, San
Juan County, New Mexico

November 9, 2011

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1.0 Introduction

Animas Environmental Services, LLC (AES), on behalf of Enterprise Products Company (Enterprise), has prepared a workplan for a soil and groundwater investigation at the Jacquez Gas Com F#1 release site. On July 27, 2011, a landowner notified Enterprise gas control of an active gas release in a pasture on his property. Limited excavation and interim soil/groundwater sampling activities were conducted on October 10, 2011. On October 25, 2011, the New Mexico Oil Conservation Division (NMOCD) was notified that groundwater analytical results confirmed that the release had impacted shallow groundwater. Results of the initial soil and groundwater sampling were detailed in a letter report to Enterprise dated October 27, 2011. On November 1, Enterprise requested that AES prepare a written workplan to conduct additional investigation to delineate the extent of the Jacquez Gas Com F#1 release.

2.0 Site Information

2.1 Site Location

The release is located along the Enterprise Jacquez Gas Com F#1 pipeline leading from the Santa Rosa 4 #2 well within the NW¼, SW¼, Section 4, T29N, R9W, approximately 2.75 miles northeast of Blanco, San Juan County, New Mexico. Latitude and longitude of the release were recorded as N36° 45.105' and W107° 47.454'. The project area is located on private land. A topographic site location map is included as Figure 1.

The release is within the floodplain of the San Juan River and is located on the north side of the river. Surface runoff drains southwest towards an unnamed irrigation return ditch, which flows south and discharges directly into the San Juan River approximately one-third mile to the south. Depth of groundwater is approximately 4 feet below ground surface (bgs).

2.2 Spill History

AES was initially contacted by Aaron Dailey of Enterprise on July 28, 2011, and on July 30, 2011, Ross Kennemer of AES met with Enterprise representatives at the release location. The cause of the release was attributed to a line leak due to corrosion on the underside of the line. Initial excavation activities were conducted on October 10, 2011, and representatives from Enterprise, AES and Industrial Mechanical, Inc. (IMI) were present on-site during site activities.

During initial excavation activities, Ross Kennemer of AES collected soil samples from the base and mid-walls of the excavation, which measured approximately 20 ft long by 12 ft

wide by 6 ft deep. Total Petroleum Hydrocarbon (TPH) concentrations in three of the five soil samples collected were above the applicable NMOCD action level for TPH. One soil sample also contained total benzene, toluene, ethylbenzene, and xylenes (Total BTEX) at concentrations above the NMOCD standard for BTEX in soil. Approximately 58 cubic yards of contaminated soil were transported for disposal at the Envirotech Landfarm, near Bloomfield, New Mexico.

Due to inflow of shallow groundwater, dewatering of the excavation was necessary for completing the line repair work and sample collection. On October 10, 2011, AES also collected one groundwater sample from the open excavation. Dissolved phase total xylene concentrations in this sample were reported at 840 µg/L, which is above the New Mexico Water Quality Control Commission (WQCC) standard of 620 µg/L. During the line repair work, vacuum trucks were used to pump out groundwater from the excavation to dewater it for access. Approximately 1,680 barrels of groundwater removed from the excavation was disposed at Basin Disposal, Inc. in Aztec, New Mexico.

3.0 Regional and Local Geology and Hydrogeology

3.1 *Geology*

San Juan County, New Mexico, is located in the San Juan Basin, which is a large, structural depression encompassing approximately 22,000 square miles and contains deep Tertiary fill resting on rocks of Late Cretaceous age. The lithology consists primarily of the Mesa Verde Formation, composed mostly of sandstones. The topography is broad and mostly flat, surrounded by mountains and deep canyons. Major rivers carved deep canyons and mesas, and physical erosion from wind and water chipped and polished the exposed rocks in the canyons.

The local site geology consists of sandy clay from surface to 4 feet bgs. Wet sand and gravel were encountered from 4 to 6 feet bgs.

3.2 *Hydrogeology*

The location of the release is within the floodplain of the San Juan River. Surface runoff drains southwest towards an unnamed irrigation return ditch, which flows south and discharges directly into the San Juan River approximately one-third mile to the south. Depth of groundwater is approximately 4 feet bgs.

