TRACY HILLS SPECIFIC PLAN
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APPENDIX E-3

PIPELINE SAFETY HAZARD ASSESSMENT, TRACY HILLS SPECIFIC PLAN. PREPARED BY PLACEWORKS, DATED OCTOBER 2014

Revised October 2014 | Pipeline Safety Hazard Assessment

Tracy Hills Specific Plan

for Tracy Hills Project Owner, LLC

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1. Introduction

1.1 INTRODUCTION

This report presents the results of a pipeline safety hazard assessment (PSHA) prepared by Placeworks for Tracy Hills Project Owner, LLC, for the Tracy Hills Specific Plan. The Specific Plan area consists of approximately 2,732 acres in the southeast portion of the City of Tracy, San Joaquin County, California. The Tracy Hills Specific Plan proposes to develop the area with residential housing, a mixed use business park, highway commercial, and light industrial land uses. There are three easements that bisect the site, containing two natural gas pipelines and three crude oil pipelines. These pipelines are the focus of this assessment.

1.2 SITE LOCATION

Tracy Hills Project Owner, LLC, is proposing to construct new housing, mixed use, commercial, and industrial land uses on a portion of the project site, which encompasses 2,732 acres located near the interchange of Corral Hollow Road and Interstate 580 in the City of Tracy, CA. Two Pacific Gas & Electric (PG&E) natural gas pipelines and a Chevron crude oil pipeline are located within a 50-foot easement that bisects the northeast corner of the Specific Plan area in a northwest to southeast orientation. In addition, a Phillips 66 crude oil pipeline bisects the middle of the Specific Plan area and is located within a 16.5-foot wide easement. Finally, a Shell crude oil pipeline is located along the west side of Interstate 580 within a 20-foot easement.

The Specific Plan area is bounded by the Delta Mendota Canal and Union Pacific (UP) railroad to the north; hillsides used for livestock grazing to the west and southwest; Corral Hollow Road, the California Aqueduct, and vacant land to the southeast; and privately owned lands designated and zoned for aggregate extraction to the east. The Specific Plan area and pipeline locations are shown on Figure 1.

1.3 PURPOSE AND SCOPE

The purpose of this PSHA is to identify potential hazards associated with the natural gas and crude oil pipelines and to evaluate risks associated with development of the project in close proximity to the pipelines. The PSHA is based on information obtained from the pipeline companies regarding materials of construction, operating parameters and pressures, and inspection and maintenance procedures. Recommendations for development setbacks based on land uses planned along the pipeline alignments are also provided. In addition, the following reports were used as references in preparing this assessment:

- Kiefner & Associates, Inc., 2012. Safety Aspects of Energy Pipelines Regarding the Proposed Ellis Development. Dated May 1, 2012.

- J. House Environmental, 2004. Pipeline Risk Analysis, Mountain House Specific Plan III, San Joaquin County, California. Prepared for EDAW, Inc. Dated June 4, 2004.

- The Planning Center|DC&E, 2013. Pipeline Safety Assessment for Cordes Ranch Specific Plan. Prepared for the City of Tracy. Dated March 2013.

- PMC, 2005. Tracy Youth Sports Facility, 15178 W. Schulte Road, Tracy, Draft Environmental Impact Report. Prepared for the City of Tracy, Development and Engineering Department. Dated September 2005.

- Pipelines and Informed Planning Alliance (PIPA), 2010. Partnering to Further Enhance Pipeline Safety in Communities through Risk-Informed Land Use Planning. Final Report of Recommended Practices. Dated November 2010.

- Municipal Research & Services Center (MRSC), 2004. Setbacks and Zoning for Natural Gas and Hazardous Liquid Transmission Pipelines. Prepared by Jim Doherty, Legal Consultant. Dated August 2004.

The California Department of Education (CDE) has developed a protocol for evaluating safety hazards associated with natural gas and hazardous liquid releases from underground and aboveground pipelines and CDE requires all new school sites within 1,500 feet of a natural gas or hazardous liquid pipeline to conduct a risk analysis. A detailed description of the procedures is provided in the *Guidance Protocol for School Site Pipeline Risk Analysis* (CDE, 2007). These procedures provided the framework for this PSHA.

The protocol uses historic data to estimate the probability of a pipeline failure and product release, as well as models to determine the consequences of a pipeline incident, considering fatality probabilities for difference exposure scenarios (pool fire, flash fire, flammable vapor cloud) and school attendance hours. For this analysis, the protocol was modified to account for residential exposure (24 hours/day for 365 days/year). The analytical result is an estimate of individual risk, which is compared to a significance threshold of one in a million (1.0×10^{-6}). If the estimated risk is less than one in a million, then no significant safety hazard is predicted. If the estimated risk is greater than one in a million, mitigation measures are required to reduce the risk to acceptable limits.

This report discusses 1) the pipeline specifications and operating parameters, 2) qualitative pipeline safety evaluation, based on Federal and State regulations and inspection, maintenance, and safety procedures, 3) setbacks and emergency planning zones implemented by other cities and counties, 4) quantitative risk analysis based on the CDE protocol, and 5) summary, recommendations, and mitigation measures.

1.4 TRACY HILLS SPECIFIC PLAN DEVELOPMENT

The proposed Tracy Hills Specific Plan includes a mixture of residential, commercial, mixed use business park, industrial land uses, and open space. Primarily residential estates, low density, and medium density housing are proposed for the south side of I-580, with two small areas of mixed use business park and commercial land use. In the area north of I-580 and south of the California Aqueduct, the land uses are mixed use business park, commercial, and low/medium/high density housing. North of the California Aqueduct, land use is primarily medium density housing and light industrial land use. The proposed land uses are shown on Figure 2.

Proposed land uses adjacent to the PG&E easement are light industrial. Land uses adjacent to the Phillips 66 easement include mixed use business park; low, medium, and high density housing; and general highway commercial. Land use adjacent to the Shell easement includes I-580, mixed use business park, and low and medium density housing. There also is a 100-foot wide conservation easement south of I-580.

2. Pipeline Safety Hazard Assessment

2.1 PIPELINE LOCATIONS AND OPERATIONAL DATA

There are two natural gas pipelines and three crude oil pipelines within the Tracy Hills Specific Plan area. No other pipelines were identified (NPMS, 2014). The locations of the pipelines are shown on Figure 1.

2.1.1 Natural Gas Pipelines

Natural gas is comprised primarily of methane. It is colorless, odorless, and tasteless and is non-toxic. However in high concentrations, it can cause asphyxiation, causing serious injury or death. Methane has an ignition temperature of 1,200°F and is flammable at concentrations between 5 and 15 percent in air. Methane is a lighter-than-air gas and is buoyant at atmospheric temperatures, thus dispersing rapidly into the air. Mixtures of methane in air can burn if exposed to an ignition source and the methane concentration is between 5% and 15%. But methane vapors in open conditions are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. Odorants, such as mercaptans, are added to natural gas in pipelines so that leaks can be detected before the lower flammability limit is reached.

Natural gas pipeline data were obtained from Pacific Gas & Electric Company (PG&E, 2014). There are two natural gas transmission pipelines (designated as Lines 002 and 401) that cut through the northeast corner of the Plan area along a 1,950 foot long, 50-foot wide easement at a 45 degree angle. The gas pipelines are separated from each other by 25 feet and there also is a Chevron crude oil pipeline nine feet west of the 26-inch pipeline and 6 feet from the edge of the easement.

The 26-inch natural gas transmission line (designated as Line 002) was installed in 1972 and runs 118 miles from a PG&E facility near the town of Brentwood, CA to a PG&E facility near Panoche, CA. It has a maximum allowable operating pressure (MAOP) of 890 pounds per square inch (psi) operating at 60% of its specified maximum yield strength (SMYS). The pipeline was constructed as a double submerged arc welded (DSAW) steel pipeline (API 5L X70 grade) and has a wall thickness of 0.322 inch. To minimize corrosion, it was double wrapped with polyethylene tape and equipped with an induced current cathodic protection system. The pipeline was pressure tested at the pipe mill to a hoop stress of 90% of the SMYS as proof of its structural integrity. It was also hydrotested to a minimum test pressure of 1,486 psig for a period of 8 hours (PG&E, 2005).

When a smart pig in-line inspection (ILI) of the pipeline was performed in 2001 within the Tracy area, the results indicated that the line has exhibited corrosion with a wall loss of up to 61%. The operating pressure of the pipeline was subsequently lowered and repairs were performed. It is possible that the corrosion occurred in the past prior to installation of the cathodic protection (CP) corrosion prevention system (Kiefner & Associates, 2012). In 2006, a recent ILI of the pipeline was conducted, including the segments which cross the proposed Plan area. The ILI indicated that the pipeline was in overall sound condition. PG&E has not reported any leaks or failures on the segment of pipeline in the vicinity of the project site.

2. Pipeline Safety Hazard Assessment

The second 36-inch natural gas transmission pipeline (designated as Line 401) within the easement was installed in 1993 and has a MAOP of 1,040 psi, operating at 60% of the SMYS. The pipeline also was constructed as a DSAW steel pipeline (API 5L X60) and has a wall thickness of 0.372 inch. It was coated with a fusion bonded epoxy (FBE) to minimum corrosion and is also equipped with a cathodic protection system. The pipeline was pressure tested before installation to a hoop stress of 99.6% of the SMYS as proof of its structural integrity. It was hydrotested to a minimum test pressure of 1,302 psig for 8 hours (PG&E, 2005).

The pipelines are inspected and maintained in accordance with Federal regulations (49 CFR 192) and the California Public Utilities Commission's (CPUC's) General Order 112-E regulations. Regular patrols are performed along the pipelines to monitor conditions and control encroachment. Additionally, periodic leak detection surveys are conducted in accordance with DOT regulations. The cathodic protection systems are also monitored on a regular basis to maintain required pipe-to-soil potential to minimize corrosion. In the event of loss of pressure, leak detection, or significant deviations from normal operating parameters, emergency procedures will be activated, including contact with local fire department and emergency personnel.

No leaks, ruptures, or incidents have been reported by PG&E for the pipeline segments in the vicinity of the Plan area. An in-line inspection (ILI) was performed in 2005 on 110 miles of Line 401 and 26 miles of Line 002 that included the Plan area and several miles in either direction to the north and south. The results indicated that the pipelines were in overall sound condition. There were six follow-up investigative digs on Line 401 in July 2007 to investigate potential anomalies found during the ILI. No internal corrosion was found and the anomalies were determined to be a result of the fabrication process. No repairs were required. These digs were not conducted on the pipeline segments within the Plan area, because there were no indications of potential issues at this location.

The natural gas pipelines are buried at least 36 inches below ground surface (bgs). The distance between isolation valves is 9,000 feet; for this analysis, it was conservatively assumed that all of the natural gas in the 9,000-foot segment of each pipeline could be released into the atmosphere in the event of a rupture or leak.

In 2000, four pipeline inspections were performed on the segment of the pipeline north of the Plan area as part of an Underground Service Alert (USA) ticket (PG&E, 2005). At each of these locations, the pipeline was unearthed and directly examined. No corrosion or other damage was documented and the coating was found to be in good condition. A summary of the operating characteristics of the natural gas pipelines within the Plan area is summarized below:

Description	26-Inch Natural Gas Pipeline	36-Inch Natural Gas Pipeline
Pipeline Identification	Line 002	Line 401
Pipeline Operator	PG&E	PG&E
Year of Installation	1972	1993
Pipeline Diameter, inches	26	36
Wall Thickness, inches	0.322	0.372
Maximum Allowable Operating Pressure, psig	890	1,040
Easement Width, feet	50	50
Distance of Pipeline from Edge of Easement, feet	15	10

2.1.2 Crude Oil Pipelines

There is a Chevron 18-inch crude oil pipeline within the 50-foot PG&E easement that is co-located with the natural gas pipelines (Chevron Pipeline Company, 2014). This pipeline is designated as the "KLM" line, which transports crude oil from Kettleman, CA to Los Medanos, CA. It was constructed in 1945 with a wall thickness of 0.25 inch and has a capacity to transport 85,000 barrels per day. The pipeline has a somastic coating to minimize corrosion and is also equipped with a cathodic protection system. Information such as operating pressure, hydrostatic test pressure and depth of burial is considered by Chevron to be proprietary information and was not available. However, according to the State Fire Marshal's Office, the pipeline is operated at a maximum pressure of 920 psig. The pipeline is monitored 24/7 by a supervisory control and data acquisition (SCADA) system and is inspected and tested on a regular basis in accordance with the Federal pipeline regulations (49 CFR 195).

Phillips 66 Pipeline, LLC also owns and operates a 16-inch crude oil pipeline that bisects the Plan area and is oriented in a northwest to southeast configuration (Phillips 66, 2014). The pipeline is aligned between Interstate 580 and the California Aqueduct within a 16.5-foot wide easement in the Plan area. The pipeline is designated as Line 200 and transports Elk Hills crude oil, gas oil, pressure distillate, and heavy distillate (pressure distillate blended with San Joaquin crude oil) on this pipeline. The pipeline originates in the Bakersfield area and terminates in the Bay area at the Phillips 66 refinery in Rodeo, California.

It was installed in 1957, is constructed of steel (API-5LX), and has a wall thickness of 0.25 inch. The pipeline has a MAOP of 1,130 psi and a flow rate of 4,000 to 4,200 barrels/hour. It also has various coatings (tape, primer, Polyguard, etc.) and is equipped with a cathodic protection system to minimize corrosion. There have been no releases from this pipeline in the last 15 years and there are no known repairs on the pipeline section within the Plan area, other than the installation of cathodic test leads and marker plates (Phillips 66, 2014).

The nearest upstream block valve to the Plan area is a manual block valve (C-21) at the southeast Plan boundary and the nearest downstream valve (remotely operated) is C-22 just past Bethany Reservoir, which is a distance of approximately 9 miles from the Plan area. The pipeline can be automatically shut down from the control center in Bartlesville in the event that there is a release on the pipeline. Response time to manually close valves can range from 30 minutes to 2 hours, depending on the location of Phillips 66 personnel at the time of the event (Phillips 66, 2014).

The pipeline is monitored 24/7 by a SCADA system and is inspected and tested on a regular basis in accordance with the Federal pipeline regulations (49 CFR 195). Phillips 66 personnel monitor the pipeline twice a week with flyovers using air patrol. The pipeline is internally inspected every five years to detect anomalies in the pipeline wall and corrective action is taken, based on the results. The SCADA system continually monitors pipeline pressures and flow rates and the California State Fire Marshal audits the pipeline records to confirm compliance with Federal regulations.

Phillips 66 Pipeline Company also has an approved spill response plan that covers emergency notifications and management of a pipeline release. Personnel are trained in the Incident Command Structure to team with local agencies to manage the response. Phillips 66 mobilizes and deploys an Incident Management Assist Team to aid in the response to pipeline releases (Phillips 66, 2014).

The Shell Pipeline Company owns and operates a 20-inch crude oil pipeline that is aligned along the west side of Interstate 580 (Shell Pipeline Company, 2014). The pipeline runs from Coalinga to the Shell refinery in Martinez, California. The pipeline was installed in 1967 and is constructed of API 5L Grade X52 carbon steel with a wall thickness of 0.25 inch. The maximum operating pressure is 926 psi; flow rates and operating pressures were considered to be proprietary and were not provided. There are block valves located to the northwest near the Tracy Pump Station and to the southeast near Chrisman Road; the distance between these valves is approximately 10 miles. The pipeline is in compliance with the Integrity Management Program (IMP) and State and Federal regulations, with annual internal inspection using in-line inspection (ILI) tools as approved by the California State Fire Marshal.