3.3 *Sensitive Receptors*

The project is located within a rural agricultural area, and there are no known wellhead protection areas, schools, day care centers, nursing homes or senior centers within the immediate vicinity.

4.0 Proposed Scope of Work

Site investigation activities will be initiated in order to delineate the full extent of petroleum hydrocarbon impacted groundwater and soils (lateral extent only). The investigation procedures are designed to be protective of both surface water and groundwater and are based upon the protocol outlined in the NMOCD *Environmental Handbook: Guidelines for Remediation of Leaks, Spills, and Releases* (1993).

4.1 Access Agreements

Prior to initiating the field work, AES requests that Enterprise coordinate with the landowner for permission to access the property and complete the proposed investigation.

4.2 Archaeological Clearances

In the event that any evidence of artifacts and/or human remains are encountered, all work will be stopped immediately, the State Historic Preservation Office (SHPO) will be contacted, and appropriate mitigation measures will be implemented.

4.3 Office of State Engineer Permits

Prior to initiating the site investigation, AES will consult with the local district office of the New Mexico State Engineer for groundwater monitor well permits that may be required for this project. These permits have not been required in the past with NMOCD groundwater investigations in the San Juan Basin; however, this protocol will be confirmed prior to field activities.

4.4 Utilities Notification

AES will utilize the New Mexico One-Call system to identify and mark all underground utilities at the site before the start of any proposed field activities which could impact buried utilities. Any local utilities not participating in the New Mexico One-Call system will be contacted separately by AES for utility locations.

4.5 Health and Safety Plan

AES has a Health and Safety Program in place to ensure the health and safety of all AES employees. The Health and Safety Program defines safety practices and procedures to be instituted in all AES work places, as applicable. The program meets the requirements promulgated by the Occupational Safety and Health Act (OSHA). All AES personnel are appropriately trained in accordance with OSHA 40 CFR 1910.120.

A comprehensive site-specific Health and Safety Plan (HASP) addressing the site investigation and associated sampling will be prepared prior to the start of the field work. All employees and subcontractors will be required to read and sign the HASP to acknowledge their

understanding of the information contained within it. The HASP will be implemented and enforced on site by the assigned Site Safety and Health Officer. Daily tailgate meetings will be held and documented during field activities and will address specific health and safety concerns or issues.

4.6 Installation of Soil Borings

AES proposes to install four soil borings which will be completed as groundwater monitor wells within the release area to define the extent of the soil and groundwater petroleum hydrocarbon contamination. The October 2011 release report confirmed the presence of petroleum hydrocarbon contaminated soil in the base and the east wall of the excavation, as well as groundwater contamination in the center of the excavation. Soil borings will be advanced with a DT 6620 track-mounted direct push rig, manufactured by Geoprobe®, and equipped with a 2-inch outer diameter (OD) core barrel. Direct push drilling will be provided by Earth Worx, Los Lunas, New Mexico. The locations of the proposed soil borings and monitor wells are shown on Figure 2.

4.7 Soil Sampling and Analyses

4.7.1 Soil Sample Collection

All soil borings will be advanced to approximately 8 feet bgs, and it is anticipated that groundwater will be encountered at approximately 4 feet bgs. Each boring will be logged for lithology and sampled continuously for field screening of volatile organic compounds (VOCs) with a photo-ionization detector (PID) organic vapor meter (OVM). A minimum of one soil sample will be collected from each boring for laboratory analysis. The sample will be collected from the capillary fringe just above groundwater.

For each soil boring, a Soil Boring Log will be completed. These logs will record sample identification, depth collected, and method of collection, as well as observations of soil moisture, color, density, grain size, plasticity, contaminant presence, and overall stratigraphy.

Soil samples will be collected from continuously driven core-barrel samplers during advancement of the soil borings. Discrete samples will be collected based on PID-OVM screening measurements from the core barrel sampler and transferred to appropriately labeled sample containers. Soil sample collection will be completed in strict accordance with AES's Standard Operating Procedures (SOPs), which are available upon request.

4.7.2 Field Screening

Samples will be field-screened for VOC vapors utilizing a PID-OVM calibrated with isobutylene gas to obtain preliminary data regarding potential petroleum hydrocarbon-impacted soil.