A summary of the information for the crude oil pipelines is provided in the following table; the locations of the pipelines are shown in Figure 1:

Description	18-Inch Crude Oil Pipeline	16-Inch Crude Oil Pipeline	20-Inch Crude Oil Pipeline
Pipeline Identification	KLM Line	Line 200	Coalinga-Avon
Pipeline Operator	Chevron	Phillips 66	Shell
Year of Installation	1945	1957	1967
Pipeline Diameter, inches	18	16	20
Wall Thickness, inches	0.250	0.250	0.25
Maximum Allowable Operating Pressure, psig	920	1,130	926
Easement Width, feet	50	16.5	20
Distance of Pipeline from Edge of Easement	6	8.25	10

2.2 PIPELINE SAFETY EVALUATION

The PG&E natural gas pipelines and the crude oil pipelines are constructed, operated, and maintained in accordance with Federal regulations (49 CFR 192 for natural gas and 49 CFR 195 for hazardous liquid pipelines). In addition, these pipelines are subject to State regulations in accordance with California Public Utilities Commission (CPUC) General Order 112-E and the California Pipeline Safety Act of 1981. Procedures and requirements established in these regulations provide safeguards to ensure public safety and reduce risk associated with these pipelines.

2.2.1 Natural Gas Pipeline Safety Procedures

As a result of the San Bruno pipeline incident in 2010 and subsequent investigation, PG&E under the direction of the CPUC has implemented increased inspection, operating, and maintenance procedures for all of their transmission pipelines (CPUC, 2012). PG&E's 2012-2014 Pipeline Safety Implementation Plan includes the following:

- Pressure test 783 miles of natural gas pipelines
- Replace 186 miles of pipeline
- Upgrade 199 miles of pipeline to allow in-line inspection
- Install 228 automated shutoff valves
- Validating MAOP for all transmission pipelines in the system.

PG&E also has a comprehensive testing and inspection program to ensure the safety of its natural gas transmission system by implementing the following:

- Monitoring the pipeline system status on a 24-hour basis, using a Supervisory Control and Data Acquisition (SCADA) computer system
- Hydrostatic testing by pressurizing a pipeline with water to verify a pipeline's MAOP or capability to operate at a safe level of pressure
- Camera inspection by excavating holes along the length of the pipeline and inserting a tethered camera to record internal pipeline conditions
- Checking for leaks by aircraft equipped with advanced laser detection technology followed by teams of gas technicians using handheld detectors
- Surveying, monitoring, and testing pipelines on a continual basis, using "smart pig" in-line inspection devices that identify internal issues, such as corrosion.
- Conducting periodic electrical surveys to inspect the cathodic protection system to detect areas where electrical potentials or flow of currents suggest that corrosion could be occurring.

In addition, PG&E has implemented additional safety procedures in conjunction with the proposed construction of the Tracy Youth Sports Facility, which was planned for the area one mile northwest of the Plan area and adjacent to the proposed Cordes Ranch development. Although the construction of this facility is no longer under consideration, the PG&E proposed safety measures were subsequently implemented. To ensure the integrity of the gas transmission pipelines that would have been aligned through the proposed sports facility, PG&E prepared the California Gas Transmission's Pipeline Safety Plan for Tracy Sports Complex (PG&E, 2005). PG&E planned the following integrity assessments and increased maintenance measures for the pipelines, including the segments that pass through the Plan area:

- High resolution in-line inspection (ILI) using a smart pig were performed on 110 miles of Line 401 and on 26 miles of Line 002 as a primary means of initially verifying the integrity of the pipeline segments within the sports complex and adjacent neighboring segments. Additionally, a caliper tool inspection will be performed to detect any geometric abnormalities
- In conjunction with the ILI, close interval surveys of the cathodic protection systems were performed on both pipeline segments within the area of the Tracy Sports Complex. This will ensure that the existing cathodic protection systems provide adequate protection against external corrosion.
- The pipelines' integrity will be reassessed at an interval not to exceed seven years.
- Monthly leak surveys of both pipelines will be performed to verify their integrity

- Bi-monthly patrols of the pipelines will be performed, focusing on detection any construction that may be taking place or evidence of construction since the last patrol

- Bi-monthly verification of the cathodic protection levels at the monitoring locations will be performed. The increased verification interval will allow prompt remediation in the event that protection falls below the desired criteria.

- Reports will be submitted on a quarterly basis to the CPUC to verify additional measures have been taken.

Because the Tracy Youth Sports Facility is no longer under consideration, it is not known if PG&E is implementing the monthly and bi-monthly monitoring and quarterly reporting. However, the in-line inspections were conducted in 2005, as discussed in more detail in Section 2.1.1. The pipelines were found to be in sound condition and no repairs were required.

2.2.2 Crude Oil Pipeline Safety Procedures

Hazardous liquid pipelines, which include the crude oil pipelines, are required to implement integrity management plans (IMPs) for pipeline segments that could impact high consequence areas (HCAs). Development of the Plan area would most likely result in the area around the crude oil pipelines being designated as HCAs. The IMP process is similar to that for natural gas pipelines, except that an HCA is defined not only with respect to proximity to populated areas but also the likelihood that a spill could cause pollution of water sources or environmentally sensitive areas.

The crude oil pipelines could be susceptible to external corrosion and encroachment damage by third parties. To minimize the external corrosion threat, the pipelines are coated and are required to be cathodically protected. Under the Federal 49 CFR 195 regulations, the pipeline's integrity must be assessed every 7 years in HCAs in accordance with IMP requirements. The pipelines are monitored 24/7 by a SCADA system that tracks pipeline pressures and flow rates to determine if leaks are occurring and the California State Fire Marshal audits the pipeline records to confirm compliance with Federal regulations. The pipeline companies also have approved spill response plans that cover emergency notifications and management of a pipeline release.

2.2.3 Historic Pipeline Incidents

A search of the natural gas pipeline incident databases maintained by the Pipeline and Hazardous Materials Safety Administration (PHMSA) indicates that there have been no reported incidents for PG&E natural gas pipelines in the vicinity of the Plan area for the period of record, which is from 1970 to 2014 (PHMSA, 2014). Pipeline operators are required to report any incident that results in either 1) a fatality or injury that requires hospitalization, or 2) more than $50,000 in cost of gas lost or cleanup costs.

There have been a few incidents of releases from the crude oil pipelines in the vicinity of the Plan area in the PHMSA database, but no incidents have been reported since 2010 to the present. In addition, none of the releases involved fire, explosions, injuries, or evacuations. On December 4, 2003, the Chevron crude oil pipeline was accidentally struck by a tractor working on farmland on the property just north of the proposed

Cordes Ranch development. Approximately 750 barrels (31,500 gallons) of crude oil were released and 400 barrels were recovered. The oil soaked into 16,667 cubic yards of soil, which was subsequently remediated. Another incident occurred on July 8, 2003 between Corral Hollow Road and Tracy Boulevard, which is southeast of the Plan area. The cause of the release was also third party damage; a total of 35 barrels of crude oil was released with the recovery of 30 barrels. No fires, explosions, injuries, or other damage were reported. Lastly, there was a report of a release from this pipeline on December 4, 2007 due to external corrosion approximately 0.3 mile south of Bird Road in Tracy. It involved the release and recovery of 4 barrels (168 gallons) of crude oil; the pipeline was subsequently repaired.

A search of the PHMSA database revealed no incidents or releases associated with the Phillips 66 crude oil pipeline during the period of record in San Joaquin County from 1970 to 2014 (PHMSA, 2014). The incident-free operating record for this pipeline in the vicinity of the site is important, because the pipeline would be located in close proximity to residential development with the proposed Specific Plan.

There have been three incidents involving the Shell crude oil pipeline in the vicinity of the Plan area; none of the incidents involved fire, explosions, injuries, or evacuations. The first incident occurred on December 21, 1994, at the time that Texaco was listed as the pipeline owner/operator. The incident involved third party damage of the pipeline at the Corral Hollow Landfill and resulted in a loss of 550 barrels of crude oil, with 535 barrels recovered. The second incident occurred near the intersection of S. Bird Road and Interstate I-580 on April 17, 2007 resulting from a longitudinal break in the pipeline due to corrosion. Approximately 428 barrels were released and flowed down an embankment onto the shoulder of I-580 and onto the roadway, resulting in a traffic snarl during afternoon commute hours. About 9,500 cubic yards of impacted soil were subsequently remediated and removed. Finally, an equipment malfunction at a location north of the Plan area resulted in a minor release of 2 barrels of crude oil on October 5, 2008. No ignition, explosion, fire, or evacuation occurred as a result of any of these releases.

2.3 PIPELINE FAILURE FACTORS AND INCIDENT RATES

There are four general categories recognized as the main causes of pipeline leaks or ruptures:

- Third Party Excavation Damage
- Internal or External Corrosion
- Material, Weld, or Equipment Failure
- Ground Movement

Third Party Excavation Damage. Third party damage typically arises from people or companies digging in the vicinity of buried pipelines without realizing that the pipelines are there. The excavating equipment accidentally strikes or damages the pipeline. Third party damage is responsible for approximately 50% of all pipeline failures and was responsible for 50% of the incidents involving crude oil pipelines in the Tracy area.

Federal and State regulations require contractors or landowners to notify in advance (48 hours) where they will be working. This provides the pipeline operators time to mark or flag the exact location of the pipelines prior to the start of excavation. California has a one-call system (www.digalert.org or dial 811) in place to minimize the potential for third party damage. In addition, PG&E and the petroleum pipeline companies are

members of Common Ground Alliance, which is a nation-wide association dedicated to promoting best practices to avoid excavation damage to pipelines.

Because the PG&E natural gas pipelines and Chevron/Phillips 66 crude oil pipelines would be located within easements within the Plan area and not beneath public streets, the probability of third party damage from utility and construction activities is lower. Construction within the Plan area will be conducted by various licensed contractors and as required by law, these contractors must contact "Digalert" 2 working days prior to the initiation of any excavation activities so the exact location of the pipeline may be marked. Additional precautionary measures for construction activities will include close coordination with the pipeline operators, potholing to confirm pipeline locations within the easements, and adherence to restrictions on landscaping, grading, and load limitations within the pipeline easement. These measures will reduce the potential for third party damage.

Internal or External Corrosion. Internal and external pipeline corrosion are functions of pipeline materials, pipeline age, corrosion preventative measures, such as cathodic protection and coatings, and soil conditions. Measures to mitigate corrosion impacts for the pipelines within the Plan area include:

- External coatings on all pipelines
- Installation of cathodic protection systems on all pipelines
- Routine inspections of the cathodic protection systems to ensure they are functioning properly
- Periodic electrical surveys along the easements to detect areas where electrical potentials or currents flow suggest corrosion may be occurring
- Periodic in-line inspections to identify, locate, and estimate areas of metal loss occurring inside the pipelines.

Routine inspections of the PG&E and crude oil pipelines have not identified any concerns with respect to corrosion or deterioration in the vicinity of the Plan area. In addition, PG&E has implemented additional monitoring requirements for the natural gas pipelines.

Material or Weld Defects. The potential for material or weld defects is typically related to the age of the pipelines. Modern pipelines with arc-welded seams are not as susceptible to failure in comparison to older pipelines that were welded with low frequency electric-resistance-welded (ERW) seams. The natural gas pipelines aligned beneath the property are relatively new and were installed between 1963 and 1993. These lines were installed in the modern era of pipe manufacturing and construction. The standards required pressure testing of each length of pipe to at least 90% of the SMYS at the pipe mill to ensure safe operation. Although the crude oil pipelines could likely be constructed using ERW seams, Federal regulations require that this be addressed in the integrity assessment part of the Integrity Management Plan (IMP).

Routine maintenance and inspections of these pipelines are conducted in accordance with CPUC General Order 112-E and 49 CFR Part 192 regulations for the natural gas pipelines and by 49 CFR Part 195 regulations and the California Pipeline Safety Act of 1981 for the crude oil pipeline. No concerns have been identified with respect to weld or material defects.

Ground Movement. The potential for ground movement in the Plan area is related to the probability and impact of a strong earthquake or liquefaction. The level of ground shaking can be measured in terms of peak ground acceleration (PGA). The Plan area is not within an Alquist-Priolo Earthquake Fault Zone. No active faults are located in the immediate vicinity of the project site. The nearest active fault is the Greenville Fault, which is located approximately 8 miles to the southwest (J House Environmental, 2004). The Black Butte Fault borders the west side of the Plan area but this fault is not considered to be "active" (i.e., displaying evidence of surface displacement within Holocene time) by the California Geological Survey. Therefore, the potential for surface fault rupture in the vicinity of the site is considered to be low.

The site is considered to be in a region of moderate to high seismicity, due to the proximity of the San Andreas and Great Valley fault systems. A horizontal peak ground acceleration (PGA) at the site is estimated to be 0.34g (10 percent probability of being exceeded within a 50-year period). This is considered to be a moderate earthquake hazard (ALA, 2005). A geotechnical report conducted for the Cordes Ranch property to the north of the Plan concluded that the soils beneath the property do not meet the criteria for liquefiable soils and the potential for liquefaction was "low to nil" (KC Engineering Company, 2000).

In summary, the overall potential for ground movement to impact the pipelines in the Plan area is considered to be low. Although the pipelines are in an area of moderate seismicity, the potential for surface fault rupture is very low and there is a very low probability of liquefaction.

Pipeline Failure Rates. The California Department of Education (CDE) has developed a methodology for determining the risk associated with natural gas and hazardous liquid pipelines to be used when siting new schools (CDE, 2007). Based on a detailed analysis of California pipeline incident data, the predicted failure probability rates used in the CDE methodology are:

- 1.2E-04 releases per mile per year for natural gas transmission pipelines
- 2.3E-03 releases per mile per year for crude oil pipelines

Given that the longest PG&E pipeline easement that crosses the property is 0.41 mile and the longest crude oil easement is 3.6 miles, this is equivalent to an on-site release of natural gas occurring once every 20,300 years or an on-site release of crude oil occurring once every 121 years.

2.4 BUILDING SETBACKS AND ZONING

Setbacks refer to minimum distances from a pipeline within which permanent structures, such as houses or buildings, are prohibited. The primary goal of pipeline setbacks is to protect pipelines from third party damage, thus reducing the likelihood of pipeline ruptures, with resulting injuries and property damage. There are no Federal or California regulations that establish a minimum setback requirement. Though pipeline operators might prefer that structures not be built in close proximity to their pipelines, they do not say that setbacks are necessary or recommended and do not establish setback requirements. Historically, pipeline operators have purchased easements through which the pipeline travels with restrictions within the easement on acceptable land uses (i.e., no permanent or temporary buildings/structures and no large trees) so that pipeline inspections and maintenance activities can be conducted without interference.

2. Pipeline Safety Hazard Assessment

PG&E has an easement that is 50 feet wide for the two natural gas transmission pipelines and the Chevron crude oil pipeline that bisects the northeast corner of the Plan area. Phillips 66 has a 16.5-foot easement for the crude oil pipeline that bisects the Plan area and Shell has a 20-foot easement for the crude oil pipeline through the Plan area. Based upon Placework's experience in siting schools and other residential land uses near pipelines, pipeline easements typically range from 10 to 25 feet wide, depending on site-specific conditions. There are typically no separate easements associated with pipelines located beneath roadways or within public right-of-ways.

There are various guidelines for safe distances from pipelines that have been promulgated by a consortium of industry, pipeline operators, and advocacy groups. The Pipelines and Informed Planning Alliance (PIPA) recommends reducing risk through appropriate consideration of land uses adjacent to pipelines. They state that a risk-based approach to land use planning and development and establishing good communication with the pipeline operator is more appropriate than establishing a fixed setback distance (PIPA, 2010). PIPA recommends defining a "consultation zone" surrounding existing pipelines as a mechanism for communication and sharing of critical information between land developers and pipeline operators. A "consultation zone" is defined by PIPA as an area extending from each side of a transmission pipeline, with the distance defined by local governments, to describe when a property developer/owner planning new development in the vicinity of an existing pipeline should initiate a dialogue with the pipeline operator.