Once collected, the soil sample to be field-screened will be placed immediately in a clean 16 ounce glass jar, filled approximately half full, and sealed with a threaded ring lid and a sheet of aluminum foil. The sample jar will then be placed in a warm water bath where it will be warmed to approximately 80°F. Approximately 10 minutes will be allowed for the soil to be heated and for any VOCs in the soil to accumulate in the head space of the jar. During the initial stages of headspace development, the sample will be gently shaken for one minute to promote vapor development and disaggregate the sample. Volatile gases will then be measured by piercing the aluminum foil with the sample probe of the PID-OVM. The highest (peak) measurement will be recorded. PID-OVM readings will be recorded onto the Soil Boring Logs. All field screening will be completed in strict accordance with AES SOPs.

4.7.3 Laboratory Analyses - Soil

Analytical samples collected from soil borings will be submitted to a U.S. Environmental Protection Agency (USEPA) approved laboratory, Hall Environmental Analysis Laboratory (Hall), Albuquerque, New Mexico, or one of its subcontractors for analysis of the following parameters:

- BTEX per EPA Method 8021B
- TPH (C6-C36) per EPA Method 8015B Modified

Additional soil samples will be collected and submitted for laboratory analyses if warranted by field observation. Therefore, based on four proposed soil borings, a minimum of four soil samples will be submitted for laboratory analyses.

Once collected, sample containers will be packed with ice in insulated coolers and shipped via UPS or Greyhound Bus to the analyzing laboratory. Typical laboratory regular turn around time is 12 to 15 business days.

For all laboratory samples, quality assurance and quality control (QA/QC) procedures, sample preservation, apparatus required, and analyses performed will be in accordance with USEPA Document EPA-600, "Methods for Chemical Analysis for Water and Wastes" dated July 1982; and USEPA document SW-846, 3rd Edition, "Test Methods for Evaluating Solid Waste: Physical Chemical Methods", dated November 1986.

4.8 Groundwater Monitor Well Installation

4.8.1 Groundwater Monitor Well Installation and Construction

Groundwater monitor wells will be installed within all of the four soil borings. Monitor well construction will consist of 1.4-inch outside diameter (OD) [0.75-inch inside diameter (ID)] Schedule 40 PVC screen and 1.0-inch blank riser casing. The screened interval will extend approximately 4 feet across the water table. The wells will be constructed of a 1.4-inch OD (0.75-inch ID) pre-packed screen (0.010-inch slot). The screen is factory packed with 20/40

Colorado silica sand. A bentonite seal will be placed above the sand pack, and concrete grout with approximately 5 percent bentonite will be poured from the top of the bentonite plug up to within 0.5 feet of ground surface. An above grade locking steel stick-up protective casing, set in a concrete base, will be installed on the well to prevent unauthorized access and damage from runoff and debris within the wash. Monitor wells will be installed in strict accordance with the AES SOPs and applicable ASTM standards.

4.8.2 Professional Survey

The location and elevation of the top of each well casing will be surveyed to the nearest 0.01 foot with reference to mean sea level by a licensed surveyor in order to accurately determine the local groundwater depth and flow direction beneath the site. Each well will be tied to an existing USGS benchmark. AES will arrange with a New Mexico licensed Professional Surveyor to complete the survey upon completion of the monitor well installation.

4.8.3 Groundwater Monitor Well Development

Following monitor well installation and completion, each well will be developed by a combination of surging and bailing techniques. It is estimated that approximately one gallon of water will be generated during development of the 1-inch diameter shallow groundwater monitor wells. Groundwater purged from the wells will be contained in labeled and sealed 55-gallon drums. Development water will be transported back to the AES yard and kept in a secure location until proper disposal. Monitor wells will be developed in strict accordance with AES SOPs and applicable ASTM standards.

4.8.4 Groundwater Monitor Well Monitoring and Sampling

Upon completion and development, the monitor wells will be allowed to sit undisturbed for a minimum of one week. The groundwater monitor wells will then be gauged to determine water table elevation and direction of groundwater flow. The wells will then be purged of a minimum of three well volumes, and a groundwater sample will be collected from each well.