PIPA also recommends defining a "planning area" for implementing additional measures by both the pipeline operator and land developer to lower risk. A "planning area" is a site-specific distance determined by local government or agencies that is based on the characteristics of the pipeline, such as pipeline product, diameter, operating pressure, potential spill volume, and the area surrounding the pipeline, such as topography, population density, vegetation, and structures. The planning area is not construed as an unsafe distance and is not intended to be used as a fixed setback distance. It is meant to be used as a corridor where additional measures may have potential benefits in reducing risk and mitigating the consequences of a pipeline incident. Examples of additional measures that may be implemented include planting and locating vegetation to prevent interference with transmission pipeline activities, reducing risk through the design of new utilities and related infrastructure, and considering site emergency response plans in land use development. According to PIPA guidelines, the Potential Impact Radius (PIR) is suggested for natural gas pipelines in defining the width of "consultation zones" and "planning areas" but is not appropriate as a setback distance (PIPA, 2010).

The PIR is derived from the formula $R = 0.69 \times D \times P^{0.5}$, where R is the radius in feet, D is the pipeline diameter in inches, and P is the pipeline operating pressure in psig. The PIR for the two PG&E natural gas transmission pipelines is summarized in the following table:

Pipeline	Pipeline Diameter (in)	Pipeline Pressure (psig)	Calculated PIR (ft)
002	26	890	535
401	36	1040	801

The calculated PIR radius corresponds to an estimate of the radiant heat exposure in the event that the pipeline was to rupture and the released gas was to ignite (Stephens, 2000). The PIR heat intensity, 5,000 BTU/hr-ft2, corresponds to a 99% survival rate for persons exposed for 30 seconds without moving away from the source of heat. The PIR is not intended to define minimum setback distances inside of which

development would be prohibited. As the Transportation Research Board stated, the PIR only considers the consequences of an event without accounting for its probability and does not attempt to weigh the risk-reduction benefits of such a measure against the considerable cost that such a provision would entail (TRB, 2004). The purpose of the PIR is to define pipeline segments that fall within the high consequence area (HCA); these segments warrant a higher standard of scrutiny and inspection as specified in the IMP. PG&E defines an HCA as any area where there are 20 or more buildings intended for human occupancy within the PIR.

PIRs are not used to identify HCAs for hazardous liquid pipelines. Determining a site-specific planning area for hazardous liquid pipelines is much more complex because of the flow characteristics of the releases for liquids and the effect of the surrounding terrain on the flow path of the release. A site-specific planning distance for hazardous liquid pipelines consider 1) how much liquid might be spilled, 2) where that spilled liquid would go, and 3) what locations would be impacted. Identification of HCAs for hazardous liquid pipelines focuses on populated areas, drinking water sources, and sensitive ecological resources. Consequently, a higher percentage of hazardous liquid pipelines are considered to be in HCAs.

For municipalities or counties that have implemented setback distances, the Transportation Research Board (TRB) report Transmission Pipelines and Land Use – A Risk-Informed Approach (2004) indicates that the most common practice by local governments is to require setbacks of 25 feet. Very few municipalities in California have implemented setbacks from pipelines. Santa Barbara County has adopted an ordinance requiring a setback distance of 15 to 25 feet from the centerline of gas pipelines to all buildings and structures. If it is determined that the County prescribed 25-foot setback poses a hardship to property development, then a lesser setback of 15 feet may be adopted.

A search of the literature did not find any setback distances that were developed on the basis of risk. This would be difficult to accomplish because setbacks based on some level of risk assessment would be complex in order to account for variations in product, pipe diameter, pressure, depth of cover, and pipeline age. Setbacks based on this approach may be very wide to minimize the risk for a high consequence event and could be interpreted as a regulatory "taking" requiring compensation to property owners. New requirements could render existing homes nonconforming, a status that could reduce their value and inhibit the opportunity to make improvements. Thus, there are many practical and cost implications of introducing setbacks and local governments typically prefer simple, rather than complex, regulatory approaches.

In summary, there are relatively few cities and counties in California that have implemented setback ordinances.

2.5 RISK ANALYSIS

Risk is made up of two factors, both of which need to be carefully considered in determining how risky an activity may be. One factor is the probability that an event will occur (i.e., the chance that a pipeline will rupture or leak) and the other factor is the possible consequences if it does. People tend to underestimate common risks, such as motor vehicle accidents and smoking, and overestimate the risk of events that have a very low probability of occurrence but can result in large consequences, such as airplane crashes or pipeline ruptures. It is possible to reduce the risk by reducing the probability of pipeline incidents through proper pipeline operation and maintenance and integrity management programs, but it is more difficult to reduce the

consequences of pipeline events, which are related to pipeline diameter and operating pressure. From the pipeline historic incident databases, it is fairly clear that the probability of a pipeline failing at any particular spot is very low but the consequences can be great and can involve serious injury or death, depending on the circumstances of the incident.

A risk analysis was conducted to determine if the existing easements for the pipelines bisecting the Plan area would of sufficient distance to be protective to future occupants of the Plan area. The California Department of Education's (CDE's) pipeline protocol for determining individual risk associated with natural gas and hazardous liquid pipelines was used for this analysis (CDE, 2007). This methodology and similar analyses have been used to determine pipeline risk for other proposed residential projects in close proximity to pipelines (The Planning Center/DC&E, 2013; Kiefner & Associates, 2012; J. House Environmental, 2004).

The CDE protocol uses historic data to estimate the probability of a pipeline failure and product release, as well as models to determine the consequences of a pipeline incident, considering fatality probabilities for difference exposure scenarios (pool fire, flash fire, flammable vapor cloud) and school attendance hours. The result is an estimate of individual risk, which is compared to a significance threshold of one in a million (1.0×10^{-6}). If the estimated risk is less than one in a million, then no significant safety hazard is predicted.

The CDE methodology was modified for this assessment to account for residential or commercial/industrial land use exposure rather than school attendance. For residential exposure, it was assumed that an individual would be present at the site for 24 hours a day and 365 days per year. This is a very conservative assumption since Californians spend approximately 17.5 hours/day at home including weekends (73% of the time), and travel away from home for vacations is not included (OEHHA, 2012). It also was conservatively assumed that a resident of the development would spend 25% of that time outdoors and would be standing at the edge of the easement. Research has shown that California residents typically spend no more than 1.2 hours/day outdoors (CARB, 1991), which would reduce the exposure percentage to 4% of the time outdoors. For commercial/industrial exposure, it was assumed that the individual was present at the site for 8 hours a day for 250 days/year. The assumptions used in the analysis for each pipeline are provided in the following table:

Parameter	26-Inch Natural Gas Pipeline	36-Inch Natural Gas Pipeline	18-Inch Chevron Crude Oil Pipeline	16-Inch Phillips 66 Crude Oil Pipeline	20-Inch Shell Crude Oil Pipeline
Land Use	Light Industrial	Light Industrial	Light Industrial	Residential/Mixed Use/Commercial Business Park	Residential/Mixed Use
Easement Width	50	50	50	16.5	20
Nearest Receptor	25	25	25	8	10
Exposure Days/Year	250	250	250	365	365
Exposure Duration (hr/day)	8	8	8	24	24
Hours Outdoors	2	2	2	6	6

It should be noted that the results for the 16-inch Phillips 66 pipeline are conservative, because the setback distances vary up to 27 feet from the edge of the easement for some of the residential parcels adjacent to the pipeline.

2.5.1 Land Use and Terrain

The Specific Plan area and surrounding land use are currently undeveloped and have been used in the past for grazing and other agricultural purposes. However, there are various plans for future development in the area. The majority of land to the northeast will be occupied by the recently approved Ellis Specific Plan and Urban Reserve 10 of the General Plan. This would be primarily low density residential, with limited commercial and industrial components. The area northwest of the Plan area is characterized by sparse rural residential development. Future development to the northeast includes the Cordes Ranch Specific Plan.

Land to the west and south of the Plan area is designated as Open Space in the General Plan and is primarily used for grazing and agriculture. The Corral Hollow Landfill, which was closed in 1995, borders the Plan area to the southeast. A portion of the land east of the Plan area is designated in the General Plan for aggregate production. In addition, the Tracy Municipal Airport is located to the east of the Plan area.

No buildings or structures would partially block or buffer vapor releases, jet fires, or pool fires for adjacent land uses if an incident were to occur involving the natural gas and crude oil pipelines in the easements within the Plan area. Residences and commercial/industrial land uses not immediately adjacent to the easements would be partially buffered from thermal impacts due to intervening structures. Due to the presently undeveloped nature of the Plan area and surroundings, there currently are minimal potential ignition sources. However, in the future, vehicles traveling along the adjacent roadways, overhead high voltage lines, and residential/commercial heating units could be potential ignition sources if any of the pipelines were to catastrophically fail.

Topography does not affect releases from natural gas pipelines, because released methane is buoyant and would disperse into the air. However, topography is important for crude oil pipelines in determining the direction and location of released crude oil. The pipeline profile of the Chevron crude oil pipeline was not provided by the company; therefore, this analysis relies on information obtained for the Phillips 66 and Shell crude oil pipelines. Results from the drain down analyses of these pipelines were used to verify that the assumptions used in the analysis for the Chevron crude oil pipeline were conservative.

The general topographic gradient at the site is from southwest to northeast. The detailed configuration of the Plan area has not yet been determined, except for Tracy Hills Phase 1A, which is the area between I-580 and the California Aqueduct. If releases were to occur given current conditions from either the Chevron or Shell crude oil pipelines, the flow would be to the northeast. The flow from the Chevron pipeline would be toward the northeast corner of the Plan area. It is not known if light industrial development is planned for the future within this small area; there are constraints to development due to proximity to the airport and the Delta-Mendota canal.

The flow from the Shell pipeline would be down an embankment and onto the shoulder of I-580, with possibly flow onto the roadway. This is what occurred in April 2007 when approximately 18,000 gallons flowed down an embankment and onto I-580 at a location approximately 3.6 miles southeast from the Plan area. Given the current and probable future topography of the land southwest of I-580 within the Plan area, it is unlikely that releases from the Shell pipeline would flow onto the planned residential and mixed use development.

For releases from the Phillips 66 crude oil pipeline, the pipeline profile and planned future development for Phase IA were used to determine potential flow direction and release volumes. For this assessment, a time period of 5 minutes was conservatively assumed to detect and respond to a pipeline rupture; information obtained from Phillips 66 indicates that the SCADA system at the Bartlesville control center could immediately detect and remotely shut off flow in the pipeline. After shutdown of the pipeline, there will be additional product that drains from the pipeline, depending on the location and elevation of the pipeline break.

The high point between valves is at an elevation of 300 feet above mean sea level (msl). This occurs at a location approximately 0.85 miles southeast from Hansen Road (Figure 1). If a release on this pipeline occurred northwest of this high point, the product would drain to the northwest. If a release occurred southeast of this high point, the product would drain to the southeast. The maximum amount of product released would occur if there was a break in the pipeline just north of the block valve at the edge of the Plan area. The release rates at various distances along the pipeline are provided in Table 1 in Appendix A. The total average discharge volume of approximately 56,000 gallons, which includes discharge during pipeline shutdown as well as drain down, was used to calculate the risk for this pipeline. The largest pipeline release in the vicinity of the site involving the three crude oil pipelines was 31,500 gallons in 2003 from third party damage to the Chevron pipeline. Therefore, this release estimate of 56,000 gallons for the Phillips 66 pipeline should be conservative. It should be noted that there have been no reported releases in the vicinity of the site for this pipeline.

For the Shell pipeline, the high point between valves is at an elevation of 400 feet msl and occurs at a location in the middle of the Plan area (Figure 1). Releases northwest of this location would drain to the northwest and releases southeast of this location would drain to the southeast. Calculations were conducted and determined that the maximum release volume would result in a break at the high point and flow to the northwest to the edge of the Plan area. The results are shown in Table 2 of Appendix A and the calculated release value (approximately 78,400 gallons) was used for this analysis.

The release volume for the Chevron pipeline was assumed to be 37,140 gallons based on CDE default values, which is greater than the previously reported maximum release in 2003.

2.5.2 Release and Consequence Scenarios

The CDE methodology for determining the risk associated with natural gas and hazardous liquid pipelines is based on a detailed analysis of pipeline incident data. The predicted failure probability rate used in the CDE methodology is 1.2×10^{-4} releases per mile per year for natural gas transmission pipelines and 2.3×10^{-3} for crude oil pipelines.

Two accident scenarios were evaluated for each pipeline: 1) a rupture or large volume release equal to the pipeline's diameter, and 2) a leak or small volume release from a 1-inch diameter hole. Three potential consequences were evaluated for each accident scenario: 1) jet flame for natural gas or pool fire for crude oil, 2) flash fire from a flammable vapor cloud, and 3) explosion. For all of the pipelines, both natural gas and crude oil, the model runs indicated that an explosion would not occur under current and proposed conditions.

2. Pipeline Safety Hazard Assessment

For this assessment, a worst case scenario was assumed, which involves a person standing at the edge of the easement from the pipeline. It also was conservatively assumed that a resident of the development would be present 24 hours/day, 365 days/year and would spend 25% of that time outdoors. For the commercial/industrial scenario, it was assumed that the worker would be present 250 days/year and spend 2 hours per day outdoors.

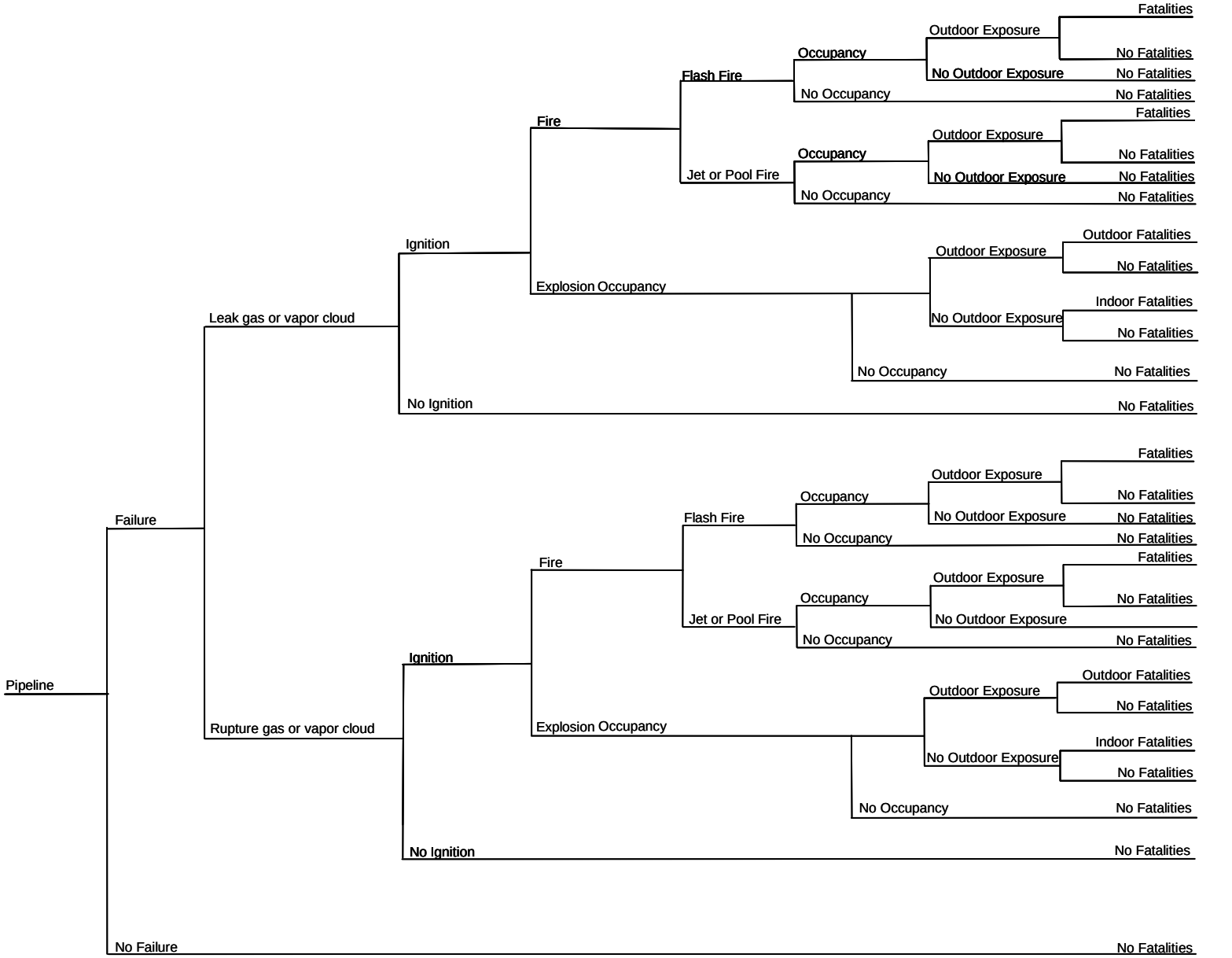
In addition, the potential heat flux on the nearest building of the proposed Phase 1A development at a minimum setback distance of 10 feet from the edge of the easement, or approximately 18 feet from the center of the pipeline, was also calculated to determine whether there is a risk of structural fire and a hazard to occupants of the residences. The developer (Tracy Hills Project Owner) and the Phillips 66 Pipeline Company have negotiated a setback distance of 10 feet from the edge of the easement to the nearest structure, or 18 feet from the centerline of the pipeline, for Phase 1A of the proposed development for most of the residential parcels. For approximately 4 to 6 parcels, the setback distance was reduced to 5 feet from the edge of the easement, or approximately 13 feet from the centerline of the pipeline, because of development constraints. To account for these exceptions, an additional calculation was conducted to confirm that the nearest structure would not be impacted if the crude oil pipeline were to break and ignite. The results are provided in Appendix A. However, in many cases, the residential parcels adjacent to the pipeline easement have an even greater proposed setback (i.e., between 12 feet and 27 feet from the edge of the easement, or approximately 20 to 35 feet from the centerline of the pipeline). The proposed setbacks and locations for vinyl or wood fencing along the easement are shown in Appendix B.