Groundwater samples will be collected from each well with a new disposable bailer equipped with a low-flow release valve. Purging data, including pH, temperature, conductivity, oxidation-reduction potential, and dissolved oxygen, will be measured with a YSI water quality meter and documented on a Water Sample Collection Form along with purged water volume. All sampling equipment will be thoroughly decontaminated between uses.

Duplicate groundwater samples will be collected from each monitor well and held in the event that further laboratory analyses are required. All sample collection data, including sample collection depth, will be documented on a Water Sample Collection Form. A Chain of Custody Record will be completed in the field as samples are being collected. Samples will be stored in a chilled, insulated cooler at 6°C until delivered to the analyzing laboratory.

Groundwater monitoring, well installation, well development, and sampling will be completed in strict accordance with AES SOPs and applicable ASTM standards.

4.8.5 Laboratory Analyses - Groundwater

All groundwater analytical samples collected from the monitor wells will be submitted to, Hall, Albuquerque, New Mexico, or one of its subcontractors for analysis of the following parameters:

- BTEX per EPA Method 8021B;
- TPH (C6-C36) per EPA Method 8015B Modified; and
- Chloride (for waste water disposal purpose only) per EPA Method 300

A travel blank and a field blank will also be analyzed for BTEX per EPA Method 8021B. Once collected, sample containers will be packed with ice in insulated coolers and shipped via UPS or Greyhound Bus to the laboratory. Typical laboratory regular turnaround time is 12 to 15 days.

For all laboratory samples, QA/QC procedures, sample preservation, apparatus required, and analyses performed will be per USEPA Document EPA-600, "Methods for Chemical Analysis for Water and Wastes" dated July 1982; and USEPA document SW-846, 3rd Edition, "Test Methods for Evaluating Solid Waste: Physical Chemical Methods", dated November 1986, as amended by Update One, July 1992.

4.9 Equipment Decontamination

In order to prevent cross-contamination between sampling locations, strict decontamination procedures will be employed during the investigation. All drilling equipment will be decontaminated after completing each soil boring, and sampling equipment (i.e. hand auger, spoon sampler, and other hand tools) will be decontaminated following each use at an individual depth or location.

All decontamination of equipment will be completed within clean, 5-gallon plastic buckets, which will contain the effluent. At least two tubs will be used, one designated for push rods and the other for small sampling equipment. On an as-needed basis, effluent from the tubs will be transferred by small pump or bucket into 55-gallon DOT approved drums, which will then be marked with identification labels and sealed. Decontamination procedures to be utilized are outlined below.

For small equipment such as hand augers, hand tools, and spoon samplers:

1. Physical removal of gross contamination and all debris with brushes
2. Hand wash with non-phosphate detergent
3. Hand wash with non-phosphate detergent and water using brush

4. Rinse with water
5. Second rinse with water
6. Air dry

All decontamination procedures will be completed in strict accordance with AES SOPs and applicable USEPA guidelines.

4.10 Investigation Derived Waste

4.10.1 Investigation Derived Waste – Equipment Decontamination Water

All decontamination and rinse water will be managed in accordance with applicable State and Federal regulations. Decontamination wash water will be stored within 55-gallon DOT approved drums, which will then be labeled and sealed. Equipment decontamination water will then be disposed of at the Envirotech Landfarm. Disposal manifests will be included within the investigation report.

4.10.2 Investigation Derived Waste – Groundwater

Contaminated water will be managed in accordance with applicable State and Federal regulations. Groundwater obtained from monitor well development and pre-sample purging will be stored within 55-gallon DOT approved drums, which will then be labeled and sealed. This water will then be disposed of at the Envirotech Landfarm. Disposal manifests will be included within the investigation report.

4.11 Quality Assurance/Quality Control and Chain of Custody Procedures

4.11.1 Quality Control Samples

Field quality control (QC) samples will be collected in order to assess variability of the media being sampled and to detect contamination and sampling error in the field. Field QC samples will include field duplicates, trip blanks and, if applicable, equipment rinsate blanks.

- One field duplicate sample will be collected for every ten field samples collected for laboratory analysis in order to check for reproducibility of laboratory and field procedures.
- One trip blank sample will be utilized per sampling event to check for contamination of volatile organic samples during handling and shipment from the field to the analyzing laboratory.

Laboratory QC samples will be analyzed by the laboratory and will consist of matrix spike and matrix spike duplicates for organic samples in order to identify, measure, and control the sources of error that may be introduced from the time of sample bottle preparation through analysis.

4.11.2 Sample Quality Assurance Elements

Sample quality assurance elements will include the following:

1. Sample documentation (location, date and time collected, batch, etc.)
2. Complete chain of custody records
3. Initial and periodic calibration of field equipment
4. Determination and documentation of applicable detection limits
5. Analyte(s) identification
6. Analyte(s) quantification

4.11.3 Chain of Custody Record

A Chain of Custody Record will be maintained from the time of sample collection until final deposition. Every transfer of custody will be noted and signed for, and a copy of the record will be kept by each individual who has signed it. The Chain of Custody Record will include the following information:

1. Sample identification
2. Sample location
3. Sample collection date
4. Sample information, i.e., matrix, number of bottles collected, etc.
5. Names and signatures of samplers
6. Signatures of all individuals who have had custody of the samples

When samples are not under direct control of the individual currently responsible for them, the samples will be stored in a locked container which has been sealed with a Custody Seal.

4.11.4 Custody Seal

Custody seals demonstrate that a sample container has not been opened or tampered with. The individual who has custody of the samples will sign and date the seal and affix it to the container in such a manner that it cannot be opened without breaking the seal.

5.0 Deliverables

Following completion of the investigation activities, a Soil and Groundwater Investigation Report summarizing the investigation activities will be submitted to Enterprise, NMOCD, and the property owner. The report will include the following:

1. A summary of all work conducted in the implementation of the investigation;
2. Maps of all sampling locations, including soil and groundwater contamination plumes;
3. Geologic cross-section;

4. All laboratory data and quality assurance and quality control information;
5. Recommendations of further sampling which needs to be conducted as a result of the sampling pursuant to the investigation; and
6. Recommendations for further remediation measures.

6.0 Implementation Schedule

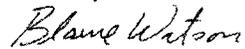
AES proposes the following timeline to implement the proposed soil and groundwater investigation activities, once NMOCD approval has been received. This schedule assumes that no inclement weather occurs, which could result in a delay in implementing field activities.

<i>Task</i>	<i>Days from NMOCD Workplan Concurrence</i>
1. Landowner permission and scheduling. Enterprise to obtain landowner access; AES will schedule direct push rig for soil borings and monitor well installation, and will provide notification to NMOCD and Enterprise of scheduled site activities.	15
2. Complete installation of soil borings and groundwater monitor wells; collect and submit soil and groundwater samples for laboratory analysis.	30
3. Receive laboratory analytical reports for soil and groundwater samples.	45
4. Prepare and submit Soil and Groundwater Investigation Report.	60

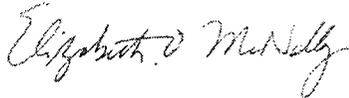
7.0 Certification

AES has prepared this Soil and Groundwater Investigation workplan on behalf of Enterprise to complete a soil and groundwater investigation for the Jacquez Gas Com F#1 Pipeline Release, which was discovered on July 27, 2011.

Respectfully submitted,



Blaine Watson, P.G.
Sr. Project Manager



Elizabeth McNally, P.E.
Principal

8.0 References

- New Mexico Oil Conservation Division. 1993. *Environmental Handbook: Miscellaneous Guidelines: Guidelines for Remediation of Spills, Leaks, and Releases*. August 13, 1993. <http://www.emnrd.state.nm.us/ocd/EnvironmentalHandbook.htm>
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- USEPA. 2001. Contract Laboratory Program (CLP) Guidance for Field Samplers. OSWER 9240.0-35, EPA 540-R-00-003. June, 2001.