The USEPA approved computer model ALOHA (Areal Locations of Hazardous Atmospheres) was used to determine the hazards from each accident scenario as per the CDE protocol (USEPA, 2006). The approach for the analysis consists of the following steps:

- Determine the event tree for pipeline failure, as shown on the following page
- Determine the probability of immediate ignition or delayed ignition for the various release scenarios (i.e., jet fires, vapor clouds, and explosions)
- Apply conditional probabilities of fatality given exposure for each type of consequence
- Add the likelihood of all probabilities of fatalities for all release scenarios
- Determine the individual risk to occupants of the proposed development
- Calculate the heat flux on the nearest building to determine the potential for a structure fire at the setback distance of 18 feet.

An event tree showing the probability calculations for pipeline failure consequences is provided on the following page.

2. Pipeline Safety Hazard Assessment



To determine the impact of heat flux on the nearest building in the Phase 1A proposed development, the criterion used was a standard of 10,000 BTU/hr-ft^2, which is considered by HUD to be an acceptable level of thermal radiation for buildings (HUD, 2011). According to the Department of Homeland Security, United States Fire Administration/National Fire Data Center, response times for structure fires are generally less than 5 minutes 50% of the time, regardless of region, season, or time of day. The nationwide 90th percentile response time to structural fires is generally less than 11 minutes. The maximum thermal radiation heat flux exposure of 10,000 BTU/hr-ft^2 for a maximum duration of 15 minutes is protective of buildings. This is based on the assumption that there will be a fire department response to protect exposed combustible buildings within 15 minutes and that the exposed building materials will not spontaneously ignite before the fire department arrives.

Modern multi-occupant buildings and homes made of wood are more fire resistant than in the past. Research and development of fire resistant wood started in 1985 and was fully implemented in the construction of buildings and residences by 1997. With updated developments on additives incorporated into wood and the substitution of plastic wood in some homes and multi-occupant buildings, it typically takes more than 15 minutes for exposed combustible materials to ignite spontaneously, which is well within fire department response times.

2.5.3 Risk Analysis Results

An acceptable level of individual risk for hazards associated with underground pipelines has not been established by the State of California or the Federal government for new development projects. Standards that have been proposed by various governmental agencies and the standard used by the CDE in evaluating new schools in close proximity to pipelines is a risk level below 1 x 10^{-6} (one in a million) as being acceptable. The detailed calculations for the pipeline risk analysis are provided in Appendix A.

The three pipelines within the PG&E easement were evaluated together, because they are in a common corridor. The analysis evaluated the potential risk to a worker in the light industrial area of the proposed development standing outside at the edge of the PG&E easement. This was calculated to be a distance of 10 feet from the 36-inch natural gas pipeline, 15 feet from the 26-inch natural gas pipeline, and 6 feet from the centerline of the 12-inch natural gas pipeline. The results, which are provided in Appendix A, are summarized herein:

- 26-Inch Natural Gas Transmission Pipeline – 1.3 x 10^{-7}
- 36-Inch Natural Gas Transmission Pipeline – 1.9 x 10^{-7}
- 18-Inch Chevron Crude Oil Pipeline – 1.7 x 10^{-7}

The calculated risk for each pipeline is less than the significance threshold of 1.0 x 10^{-6} and the total cumulative risk for all pipelines within the corridor 4.9 x 10^{-7}, which is also less than the significance threshold. Therefore, the 50-foot easement for the PG&E and Chevron pipeline would be protective of the workers at the proposed Tracy Hills Specific Plan.

For the Phillips 66 pipeline located in a 16.5-foot wide easement that bisects the Plan area, the calculated individual risk for a resident standing at the edge of the easement for 6 hours/day and 365 days/year (i.e., approximately 8 feet from the pipeline) was determined to be 6.3×10^{-7}, which is also less than the significance threshold of 1.0×10^{-6}. These results are conservative because the developer of Phase 1A (Tracy Hills Project Owner, LLC) and the Phillips 66 pipeline company have coordinated to include vinyl or wood fencing along the easement where it is adjacent to residential parcels and include additional setbacks ranging from 12 to 27 feet from the edge of the easement for many of the proposed residential parcels. The maps showing the negotiated setbacks and locations of fencing are provided in Appendix B.

Also, the pipeline will be located in a dedicated easement. Along the west side of Spine Road in the southern portion of the development, any released crude oil would drain toward the street. In addition, crude oil released in the area adjacent to detention basin would drain into this basin. Drainage for the proposed development will be designed so that stormwater drainage from open space along the easement will not enter the residential yards or properties. Therefore, in the unlikely event of a potential release from the crude oil pipeline, released liquid would also drain in a manner that should not impact the adjacent residences.

For the Shell crude oil pipeline located in a 20-foot wide easement along I-580, the calculated individual risk for a resident standing at the edge of the easement for 6 hours/day and 365 days/year (i.e., approximately 10 feet from the pipeline) was determined to be 5.2×10^{-7}, which is also less than the significance criterion of 1.0×10^{-6}. These results also are conservative, because the pipeline is located within a 100-foot wide conservation easement and the actual distance between the centerline of the pipeline and the nearest receptor would be more than 50 feet. Also, based on the current and probable future topography of the site, a break in this pipeline would drain toward I-580 and away from the proposed residences. Mixed use is also planned along this easement and would result in a lower calculated risk, due to exposure of only 8 hours/day for 250 days/year. Also, it is unlikely that residents would spend 6 hours/day outside of their homes; research shows that California residents typically spend no more than 1.2 hours/day outdoors (CARB, 1991).

An additional calculation was conducted to determine the risk associated with buildings located at setback distances of 18 feet and 13 feet from the centerline of the pipeline, or 10 feet or 5 feet from the edge of the easement, as per the negotiations between Tracy Hills Project Owner, LLC and Phillips 66 Pipeline Company. In some cases, the distance between habitable structures and the centerline of the pipeline would be greater, based on the Phase IA layout as shown in the drawings provided in Appendix B.

The thermal radiation flux required to ignite a wooden structure after an exposure of 15 minutes (i.e., the approximate response time for a fire department in urban areas) is 10,000 BTU/hr-ft^2 (HUD, 2011). The United States Nuclear Regulatory Commission's (NRC's) Excel spreadsheet (2013) for estimating radiant heat flux from a fuel (crude oil), using a solid flame radiation model, was used for these calculations. Results of the heat flux calculations, as provided in Appendix A, indicate that the maximum heat flux on a building located 18 feet from a pool fire would be 7.96 kW/m^2, which is equivalent to 2,520 BTU/hr-ft^2 (assuming that the crude oil from the pipeline ignited). For the 4 to 6 parcels that would be 13 feet from the centerline of the pipeline, the calculations indicate a heat flux of 8.39 kW/m^2, which is equivalent to 2,660 BTU/hr-ft^2. These values are much less than the 10,000 BTU/hr-ft^2 that would be required to ignite a building. Large crude oil pool fires burn with higher soot levels, resulting in heat radiation blockage effects and lower emissive rates

(McGrattan et al, 2000). Therefore, siting buildings within 5 to 10 feet of the Phillips 66 crude oil pipeline would not pose a fire risk in the unlikely event that the pipeline ruptured and subsequently ignited. There are many conservative assumptions built into the estimates of risk, including the following:

- The natural gas transmission pipeline failure rate of 1.2×10^{-4} releases/mile/year and crude oil pipeline failure rate of 2.3×10^{-3} releases/mile/year are based on California pipeline statistics for the years 1984-2001. Failure rates have decreased over the years with new integrity management programs (IMPs), more stringent regulatory requirements, better pipeline construction, and improved one-call systems.

- It is conservatively assumed that all of the natural gas in 9,000 feet of pipeline between the main line valves would be released in the vicinity of the project site, and that crude oil would be released from the pipelines after pumping stops due to drain down. The volume of released crude oil used in the analyses is much greater than the maximum reported spill in the vicinity of the Plan area.

- The computer model ALOHA overestimates natural gas concentrations and impacts at near-field distances, ignores initial plume or puff rise, doesn't model initial momentum of release, doesn't account for buoyancy due to heat, and treats release methane as being neutrally buoyant, when it is actually lighter than ambient air. All of these assumptions result in conservative results.

- Hexane is used in the ALOHA model as a surrogate for crude oil. However, crude oil typically consists of only 5% to 10% hexane. Because hexane is more flammable and volatile (i.e., evaporates more readily) than crude oil, the ALOHA results overestimate the distance to hazard endpoints.

- The risk assessment methodology assumes that the wind is blowing directly toward the nearest receptor at a velocity of 3 m/sec (6.7 mph) at all times. In reality, wind direction varies with the predominant direction to the east 31% of the time.

- The risk assessment conservatively assumes a 30% chance of ignition with a natural gas pipeline leak and a 45% chance of ignition with a pipeline rupture. Other references indicate the probability of ignition is probably under 10% and possibly 1% or less (Lees, 2005). If the pipeline does not ignite, there are no adverse consequences to receptors.

- The risk assessment conservatively assumes an ignition probability of 9% for a crude oil pipeline leak and an ignition probability of 3% for a rupture. Other references indicate the probability of ignition to be 0.1% for flammable liquids with flashpoints greater than 38°C. Crude oils from the San Joaquin oil fields typically have flashpoints greater than 100°C and are not likely to ignite. None of the previously reported crude oil spills in the vicinity of Tracy have resulted in ignition.

- The analysis assumes that residents in the Plan area spend 24 hours/day, 365 days/year at the development, including 6 hours a day spent outdoors. Research shows that California residents typically spend about just over one hour/day outdoors (CARB, 1991) and spend only 73% of their time at their residence (OEHHA, 2012). Therefore, the risk analysis overestimates exposure, resulting in conservative results.

3. Summary, Recommendations, And Mitigation Measures

Pipeline incidents are infrequent, although they can and do occur. However, most reportable pipeline incidents do not result in casualties. Approximately 97% of all reportable hazardous liquid pipeline incidents and 88% of all natural gas transmission pipeline incidents do not involve injuries or casualties (OPS, 2012). And 50% of all reported casualties are incurred by pipeline operator employees or contractors working within the pipeline easement. Pipeline operators are required to report all incidents involving a release of natural gas or hazard liquid resulting in an injury, fatality, fire, explosion, or property damage in excess of $50,000.

3.1.1 Summary

- There are two natural gas transmission pipelines and three crude oil pipelines that traverse the Plan area, ranging in diameter from 16 to 36 inches

- The pipelines are similar to a large number of pipelines making up the pipeline transportation infrastructure in California and throughout the United States. Some of these pipelines have been evaluated by others for proposed development projects to the north and east

- The natural gas pipelines are relatively new, ranging in age from 1972 to 1993 and are in sound condition, based on the results of recent integrity assessments and in-line inspections

- The crude oil pipelines are older in age, ranging from 1945 to 1967, but are regularly inspected and assessed for their integrity in accordance with Federal regulations. In addition, fuel released from these pipelines is not likely to ignite, thus resulting in minimal risk to Plan occupants

- The pipelines are expected to continue to operate reliably and safely as PG&E and the petroleum pipeline companies conduct periodic inspections and integrity assessments in accordance with Federal and State regulatory requirements

- The pipelines are exposed to a limited range of potential integrity threats which are mitigated by pipeline operating practices, such as regular inspections, corrosion controls, and their locations within easements that limits the potential for third party excavation damage

- The results of the risk analyses calculated a total individual risk to occupants of the proposed Plan area of 4.9×10^{-7} for the PG&E easement, 6.3×10^{-7} for the Phillips 66 crude oil pipeline, and 5.2×10^{-7} for the Shell crude oil pipeline. All values are well below the significance threshold of one in a million ($1.0 \times$

10^{-6}) and assume potential receptors are standing at the edge of the pipeline easements for extended periods of time that do not reflect real world conditions and greatly overestimate risk

- In addition, the calculated heat flux on a building located 13 to 18 feet from the centerline of the Phillips 66 pipeline was estimated to be less than the heat flux of 10,000 BTU/hr-ft2, which is the heat flux required to ignite a wooden structure after an exposure of 15 minutes

- The pipelines would not impose hazards to occupants of the Plan area above and beyond those commonly associated with pipelines already in place in adjacent communities. The risks due to the pipelines are lower than other societal risks, such as motor vehicle accidents, household accidents, disease, or crime

- Building setbacks from pipelines are not required by Federal or State regulations nor are they currently incorporated into the City of Tracy zoning standards. However, proposed development plans will consider pipeline easements to be dedicated public space and a minimum 5- to 10-foot setback from the edge of the Phillips 66 pipeline easement would be established for any buildings or structures. Additional setbacks will be determined, as needed, for the other pipelines in coordination with PG&E, Chevron, and Shell pipeline companies.

3.1.2 Recommendations and Mitigation Measures

The recommendation for this Plan area is to minimize pipeline risk by incorporating a 13- to 18-foot setback distance from the centerline of the Phillips 66 pipeline to the nearest buildings/structures in the proposed development. For most of the development, this equates to a 10-foot setback from the edge of the pipeline easement. In the case of 4 to 6 parcels, the setback distance from the edge of the pipeline easement is five feet. This has been negotiated with Phillips 66 for the 16-inch crude oil pipeline as part of Phase 1A of the development. In some cases, the setback will be greater than this distance for some of the residential parcels.

For the Shell crude oil pipeline, the closest distance to the centerline of the pipeline would be greater than 50 feet because of its location within the 100-foot wide conservation easement. Since the analysis assumed a receptor would be present at a distance of 10 feet from the pipeline and the calculated risk was within acceptable limits, it is recommended that maintaining a no-build zone within the 100-foot conservation easement would be protective to future occupants of the development.

The two natural gas pipelines and one Chevron crude oil pipeline within the 50-foot wide PG&E easement will be located in the Plan area zoned for light industrial. Less stringent restrictions on development apply for light industrial land use as compared to residential land use. Although the analysis shows no significant risk to workers standing at the edge of the pipeline easement under current conditions, the potential dangers associated with natural gas releases and the co-location of three pipelines in a common easement warrants additional precautionary measures. Therefore, it is recommended that a setback distance of 25 feet from the centerline of any pipeline within the easement be maintained. This would result in an additional 15 feet on the northeast side of the PG&E easement and an additional 20 feet on the southwest side of the easement to be dedicated as open space or public space or used for landscaping.

3. Summary Recommendations and Mitigation Measures

Additional design measures to be considered include:

- Incorporate designated land uses over the pipeline easements, such as public space, open space, or green space, to minimize the potential for third party damage
- Prominently mark the pipeline locations prior to Plan development, maintaining the markings throughout the development process, and installing final markings after the work is complete
- Communicate with the pipeline operators when plans call for excavation or utility trenching near the pipelines
- Institute measures that all contractors must initially pothole or hand dig to the proposed depth of the utility trench or excavation if within 25 feet of the pipeline easements.
- Evaluate in consultation with the pipeline operators whether heavy construction vehicles with axle loads greater than 15,000 pounds would create stress on the pipelines at their current burial depths when crossing the lines and/or easements. Establish temporary fill or other protective measures as needed and establish permanent crossing areas for vehicles in excess of 15,000 pounds
- Avoid placing new utilities and services within the pipeline easements and minimize utility crossings over the pipeline easements to the extent feasible.

Other measures for reducing risk as suggested in the Pipelines and Informed Planning Alliance (PIPA) recommended practices document (2010) should also be incorporated, as described herein:

- Select landscaping vegetation with shallow root structures within the setback zone to avoid root structures that damage pipeline coatings
- Avoid planting trees that prevent direct observation of the pipelines by aerial patrol
- Use non-flammable fencing along the pipeline easement
- Manage storm water runoff to prevent erosion of the pipeline bedding
- Consider accessibility to pipeline personnel and first responders in the event of an emergency.

Mitigation measures are also warranted for future occupants of the Plan area, as follows:

3. Summary Recommendations and Mitigation Measures

- Disclosure will be made by the developer or sales representatives to potential occupants regarding the proximity of the natural gas and crude oil pipelines, as required in accordance with Assembly Bill 1511 – Real Property: Disclosures: Transmission Pipeline

- An emergency contact list will be maintained by the Home Owners Association (HOA) with phone numbers of the local police, fire department, and pipeline operators (PG&E, Chevron, Phillips 66, and Shell)

- Communication will be established with the pipeline companies so that the property occupants are notified if excavation or maintenance activities for the pipelines are planned along the pipeline easements

- Any roadwork or underground utility work that involves digging in or near the pipelines should be reported to the pipeline companies to ensure that they are aware of these activities

- Any odors or leakage from the pipelines will be reported immediately to the pipeline operator and local emergency response personnel (i.e., the Tracy Fire Department).

- Emergency procedures to be followed in the event of a pipeline release and an emergency response plan should be maintained by the HOA at an appropriate on-site location.

Steps to be taken in the event of a pipeline failure include:

- Immediately notify the Tracy Fire Department and pipeline companies (PG&E, Chevron, Phillips 66, and Shell)

- If natural gas or crude oil is leaking but not burning, avoid doing anything that may ignite it. Eliminate ignition sources, such as vehicles, cell phones, switches, door bells, flashlights, static electricity, and cigarettes

- Evacuation (i.e., away from the pipelines) or shelter in place procedures may be necessary.

It is recommended that these risk management measures be implemented in coordination with the City of Tracy, Tracy Fire Department, and the pipeline companies. Based on the results of the risk analysis presented herein and implementation of proposed mitigation measures, the risk to Plan occupants in the unlikely event of a pipeline incident would be less than significant.

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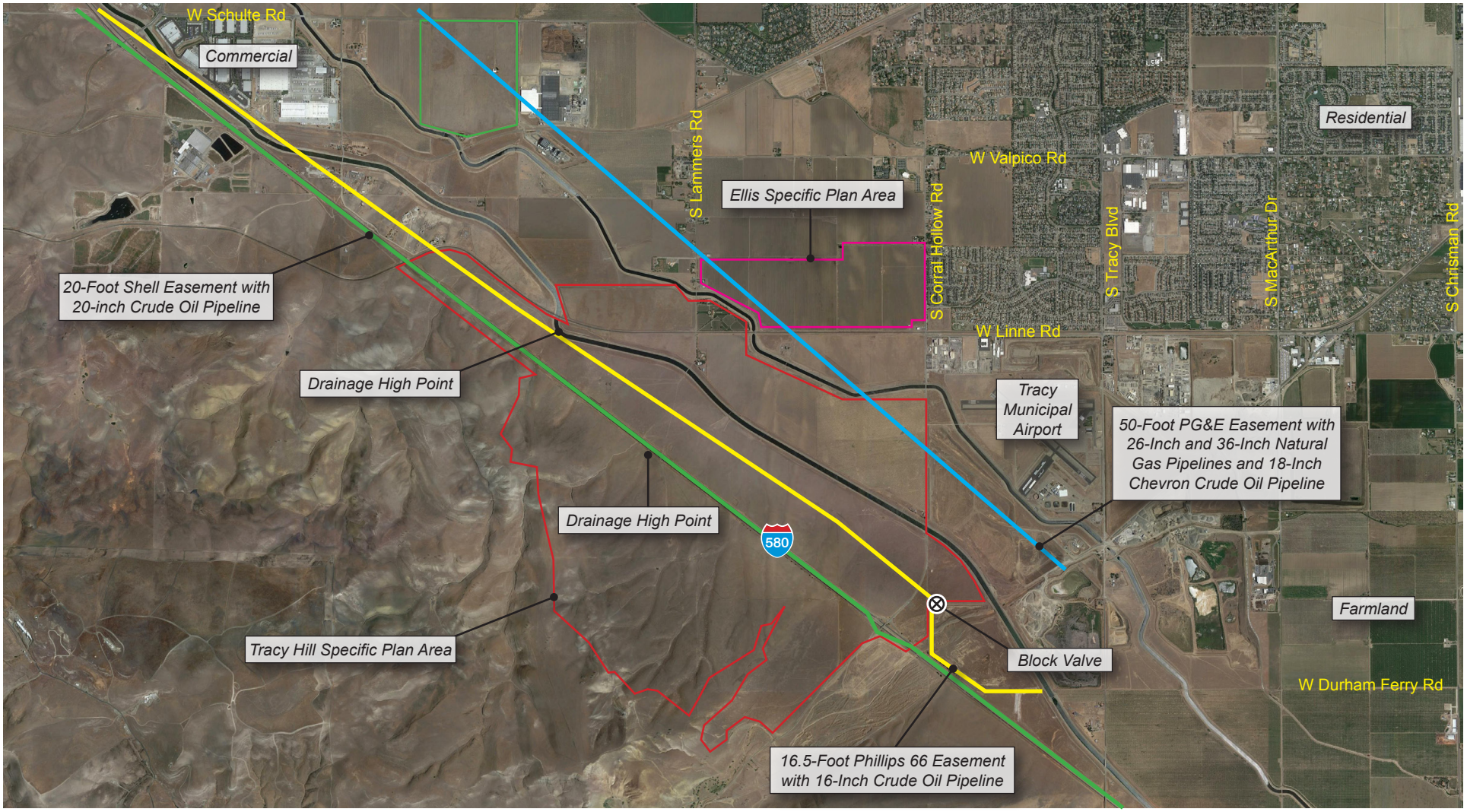
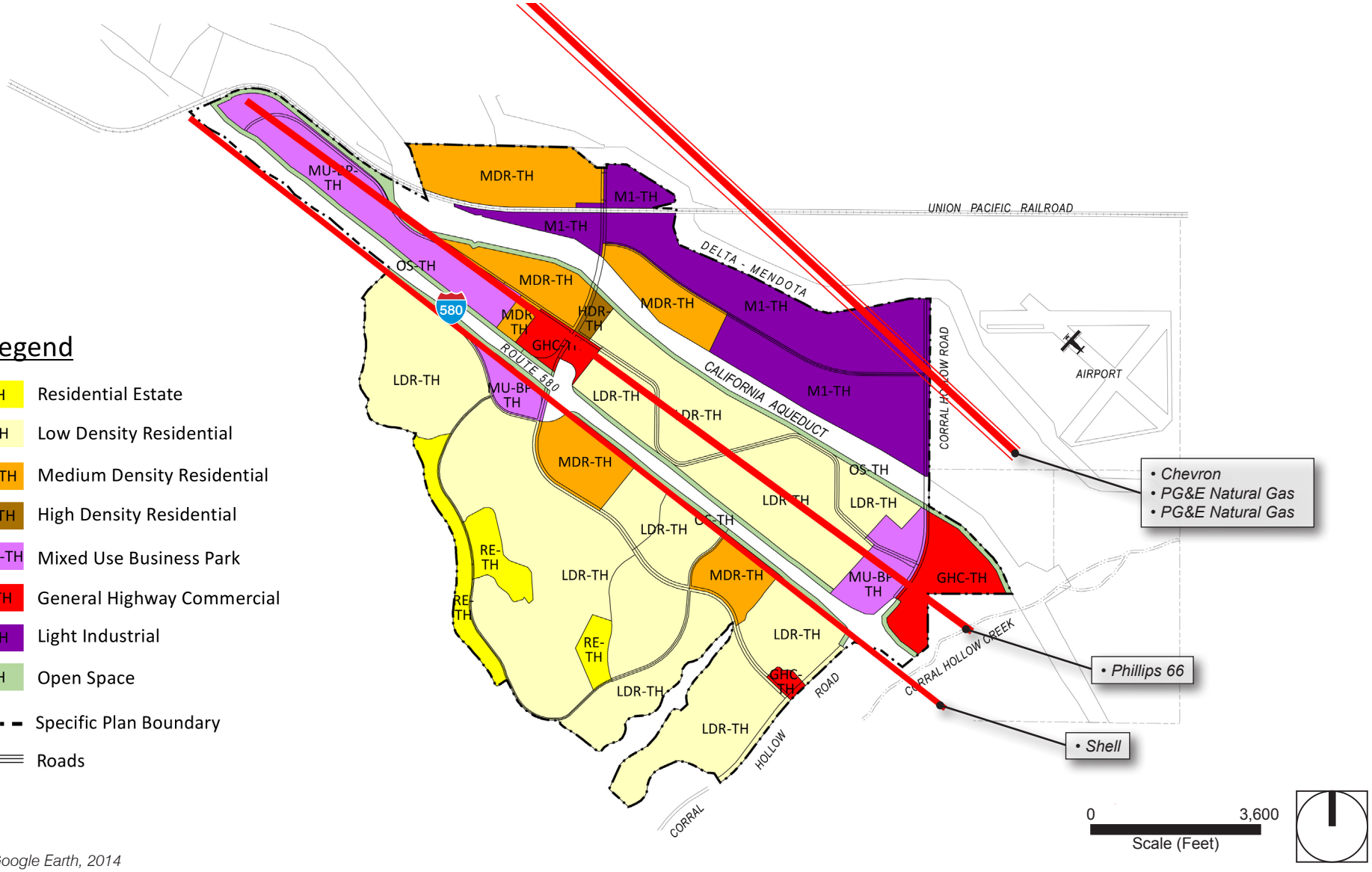
Figures

Figure 1 - Site Location and Pipeline Map



Source: Google Earth, 2014

Figure 2 - Proposed Land Uses



Source: Google Earth, 2014

Appendix A. Risk Calculations

26-INCH NATURAL GAS TRANSMISSION PIPELINE

INPUT TABLE

Input Data	Value	Units	Data Source
Product	natural gas		Pacific Gas & Electric Company
Diameter	26	inches	Same as above
Pressure	890	psig (MAOP)	Same as above
R0	15	ft	Easement distance
RX(LJF)	36	ft	ALOHA model result - Appendix A
RX(RJF)	510	ft	ALOHA model result - Appendix A
RX(LFF)	177	ft	ALOHA model result - Appendix A
RX(RFF)	2,322	ft	ALOHA model result - Appendix A
RX(LEX)	0	ft	ALOHA - no GCE explosion
RX(REX)	0	ft	ALOHA - no GCE explosion
XSEG(LJF)	65	ft	Calculated, using CDE methodology
XSEG(RJF)	1020	ft	Calculated, using CDE methodology
XSEG(LFF)	353	ft	Calculated, using CDE methodology
XSEG(RFF)	4644	ft	Calculated, using CDE methodology
XSEG(LEX)	0	ft	Calculated, using CDE methodology
XSEG(REX)	0	ft	Calculated, using CDE methodology

BASE AND CONDITIONAL PROBABILITY TABLE

Base		Leak		Rupture		Exposure	
F0	1.20E-04	PC(L)	0.8	PC(R)	0.2	PC(OCC)	0.23
P0	1.20E-04	PC(LIG)	0.3	PC(RIG)	0.45	PC(OUT)	0.25
PAF	1	PC(FIG)	0.99	PC(FIG)	0.99		
PA	1.20E-04	PC(JF)	0.98	PC(JF)	0.98		
		PC(FF)	0.01	PC(FF)	0.01		
		PC(EIG)	0.01	PC(EIG)	0.01		
Calculated Values Base Hazard Probabilities		Leak Impact Probabilities		Rupture Impact Probabilities		Exposure Probability	
PA(LJF)	1.49E-06	PCI(LJF)	2.33E-01	PCI(RJF)	8.73E-02	PC(EXPO)	0.0575
PA(RJF)	2.32E-05	PCI(LFF)	2.38E-03	PCI(RFF)	8.91E-04		
PA(LFF)	8.02E-06	PCI(LEX)	2.40E-03	PCI(REX)	9.00E-04		
PA(RFF)	1.06E-04						
PA(LEX)	0.00E+00						
PA(REX)	0.00E+00						

26-INCH NATURAL GAS TRANSMISSION PIPELINE

INDIVIDUAL HAZARD PROBABILITIES

Hazard Conditional Probability PC(X)	Base Hazard Probability PA(X)	Conditional Impact Probability Factor PCI(X)	Conditional Exposure Probability PC(EXPO)	PA(X) Value	PCI(X) Value	PC(EXPO) Value	PC(X)
PC(LJF) =	PA(LJF) x	PCI(LJF) x	PC(EXPO) =	1.49E-06	2.33E-01	0.0575	1.99E-08
PC(RJF) =	PA(RJF) x	PCI(RJF) x	PC(EXPO) =	2.32E-05	8.73E-02	0.0575	1.16E-07
PC(LFF) =	PA(LFF) x	PCI(LFF) x	PC(EXPO) =	8.02E-06	2.38E-03	0.0575	1.10E-09
PC(RFF) =	PA(RFF) x	PCI)RFF) x	PC(EXPO) =	1.06E-04	8.91E-04	0.0575	5.41E-09
PC(LEX) =	PA(LEX) x	PCI(LEX) x	PC(EXPO) =	0.00E+00	2.40E-03	0.0575	0.00E+00
PC(REX) =	PA(REX) x	PCI(REX) x	PC(EXPO) =	0.00E+00	9.00E-04	0.0575	0.00E+00

INDIVIDUAL RISK SUMMARY

IR(X)		Maximum PF(X)	Hazard Conditional Probability PC(X)	IR(X)
IR(LJF) =		0.5	1.99E-08	9.96E-09
IR(RJF) =		1	1.16E-07	1.16E-07
IR(LFF) =		1	1.10E-09	1.10E-09
IR(RFF) =		1	5.41E-09	5.41E-09
IR(LEX) =		0	0.00E+00	0.00E+00
IR(REX) =		0	0.00E+00	0.00E+00
TIR =				**1.33E-07**