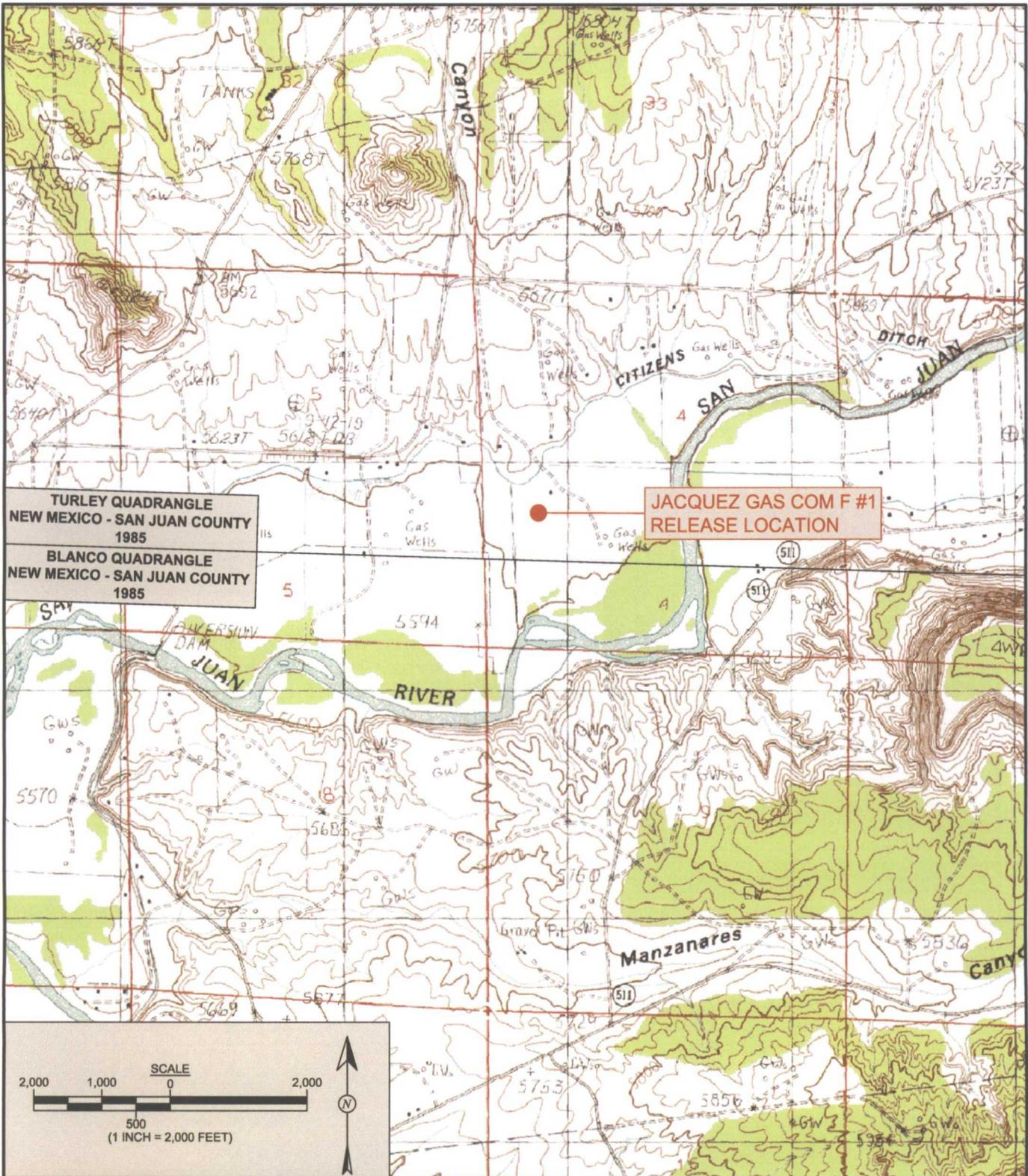


FIGURE 1

TOPOGRAPHIC SITE LOCATION MAP

ENTERPRISE PRODUCTS COMPANY
 JACQUEZ GAS COM F #1
 PIPELINE RELEASE LOCATION
 SAN JUAN COUNTY, NEW MEXICO
 NW ¼, SW ¼, SEC. 4, T29N, R9W
 N36°45.105', W107°47.454'

DRAWN BY: C. Lameman	DATE DRAWN: October 21, 2011
REVISIONS BY: C. Lameman	DATE REVISED: October 21, 2011
CHECKED BY: B. Watson	DATE CHECKED: October 26, 2011
APPROVED BY: E. McNally	DATE APPROVED: November 8, 2011

AES
Animas Environmental Services, LLC