For leak - jet flame, heat flux at 10 feet is 25.2 kW/m2, which is equal to 50% mortality

Text Summary ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: METHANE                  Molecular Weight: 16.04 g/mol
  PAC-1: 2900 ppm    PAC-2: 2900 ppm      PAC-3: 17000 ppm
  LEL: 50000 ppm     UEL: 150000 ppm
  Ambient Boiling Point: -258.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Flammable gas is burning as it escapes from pipe
  Pipe Diameter: 26 inches                Pipe Length: 9000 feet
  Unbroken end of the pipe is connected to an infinite source
  Pipe Roughness: smooth                  Hole Area: 531 sq in
  Pipe Press: 905 psia                    Pipe Temperature: 77° F
  Max Flame Length: 77 yards
  Burn Duration: ALOHA limited the duration to 1 hour
  Max Burn Rate: 470,000 pounds/min
  Total Amount Burned: 5,592,290 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from jet fire
  Red    : 170 yards --- (15.7 kW/(sq m))
```

26-Inch PG&E Natural Gas Transmission Pipeline Rupture - Flammable Vapor Cloud


```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: METHANE                  Molecular Weight: 16.04 g/mol
  PAC-1: 2900 ppm    PAC-2: 2900 ppm      PAC-3: 17000 ppm
  LEL: 50000 ppm     UEL: 150000 ppm
  Ambient Boiling Point: -258.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Flammable gas escaping from pipe (not burning)
  Pipe Diameter: 26 inches                Pipe Length: 9000 feet
  Unbroken end of the pipe is connected to an infinite source
  Pipe Roughness: smooth                  Hole Area: 531 sq in
  Pipe Press: 905 psia                    Pipe Temperature: 77° F
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 112,000 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 5,592,290 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Gaussian
  Red    : 774 yards --- (50000 ppm = LEL)
```

Text Summary ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: METHANE                  Molecular Weight: 16.04 g/mol
  PAC-1: 2900 ppm    PAC-2: 2900 ppm      PAC-3: 17000 ppm
  LEL: 50000 ppm     UEL: 150000 ppm
  Ambient Boiling Point: -258.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Flammable gas is burning as it escapes from pipe
  Pipe Diameter: 26 inches                Pipe Length: 9000 feet
  Unbroken end of the pipe is closed off
  Pipe Roughness: smooth                  Hole Area: 0.785 sq in
  Pipe Press: 905 psia                    Pipe Temperature: 77° F
  Max Flame Length: 2 yards
  Burn Duration: ALOHA limited the duration to 1 hour
  Max Burn Rate: 695 pounds/min
  Total Amount Burned: 32,729 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from jet fire
  Red    : 12 yards --- (15.7 kW/(sq m))
```

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: METHANE                  Molecular Weight: 16.04 g/mol
  PAC-1: 2900 ppm    PAC-2: 2900 ppm      PAC-3: 17000 ppm
  LEL: 50000 ppm     UEL: 150000 ppm
  Ambient Boiling Point: -258.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Flammable gas escaping from pipe (not burning)
  Pipe Diameter: 26 inches                Pipe Length: 9000 feet
  Unbroken end of the pipe is closed off
  Pipe Roughness: smooth                  Hole Area: 0.785 sq in
  Pipe Press: 905 psia                    Pipe Temperature: 77° F
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 667 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 32,729 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Gaussian
  Red   : 59 yards --- (50000 ppm = LEL)
```

36-INCH NATURAL GAS TRANSMISSION PIPELINE

INPUT TABLE

Input Data	Value	Units	Data Source
Product	natural gas		Pacific Gas & Electric Company
Diameter	36	inches	Same as above
Pressure	1040	psig (MAOP)	Same as above
R0	10	ft	Easement distance
RX(LJF)	39	ft	ALOHA model result - Appendix A
RX(RJF)	804	ft	ALOHA model result - Appendix A
RX(LFF)	192	ft	ALOHA model result - Appendix A
RX(RFF)	1,629	ft	ALOHA model result - Appendix A
RX(LEX)	0	ft	ALOHA - no GCE explosion
RX(REX)	0	ft	ALOHA - no GCE explosion
XSEG(LJF)	75	ft	Calculated, using CDE methodology
XSEG(RJF)	1608	ft	Calculated, using CDE methodology
XSEG(LFF)	383	ft	Calculated, using CDE methodology
XSEG(RFF)	3258	ft	Calculated, using CDE methodology
XSEG(LEX)	0	ft	Calculated, using CDE methodology
XSEG(REX)	0	ft	Calculated, using CDE methodology

BASE AND CONDITIONAL PROBABILITY TABLE

Base		Leak		Rupture		Exposure	
F0	1.20E-04	PC(L)	0.8	PC(R)	0.2	PC(OCC)	0.23
P0	1.20E-04	PC(LIG)	0.3	PC(RIG)	0.45	PC(OUT)	0.25
PAF	1	PC(FIG)	0.99	PC(FIG)	0.99		
PA	1.20E-04	PC(JF)	0.98	PC(JF)	0.98		
		PC(FF)	0.01	PC(FF)	0.01		
		PC(EIG)	0.01	PC(EIG)	0.01		
Calculated Values Base Hazard Probabilities		Leak Impact Probabilities		Rupture Impact Probabilities		Exposure Probability	
PA(LJF)	1.71E-06	PCI(LJF)	2.33E-01	PCI(RJF)	8.73E-02	PC(EXPO)	0.0575
PA(RJF)	3.65E-05	PCI(LFF)	2.38E-03	PCI(RFF)	8.91E-04		
PA(LFF)	8.72E-06	PCI(LEX)	2.40E-03	PCI(REX)	9.00E-04		
PA(RFF)	7.40E-05						
PA(LEX)	0.00E+00						
PA(REX)	0.00E+00						

36-INCH NATURAL GAS TRANSMISSION PIPELINE

INDIVIDUAL HAZARD PROBABILITIES

Hazard Conditional Probability PC(X)	Base Hazard Probability PA(X)	Conditional Impact Probability Factor PCI(X)	Conditional Exposure Probability PC(EXPO)	PA(X) Value	PCI(X) Value	PC(EXPO) Value	PC(X)
PC(LJF) =	PA(LJF) x	PCI(LJF) x	PC(EXPO) =	1.71E-06	2.33E-01	0.0575	2.29E-08
PC(RJF) =	PA(RJF) x	PCI(RJF) x	PC(EXPO) =	3.65E-05	8.73E-02	0.0575	1.83E-07
PC(LFF) =	PA(LFF) x	PCI(LFF) x	PC(EXPO) =	8.72E-06	2.38E-03	0.0575	1.19E-09
PC(RFF) =	PA(RFF) x	PCI)RFF) x	PC(EXPO) =	7.40E-05	8.91E-04	0.0575	3.79E-09
PC(LEX) =	PA(LEX) x	PCI(LEX) x	PC(EXPO) =	0.00E+00	2.40E-03	0.0575	0.00E+00
PC(REX) =	PA(REX) x	PCI(REX) x	PC(EXPO) =	0.00E+00	9.00E-04	0.0575	0.00E+00

INDIVIDUAL RISK SUMMARY

IR(X)		Maximum PF(X)	Hazard Conditional Probability PC(X)	IR(X)
IR(LJF) =		0	2.29E-08	0.00E+00
IR(RJF) =		1	1.83E-07	1.83E-07
IR(LFF) =		1	1.19E-09	1.19E-09
IR(RFF) =		1	3.79E-09	3.79E-09
IR(LEX) =		0	0.00E+00	0.00E+00
IR(REX) =		0	0.00E+00	0.00E+00
TIR =				**1.88E-07**

For leak - jet flame, the heat flux at 15 feet is 9.82 kW/m2, which equals 0% mortality

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: METHANE                  Molecular Weight: 16.04 g/mol
  PAC-1: 2900 ppm    PAC-2: 2900 ppm      PAC-3: 17000 ppm
  LEL: 50000 ppm     UEL: 150000 ppm
  Ambient Boiling Point: -258.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Flammable gas is burning as it escapes from pipe
  Pipe Diameter: 36 inches                Pipe Length: 9000 feet
  Unbroken end of the pipe is connected to an infinite source
  Pipe Roughness: smooth                  Hole Area: 1,018 sq in
  Pipe Press: 1055 psia                   Pipe Temperature: 77° F
  Max Flame Length: 110 yards
  Burn Duration: ALOHA limited the duration to 1 hour
  Max Burn Rate: 1,050,000 pounds/min
  Total Amount Burned: 14,876,078 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from jet fire
  Red    : 268 yards --- (15.7 kW/(sq m))
```

Text Summary ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: METHANE                  Molecular Weight: 16.04 g/mol
  PAC-1: 2900 ppm    PAC-2: 2900 ppm      PAC-3: 17000 ppm
  LEL: 50000 ppm     UEL: 150000 ppm
  Ambient Boiling Point: -258.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Flammable gas escaping from pipe (not burning)
  Pipe Diameter: 36 inches                Pipe Length: 9000 feet
  Unbroken end of the pipe is connected to an infinite source
  Pipe Roughness: smooth                  Hole Area: 1,018 sq in
  Pipe Press: 1055 psia                   Pipe Temperature: 77° F
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 293,000 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 14,876,078 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Heavy Gas
  Red   : 543 yards --- (50000 ppm = LEL)
```

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: METHANE                  Molecular Weight: 16.04 g/mol
  PAC-1: 2900 ppm    PAC-2: 2900 ppm      PAC-3: 17000 ppm
  LEL: 50000 ppm     UEL: 150000 ppm
  Ambient Boiling Point: -258.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Flammable gas is burning as it escapes from pipe
  Pipe Diameter: 36 inches                Pipe Length: 9000 feet
  Unbroken end of the pipe is closed off
  Pipe Roughness: smooth                  Hole Area: .785 sq in
  Pipe Press: 1055 psia                   Pipe Temperature: 77° F
  Max Flame Length: 2 yards
  Burn Duration: ALOHA limited the duration to 1 hour
  Max Burn Rate: 812 pounds/min
  Total Amount Burned: 42,812 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from jet fire
  Red    : 13 yards --- (15.7 kW/(sq m))
```

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: METHANE                  Molecular Weight: 16.04 g/mol
  PAC-1: 2900 ppm    PAC-2: 2900 ppm      PAC-3: 17000 ppm
  LEL: 50000 ppm     UEL: 150000 ppm
  Ambient Boiling Point: -258.8° F
  Vapor Pressure at Ambient Temperature: greater than 1 atm
  Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Flammable gas escaping from pipe (not burning)
  Pipe Diameter: 36 inches                Pipe Length: 9000 feet
  Unbroken end of the pipe is closed off
  Pipe Roughness: smooth                  Hole Area: .785 sq in
  Pipe Press: 1055 psia                   Pipe Temperature: 77° F
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 793 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 42,812 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Gaussian
  Red    : 64 yards --- (50000 ppm = LEL)
```

18-INCH CRUDE OIL PIPELINE

INPUT TABLE

Input Data	Value	Units	Data Source
Product	Crude Oil		Chevron Pipe Line Company
Diameter	18	inches	Same as above
Pressure	920	psig	Proprietary - based on pressure of similar diameter pipeline
R0	6	ft	Easement distance
Release Rate - Rupture	331	ft^3/min	Calculated based on flow rate of 85,000 barrels/day
Release Rate - Leak	2.29	ft^3/min	CDE Protocol - 1-inch hole x flow velocity of 420 ft/min
Release Period	15	min	CDE default value
Release Volume - Rupture	4,965	ft^3	Release rate x release period
Release Volume - Leak	34	ft^3	Release rate x release period
Pool Area - Rupture	19,860	ft^2	Assuming depth of pool is 3 inches
Pool Area - Leak	137	ft^2	Assuming depth of pool is 3 inches
Pool Diameter - Rupture	159	ft	Effective diameter = $[4(\text{pool area})/\pi]^{0.5}$
Pool Diameter - Leak	13	ft	Effective diameter = $[4(\text{pool area})/\pi]^{0.5}$
RX(LJF)	25		Pool fire - leak - uncontained spread and ALOHA run
RX(RJF)	330		Pool fire - rupture - uncontained spread and ALOHA run
RX(LFF)	23		Flash fire - leak - uncontained spread and ALOHA run
RX(RFF)	97		Flash fire - rupture - uncontained spread and ALOHA run
RX(LEX)	0		ALOHA - no VCE explosion - uncongested setting
RX(REX)	0		ALOHA - no VCE explosion - uncongested setting
XSEG(LJF)	49		Calculated via CDE Manual
XSEG(RJF)	660		Calculated via CDE Manual
XSEG(LFF)	44		Calculated via CDE Manual
XSEG(RFF)	194		Calculated via CDE Manual
XSEG(LEX)	0		Calculated via CDE Manual
XSEG(REX)	0		Calculated via CDE Manual

BASE AND CONDITIONAL PROBABILITY TABLE

Base		Leak		Rupture		Exposure	
F0	2.30E-03	PC(L)	0.8	PC(R)	0.2	PC(OCC)	0.23
P0	2.30E-03	PC(LIG)	0.09	PC(RIG)	0.03	PC(OUT)	0.25
PAF	1	PC(FIG)	0.95	PC(FIG)	0.95		
PA	2.30E-03	PC(JF)	0.95	PC(JF)	0.95		
		PC(FF)	0.05	PC(FF)	0.05		
		PC(EIG)	0.05	PC(EIG)	0.05		
Calculated Values Base Hazard Probabilities		Leak Impact Probabilities		Rupture Impact Probabilities		Exposure Probability	
PA(LJF)	2.11E-05	PCI(LJF)	6.50E-02	PCI(RJF)	5.42E-03	PC(EXPO)	0.0575
PA(RJF)	2.87E-04	PCI(LFF)	3.42E-03	PCI(RFF)	2.85E-04		
PA(LFF)	1.93E-05	PCI(LEX)	3.60E-03	PCI(REX)	3.00E-04		
PA(RFF)	8.43E-05						
PA(LEX)	0.00E+00						
PA(REX)	0.00E+00						

18-INCH CRUDE OIL PIPELINE

INDIVIDUAL HAZARD PROBABILITIES

Hazard Conditional Probability PC(X)	Base Hazard Probability PA(X)	Conditional Impact Probability Factor PCI(X)	Conditional Exposure Probability PC(EXPO)	PA(X) Value	PCI(X) Value	PC(EXPO) Value	PC(X)
PC(LJF) =	PA(LJF) x	PCI(LJF) x	PC(EXPO) =	2.11E-05	6.50E-02	0.0575	7.90E-08
PC(RJF) =	PA(RJF) x	PCI(RJF) x	PC(EXPO) =	2.87E-04	5.42E-03	0.0575	8.95E-08
PC(LFF) =	PA(LFF) x	PCI(LFF) x	PC(EXPO) =	1.93E-05	3.42E-03	0.0575	3.80E-09
PC(RFF) =	PA(RFF) x	PCI)RFF) x	PC(EXPO) =	8.43E-05	2.85E-04	0.0575	1.38E-09
PC(LEX) =	PA(LEX) x	PCI(LEX) x	PC(EXPO) =	0.00E+00	3.60E-03	0.0575	0.00E+00
PC(REX) =	PA(REX) x	PCI(REX) x	PC(EXPO) =	0.00E+00	3.00E-04	0.0575	0.00E+00

INDIVIDUAL RISK SUMMARY

IR(X)		Maximum PF(X)	Hazard Conditional Probability PC(X)	IR(X)
IR(LJF) =		0.91	7.90E-08	7.19E-08
IR(RJF) =		1	8.95E-08	8.95E-08
IR(LFF) =		1	3.80E-09	3.80E-09
IR(RFF) =		1	1.38E-09	1.38E-09
IR(LEX) =		0	0.00E+00	0.00E+00
IR(REX) =		0	0.00E+00	0.00E+00
TIR =				**1.67E-07**

Leak - pool fire - heat flux at distance of 6 feet is 35.2 kW/m2, which is equivalent to 91% mortality

18-Inch Crude Oil Pipeline
Rupture - Pool Fire

Text Summary

ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.4° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,097 ppm or 20.1%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Burning Puddle / Pool Fire
  Puddle Diameter: 238 feet               Average Puddle Depth: 3 inches
  Initial Puddle Temperature: Air temperature
  Flame Length: 95 yards                  Burn Duration: 8 minutes
  Burn Rate: 56,400 pounds/min
  Total Amount Burned: 455,486 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from pool fire
  Red    : 157 yards --- (15.7 kW/(sq m))

     Distance reduced by 70% to account for crude vs petroleum = 330 feet
```

18-Inch Crude Oil Pipeline
Rupture - Flammable Vapor Cloud

Text Summary

ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.4° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,097 ppm or 20.1%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Diameter: 238 feet               Average Puddle Depth: 3 inches
  Ground Type: Default soil               Ground Temperature: 77° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 1,880 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 90,324 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Heavy Gas
  Red    : 46 yards ---  (12000 ppm = LEL)
  Note: Threat zone was not drawn because effects of near-field patchiness
    make dispersion predictions less reliable for short distances.

      Distance reduced by 70% to account for crude vs petroleum = 97 feet
```

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.4° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,097 ppm or 20.1%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Burning Puddle / Pool Fire
  Puddle Diameter: 13 feet                Average Puddle Depth: 3 inches
  Initial Puddle Temperature: Air temperature
  Flame Length: 12 yards                  Burn Duration: 8 minutes
  Burn Rate: 168 pounds/min
  Total Amount Burned: 1,359 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from pool fire
  Red    : 12 yards --- (15.7 kW/(sq m))

     Distance reduced by 70% to account for crude vs. petroleum = 25 feet
```

18-Inch Crude Oil Pipeline
Leak - Flammable Vapor Cloud

Text Summary ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: February 22, 2013  1716 hours PST (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.4° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,097 ppm or 20.1%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Diameter: 13 feet                Average Puddle Depth: 3 inches
  Ground Type: Default soil               Ground Temperature: 77° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 7.24 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 331 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Gaussian
  Red    : less than 10 meters(10.9 yards) --- (12000 ppm = LEL)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.

    Distance reduced by 70% to account for crude vs. petroleum =
```

16-INCH CRUDE OIL PIPELINE

INPUT TABLE

Input Data	Value	Units	Data Source
Product	Crude Oil		Phillips 66 Pipeline Company
Diameter	16	inches	Same as above
Pressure	1,130	psig	Same as above
R0	8	ft	Assume pipeline in middle of 16.5-foot wide easement
Release Rate - Rupture	393	ft^3/min	Calculated from pipeline capacity of 4,200 bbl/hr
Release Rate - Leak	2.29	ft^3/min	CDE Protocol - 1-inch hole x flow velocity of 420 ft/min
Shutdown Period	5	min	Phillips 66 Pipeline Company
Release Volume - Rupture	11,091	ft^3	Includes amount released during shutdown plus draindown (Table 1)
Release Volume - Leak	34	ft^3	Release rate x 15 minutes - CDE default value
Pool Area - Rupture	44,364	ft^2	Assuming depth of pool is 3 inches
Pool Area - Leak	137	ft^2	Assuming depth of pool is 3 inches
Pool Diameter - Rupture	238	ft	Effective diameter = $[4(\text{pool area})/\pi]^{0.5}$
Pool Diameter - Leak	13	ft	Effective diameter = $[4(\text{pool area})/\pi]^{0.5}$
RX(LJF)	25		Pool fire - leak - uncontained spread and ALOHA run
RX(RJF)	330		Pool fire - rupture - uncontained spread and ALOHA run
RX(LFF)	23		Flash fire - leak - uncontained spread and ALOHA run
RX(RFF)	97		Flash fire - rupture - uncontained spread and ALOHA run
RX(LEX)	0		ALOHA - no VCE explosion - uncongested setting
RX(REX)	0		ALOHA - no VCE explosion - uncongested setting
XSEG(LJF)	47		Calculated via CDE Manual
XSEG(RJF)	660		Calculated via CDE Manual
XSEG(LFF)	43		Calculated via CDE Manual
XSEG(RFF)	193		Calculated via CDE Manual
XSEG(LEX)	0		Calculated via CDE Manual
XSEG(REX)	0		Calculated via CDE Manual

BASE AND CONDITIONAL PROBABILITY TABLE

Base		Leak		Rupture		Exposure	
F0	2.30E-03	PC(L)	0.8	PC(R)	0.2	PC(OCC)	1.00
P0	2.30E-03	PC(LIG)	0.09	PC(RIG)	0.03	PC(OUT)	0.25
PAF	1	PC(FIG)	0.95	PC(FIG)	0.95		
PA	2.30E-03	PC(JF)	0.95	PC(JF)	0.95		
		PC(FF)	0.05	PC(FF)	0.05		
		PC(EIG)	0.05	PC(EIG)	0.05		
Calculated Values Base Hazard Probabilities		Leak Impact Probabilities		Rupture Impact Probabilities		Exposure Probability	
PA(LJF)	2.06E-05	PCI(LJF)	6.50E-02	PCI(RJF)	5.42E-03	PC(EXPO)	0.25
PA(RJF)	2.87E-04	PCI(LFF)	3.42E-03	PCI(RFF)	2.85E-04		
PA(LFF)	1.87E-05	PCI(LEX)	3.60E-03	PCI(REX)	3.00E-04		
PA(RFF)	8.42E-05						
PA(LEX)	0.00E+00						
PA(REX)	0.00E+00						

16-INCH CRUDE OIL PIPELINE

INDIVIDUAL HAZARD PROBABILITIES

Hazard Conditional Probability PC(X)	Base Hazard Probability PA(X)	Conditional Impact Probability Factor PCI(X)	Conditional Exposure Probability PC(EXPO)	PA(X) Value	PCI(X) Value	PC(EXPO) Value	PC(X)
PC(LJF) =	PA(LJF) x	PCI(LJF) x	PC(EXPO) =	2.06E-05	6.50E-02	0.25	3.34E-07
PC(RJF) =	PA(RJF) x	PCI(RJF) x	PC(EXPO) =	2.87E-04	5.42E-03	0.25	3.89E-07
PC(LFF) =	PA(LFF) x	PCI(LFF) x	PC(EXPO) =	8.42E-05	3.42E-03	0.25	7.20E-08
PC(RFF) =	PA(RFF) x	PCI)RFF) x	PC(EXPO) =	0.00E+00	2.85E-04	0.25	0.00E+00
PC(LEX) =	PA(LEX) x	PCI(LEX) x	PC(EXPO) =	0.00E+00	3.60E-03	0.25	0.00E+00
PC(REX) =	PA(REX) x	PCI(REX) x	PC(EXPO) =	0.00E+00	3.00E-04	0.25	0.00E+00

INDIVIDUAL RISK SUMMARY

IR(X)		Maximum PF(X)	Hazard Conditional Probability PC(X)	IR(X)
IR(LJF) =		0.5	3.34E-07	1.67E-07
IR(RJF) =		1	3.89E-07	3.89E-07
IR(LFF) =		1	7.20E-08	7.20E-08
IR(RFF) =		1	0.00E+00	0.00E+00
IR(LEX) =		0	0.00E+00	0.00E+00
IR(REX) =		0	0.00E+00	0.00E+00
TIR =				**6.28E-07**

Leak - Pool Fire - heat flux of 25 kW/m2 at nearest receptor = 50% mortality

TABLE 1

PIPELINE DISCHARGE VOLUMES - RUPTURE SCENARIO - PHILLIPS 66 PIPELINE

Distance from High Point (ft)	Discharge During Shutdown (gal)	Drain Down Volume (ft3)	Drain Down Volume (gal)	Total Discharge Volume (gal)
0	14,700	0	0	14,700
1000	14,700	1310	5,879	20,579
2000	14,700	2620	11,759	26,459
3000	14,700	3930	17,638	32,338
4000	14,700	5240	23,517	38,217
5000	14,700	6550	29,396	44,096
6000	14,700	7860	35,276	49,976
7000	14,700	9170	41,155	55,855
8000	14,700	10480	47,034	61,734
9000	14,700	11790	52,914	67,614
10000	14,700	13100	58,793	73,493
11000	14,700	14410	64,672	79,372
12000	14,700	15720	70,551	85,251
13000	14,700	17030	76,431	91,131
13500	14,700	17685	79,370	94,070
	Average	9126	40,959	55,659

Discharge during shutdown = (4,200 bbl/hr x 42 gallons/bbl x 5 minutes)/ 60 min/hr = 14,700 gallons total
Drain down volume based on area of pipeline x distance from high point x 0.6 draindown factor

Text Summary

16-Inch Phillips 66 Crude Oil Pipeline
Rupture - Pool Fire

ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: September 29, 2014  1744 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.2° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,899 ppm or 20.2%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Burning Puddle / Pool Fire
  Puddle Diameter: 238 feet               Average Puddle Depth: 3 inches
  Initial Puddle Temperature: Air temperature
  Flame Length: 95 yards                  Burn Duration: 8 minutes
  Burn Rate: 56,500 pounds/min
  Total Amount Burned: 455,486 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from pool fire
  Red    : 157 yards --- (15.7 kW/(sq m))
  Distance adjusted by factor of 0.7 to account for crude vs. petroleum =
   330 feet
```

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: September 29, 2014  1744 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.2° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,899 ppm or 20.2%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Diameter: 238 feet               Average Puddle Depth: 3 inches
  Ground Type: Default soil               Ground Temperature: 77° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 1,900 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 91,425 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Heavy Gas
  Red    : 46 yards --- (12000 ppm = LEL)
  Note: Threat zone was not drawn because effects of near-field patchiness
    make dispersion predictions less reliable for short distances.

 Distance adjusted by factor of 0.7 to account for crude vs. petroleum =
  97 feet
```

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: September 29, 2014  1744 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.2° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,899 ppm or 20.2%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Burning Puddle / Pool Fire
  Puddle Diameter: 13 feet                Average Puddle Depth: 3 inches
  Initial Puddle Temperature: Air temperature
  Flame Length: 12 yards                  Burn Duration: 8 minutes
  Burn Rate: 168 pounds/min
  Total Amount Burned: 1,359 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from pool fire
  Red    : 12 yards --- (15.7 kW/(sq m))

 Distance adjusted by 0.7 to account for crude vs petroleum = 25 feet
```

16-Inch Phillips 66 Crude Oil Pipeline
Leak - Flammable Vapor Cloud

Text Summary

ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: September 29, 2014  1744 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.2° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,899 ppm or 20.2%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Diameter: 13 feet                Average Puddle Depth: 3 inches
  Ground Type: Default soil               Ground Temperature: 77° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 7.29 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 335 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Gaussian
  Red    : less than 10 meters(10.9 yards) --- (12000 ppm = LEL)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
  Distance adjusted by 0.7 to account for crude vs. petroleum = 23 feet
```

ESTIMATING RADIANT HEAT FLUX FROM FIRE TO A TARGET AT GROUND LEVEL UNDER WIND-FREE CONDITION SOLID FLAME RADIATION MODEL - PHILLIPS 66 PIPELINE

Version 1805.0

The following calculations estimate the radiative heat flux from a pool fire to a target fuel.
The purpose of this calculation is to estimate the radiation transmitted from a burning fuel array to a target fuel positioned some distance from the fire at ground level to determine if secondary ignitions are likely with no wind.

Parameters in YELLOW CELLS are Entered by the User.

Parameters in GREEN CELLS are Automatically Selected from the DROP DOWN MENU for the Fuel Selected.

All subsequent output values are calculated by the spreadsheet and based on values specified in the input parameters. This spreadsheet is protected and secure to avoid errors due to a wrong entry in a cell(s).
The chapter in the NUREG should be read before an analysis is made.

INPUT PARAMETERS

Mass Burning Rate of Fuel (m")	0.0335	kg/m^2-sec	
Effective Heat of Combustion of Fuel ($\Delta H_{c,eff}$)	42600	kJ/kg	
Empirical Constant ($k\beta$)	2.8	m^{-1}	
Heat Release Rate (Q)	5881864.67	kW	
Fuel Area or Dike Area (A_{dike})	44364.00	ft^2	4121.55 m^2
Distance between Fire and Target (L)	18.00	ft	5.4864 m

OPTIONAL CALCULATION FOR GIVEN HEAT RELEASE RATE

Select "User Specified Value" from Fuel Type Menu and Enter Your HRR here → kW

Calculate

THERMAL PROPERTIES DATA

BURNING RATE DATA FOR FUELS

Fuel	Mass Burnin m" (kg/m^2-se	Heat of Combustion $\Delta H_{c,eff}$ (kJ/kg)	Empirical Constant $k\beta$ (m^{-1})
Methanol	0.017	20,000	100
Ethanol	0.015	26,800	100
Butane	0.078	45,700	2.7
Benzene	0.085	40,100	2.7
Hexane	0.074	44,700	1.9
Heptane	0.101	44,600	1.1
Xylene	0.09	40,800	1.4
Acetone	0.041	25,800	1.9
Dioxane	0.018	26,200	5.4
Diethy Ether	0.085	34,200	0.7
Benzine	0.048	44,700	3.6
Gasoline	0.055	43,700	2.1
Kerosine	0.039	43,200	3.5
Diesel	0.045	44,400	2.1
JP-4	0.051	43,500	3.6
JP-5	0.054	43,000	1.6
Transformer Oil, Hydroca	0.039	46,000	0.7
561 Silicon Transformer	0.005	28,100	100
Fuel Oil, Heavy	0.035	39,700	1.7
Crude Oil	0.0335	42,600	2.8
Lube Oil	0.039	46,000	0.7
Douglas Fir Plywood	0.01082	10,900	100
User Specified Value	Enter Value	Enter Value	Enter Value

Reference: *SFPE Handbook of Fire Protection Engineering*, 3rd Edition, 2002, *Page 3-26.*

Select Fuel Type

Scroll to desired fuel type then Click on selection

ESTIMATING RADIATIVE HEAT FLUX TO A TARGET FUEL

Reference: *SFPE Handbook of Fire Protection Engineering* , 3rd Edition, 2002, *Page 3-276.*

SOLID FLAME RADIATION MODEL

$q'' = EF_{1->2}$

Where q" = incident radiative heat flux on the target (kW/m^2)
E = emissive power of the pool fire flame (kW/m^2)
$F_{1->2}$ = view factor between target and the flame

Pool Fire Diameter Calculation

$A_{dike} = \pi D^2/4$

$D = \sqrt{(4A_{dike}/\pi)}$

Where A_{dike} = surface area of pool fire (m^2)
D = pool fire diamter (m)

D = **72.44** m

Emissive Power Calculation

$E = 58\ (10^{-0.00823\ D})$

Where E = emissive power of the pool fire flame (kW/m^2)
D = diameter of the pool fire (m)

E = **14.70** kW/m^2

View Factor Calculation

$F_{1->2,H} = (B-1/S)/\pi(B^2-1)^{1/2} \tan^{-1}((B+1)(S-1)/(B-1)(S+1))^{1/2} - (A-1/S)/(\pi(A^2-1)^{1/2}) \tan^{-1}((A+1)(S-1)/(A-1)(S+1))^{1/2}$

$F_{1->2,V} = 1/(\pi S) \tan^{-1}(h/(S^2-1)^{1/2}) - (h/\pi S) \tan^{-1}((S-1)/(S+1))^{1/2} + Ah/\pi S(A^2-1)^{1/2} \tan^{-1}((A+1)(S-1)/(A-1)(S+1))^{1/2}$

$A = (h^2+S^2+1)/2S$

$B = (1+S^2)/2S$

$S = 2R/D$

$h = 2H_f/D$

$F_{1->2,max} = \sqrt{(F^2_{1->2,H} + F^2_{1->2,V})}$

Where $F_{1->2,H}$ = horizontal view factor
$F_{1->2,V}$ = vertical view factor
$F_{1->2,max}$ = maximum view factor
R = distance from center of the pool fire to edge of the target (m)
H_f = height of the pool fire flame (m)
D = pool fire diameter (m)

Distance from Center of the Pool Fire to Edge of the Target Calculation

$R = L + D/2$

Where R = distance from center of the pool fire to edge of the target (m)
L = distance between pool fire and target (m)
D = pool fire diameter (m)

R = L + D/2 = **41.707** m

Heat Release Rate Calculation

$Q = m''\Delta H_{c,eff}\ (1 - e^{-k\beta\ D})\ A_{dike}$

Where Q = pool fire heat release rate (kW)
m" = mass burning rate of fuel per unit surface area (kg/m^2-sec)
ΔH_c = effective heat of combustion of fuel (kJ/kg)
A_{dike} = surface area of pool fire (area involved in vaporization) (m^2)
$k\beta$ = empirical constant (m^{-1})
D = diameter of pool fire (diameter involved in vaporization, circular pool is assumed) (m)

Q = **5881864.67** kW

Pool Fire Flame Height Calculation

$H_f = 0.235\ Q^{2/5} - 1.02\ D$

Where H_f = flame height (m)

Q = heat release rate of fire (kW)

D = fire diameter (m)

H_f = **46.025** m

		F_{H1}	F_{H2}	F_{H3}	F_{H4}	$F_{1->2,H}$
S = 2R/D =	**1.151**					
$h = 2H_f/D$ =	**1.271**					
$A = (h^2+S^2+1)/2S$ =	**1.711**					
$B = (1+S^2)/2S$ =	**1.010**					
$F_{1->2,H}$ =	**0.325**	0.318		1.311	0.193	0.478	**0.325**
$F_{1->2,V}$ =	**0.433**	F_{V1}	F_{V2}	F_{V3}	F_{V4}	$F_{1->2,V}$
$F_{1->2,max} = \sqrt{(F^2_{1->2,H} + F^2}$	**0.542**	0.318		0.091	0.433	0.478	**0.433**

Radiative Heat Flux Calculation

$q'' = EF_{1->2}$

q" =	**7.96** **kW/m²**	**0.70** **Btu/ft²-sec**

Heat flux of 7.96 kW/m2 = 2,523 BTU/hr-ft2

ESTIMATING RADIANT HEAT FLUX FROM FIRE TO A TARGET
FUEL AT GROUND LEVEL UNDER WIND-FREE CONDITION
SOLID FLAME RADIATION MODEL - PHILLIPS 66 PIPELINE - CASE 2

Version 1805.0

The following calculations estimate the radiative heat flux from a pool fire to a target fuel.
The purpose of this calculation is to estimate the radiation transmitted from a burning fuel array to a target fuel positioned some distance from the fire at ground level to determine if secondary ignitions are likely with no wind.

Parameters in YELLOW CELLS are Entered by the User.

Parameters in GREEN CELLS are Automatically Selected from the DROP DOWN MENU for the Fuel Selected.

All subsequent output values are calculated by the spreadsheet and based on values specified in the input parameters. This spreadsheet is protected and secure to avoid errors due to a wrong entry in a cell(s).
The chapter in the NUREG should be read before an analysis is made.

INPUT PARAMETERS

Mass Burning Rate of Fuel (m")	0.0335	kg/m^2-sec	
Effective Heat of Combustion of Fuel ($\Delta H_{c,eff}$)	42600	kJ/kg	
Empirical Constant (kβ)	2.8	m^{-1}	
Heat Release Rate (Q)	5881864.67	kW	
Fuel Area or Dike Area (A_{dike})	44364.00	ft^2	4121.55 m^2
Distance between Fire and Target (L)	13.00	ft	3.9624 m

OPTIONAL CALCULATION FOR GIVEN HEAT RELEASE RATE

Select "User Specified Value" from Fuel Type Menu and Enter Your HRR here → kW

Calculate

THERMAL PROPERTIES DATA

BURNING RATE DATA FOR FUELS

Fuel	Mass Burnin m" (kg/m^2-se	Heat of Combustion $\Delta H_{c,eff}$ (kJ/kg)	Empirical Constant kβ (m^{-1})
Methanol	0.017	20,000	100
Ethanol	0.015	26,800	100
Butane	0.078	45,700	2.7
Benzene	0.085	40,100	2.7
Hexane	0.074	44,700	1.9
Heptane	0.101	44,600	1.1
Xylene	0.09	40,800	1.4
Acetone	0.041	25,800	1.9
Dioxane	0.018	26,200	5.4
Diethy Ether	0.085	34,200	0.7
Benzine	0.048	44,700	3.6
Gasoline	0.055	43,700	2.1
Kerosine	0.039	43,200	3.5
Diesel	0.045	44,400	2.1
JP-4	0.051	43,500	3.6
JP-5	0.054	43,000	1.6
Transformer Oil, Hydroca	0.039	46,000	0.7
561 Silicon Transformer	0.005	28,100	100
Fuel Oil, Heavy	0.035	39,700	1.7
Crude Oil	0.0335	42,600	2.8
Lube Oil	0.039	46,000	0.7
Douglas Fir Plywood	0.01082	10,900	100
User Specified Value	Enter Value	Enter Value	Enter Value

Select Fuel Type

Scroll to desired fuel type then Click on selection

Reference: *SFPE Handbook of Fire Protection Engineering*, 3rd Edition, 2002, *Page 3-26.*

ESTIMATING RADIATIVE HEAT FLUX TO A TARGET FUEL

Reference: *SFPE Handbook of Fire Protection Engineering* , 3rd Edition, 2002, *Page 3-276.*

SOLID FLAME RADIATION MODEL

$q'' = EF_{1->2}$

Where q" = incident radiative heat flux on the target (kW/m^2)
E = emissive power of the pool fire flame (kW/m^2)
$F_{1->2}$ = view factor between target and the flame

Pool Fire Diameter Calculation

$A_{dike} = \pi D^2/4$

$D = \sqrt{(4A_{dike}/\pi)}$

Where A_{dike} = surface area of pool fire (m^2)
D = pool fire diamter (m)

D = **72.44** m

Emissive Power Calculation

$E = 58\ (10^{-0.00823\ D})$

Where E = emissive power of the pool fire flame (kW/m^2)
D = diameter of the pool fire (m)

E = **14.70** kW/m^2

View Factor Calculation

$F_{1->2,H} = (B-1/S)/\pi(B^2-1)^{1/2} \tan^{-1}((B+1)(S-1)/(B-1)(S+1))^{1/2} - (A-1/S)/(\pi(A^2-1)^{1/2}) \tan^{-1}((A+1)(S-1)/(A-1)(S+1))^{1/2}$

$F_{1->2,V} = 1/(\pi S) \tan^{-1}(h/(S^2-1)^{1/2}) - (h/\pi S) \tan^{-1}((S-1)/(S+1))^{1/2} + Ah/\pi S(A^2-1)^{1/2} \tan^{-1}((A+1)(S-1)/(A-1)(S+1))^{1/2}$

$A = (h^2+S^2+1)/2S$

$B = (1+S^2)/2S$

$S = 2R/D$

$h = 2H_f/D$

$F_{1->2,max} = \sqrt{(F^2_{1->2,H} + F^2_{1->2,V})}$

Where $F_{1->2,H}$ = horizontal view factor
$F_{1->2,V}$ = vertical view factor
$F_{1->2,max}$ = maximum view factor
R = distance from center of the pool fire to edge of the target (m)
H_f = height of the pool fire flame (m)
D = pool fire diameter (m)

Distance from Center of the Pool Fire to Edge of the Target Calculation

$R = L + D/2$

Where R = distance from center of the pool fire to edge of the target (m)
L = distance between pool fire and target (m)
D = pool fire diameter (m)

R = L + D/2 = **40.183** m

Heat Release Rate Calculation

$Q = m''\Delta H_{c,eff}\ (1 - e^{-k\beta\ D})\ A_{dike}$

Where Q = pool fire heat release rate (kW)
m" = mass burning rate of fuel per unit surface area (kg/m^2-sec)
ΔH_c = effective heat of combustion of fuel (kJ/kg)
A_{dike} = surface area of pool fire (area involved in vaporization) (m^2)
$k\beta$ = empirical constant (m^{-1})
D = diameter of pool fire (diameter involved in vaporization, circular pool is assumed) (m)

Q = **5881864.67** kW

Pool Fire Flame Height Calculation

$H_f = 0.235\ Q^{2/5} - 1.02\ D$

Where H_f = flame height (m)

Q = heat release rate of fire (kW)

D = fire diameter (m)

H_f = **46.025** m

$S = 2R/D$ =	**1.109**
$h = 2H_f/D$ =	**1.271**
$A = (h^2+S^2+1)/2S$ =	**1.733**
$B = (1+S^2)/2S$ =	**1.005**

		F_{H1}	F_{H2}	F_{H3}	F_{H4}	$F_{1->2,H}$
$F_{1->2,H}$ =	**0.351**	0.318		1.347	0.187	0.414	**0.351**
$F_{1->2,V}$ =	**0.450**	F_{V1}	F_{V2}	F_{V3}	F_{V4}	$F_{1->2,V}$
$F_{1->2,max} = \sqrt{(F^2_{1->2,H} + F^2}$	**0.571**	0.347		0.082	0.446	0.414	**0.450**

Radiative Heat Flux Calculation

$q'' = EF_{1->2}$

q" =	**8.39**	**kW/m²**	**0.74** **Btu/ft²-sec**

Heat flux of 8.39 kW.m2 = 2,660 BTU/hr-ft2

20-INCH CRUDE OIL PIPELINE

INPUT TABLE

Input Data	Value	Units	Data Source
Product	Crude Oil		Shell Pipeline Company
Diameter	20	inches	Same as above
Pressure	926	psig	Same as above
R0	10	ft	Assume pipeline in middle of 20-foot wide easement
Release Rate - Rupture	871	ft^3/min	Pipeline area x flow velocity of 420 ft/min - CDE default value
Release Rate - Leak	2.29	ft^3/min	CDE Protocol - 1-inch hole x flow velocity of 420 ft/min
Shutdown Period	5	min	Typical shutdown (detection plus verification) for SCADA system
Release Volume - Rupture	10,479	ft^3	Includes amount released during shutdown plus draindown (Table 2)
Release Volume - Leak	34	ft^3	Release rate x 15 minutes - CDE default value
Pool Area - Rupture	41,916	ft^2	Assuming depth of pool is 3 inches
Pool Area - Leak	137	ft^2	Assuming depth of pool is 3 inches
Pool Diameter - Rupture	231	ft	Effective diameter = $[4(\text{pool area})/\pi]^{0.5}$
Pool Diameter - Leak	13	ft	Effective diameter = $[4(\text{pool area})/\pi]^{0.5}$
RX(LJF)	25		Pool fire - leak - uncontained spread and ALOHA run
RX(RJF)	321		Pool fire - rupture - uncontained spread and ALOHA run
RX(LFF)	23		Flash fire - leak - uncontained spread and ALOHA run
RX(RFF)	95		Flash fire - rupture - uncontained spread and ALOHA run
RX(LEX)	0		ALOHA - no VCE explosion - uncongested setting
RX(REX)	0		ALOHA - no VCE explosion - uncongested setting
XSEG(LJF)	46		Calculated via CDE Manual
XSEG(RJF)	642		Calculated via CDE Manual
XSEG(LFF)	41		Calculated via CDE Manual
XSEG(RFF)	189		Calculated via CDE Manual
XSEG(LEX)	0		Calculated via CDE Manual
XSEG(REX)	0		Calculated via CDE Manual

BASE AND CONDITIONAL PROBABILITY TABLE

Base		Leak		Rupture		Exposure	
F0	2.30E-03	PC(L)	0.8	PC(R)	0.2	PC(OCC)	1.00
P0	2.30E-03	PC(LIG)	0.09	PC(RIG)	0.03	PC(OUT)	0.25
PAF	1	PC(FIG)	0.95	PC(FIG)	0.95		
PA	2.30E-03	PC(JF)	0.95	PC(JF)	0.95		
		PC(FF)	0.05	PC(FF)	0.05		
		PC(EIG)	0.05	PC(EIG)	0.05		
Calculated Values Base Hazard Probabilities		Leak Impact Probabilities		Rupture Impact Probabilities		Exposure Probability	
PA(LJF)	2.00E-05	PCI(LJF)	6.50E-02	PCI(RJF)	5.42E-03	PC(EXPO)	0.25
PA(RJF)	2.80E-04	PCI(LFF)	3.42E-03	PCI(RFF)	2.85E-04		
PA(LFF)	1.80E-05	PCI(LEX)	3.60E-03	PCI(REX)	3.00E-04		
PA(RFF)	8.23E-05						
PA(LEX)	0.00E+00						
PA(REX)	0.00E+00						

20-INCH CRUDE OIL PIPELINE

INDIVIDUAL HAZARD PROBABILITIES

Hazard Conditional Probability PC(X)	Base Hazard Probability PA(X)	Conditional Impact Probability Factor PCI(X)	Conditional Exposure Probability PC(EXPO)	PA(X) Value	PCI(X) Value	PC(EXPO) Value	PC(X)
PC(LJF) =	PA(LJF) x	PCI(LJF) x	PC(EXPO) =	2.00E-05	6.50E-02	0.25	3.24E-07
PC(RJF) =	PA(RJF) x	PCI(RJF) x	PC(EXPO) =	2.80E-04	5.42E-03	0.25	3.78E-07
PC(LFF) =	PA(LFF) x	PCI(LFF) x	PC(EXPO) =	1.80E-05	3.42E-03	0.25	1.54E-08
PC(RFF) =	PA(RFF) x	PCI)RFF) x	PC(EXPO) =	8.23E-05	2.85E-04	0.25	5.86E-09
PC(LEX) =	PA(LEX) x	PCI(LEX) x	PC(EXPO) =	0.00E+00	3.60E-03	0.25	0.00E+00
PC(REX) =	PA(REX) x	PCI(REX) x	PC(EXPO) =	0.00E+00	3.00E-04	0.25	0.00E+00

INDIVIDUAL RISK SUMMARY

IR(X)		Maximum PF(X)	Hazard Conditional Probability PC(X)	IR(X)
IR(LJF) =		0.38	3.24E-07	1.23E-07
IR(RJF) =		1	3.78E-07	3.78E-07
IR(LFF) =		1	1.54E-08	1.54E-08
IR(RFF) =		1	5.86E-09	5.86E-09
IR(LEX) =		0	0.00E+00	0.00E+00
IR(REX) =		0	0.00E+00	0.00E+00
TIR =				**5.23E-07**

Leak - Pool Fire - heat flux of 22.6 kW/m2 at nearest receptor = 38% mortality

TABLE 2

PIPELINE DISCHARGE VOLUMES - RUPTURE SCENARIO - SHELL PIPELINE

Distance from High Point (ft)	Discharge During Shutdown (gal)	Drain Down Volume (ft3)	Drain Down Volume (gal)	Total Discharge Volume (gal)
0	34,258	0	0	34,258
500	34,258	1035	4,645	38,903
1000	34,258	2070	9,290	43,548
1500	34,258	3105	13,935	48,193
2000	34,258	4140	18,580	52,838
2500	34,258	5175	23,225	57,483
3000	34,258	6210	27,870	62,128
3500	34,258	7245	32,516	66,774
4000	34,258	8280	37,161	71,419
4500	34,258	9315	41,806	76,064
5000	34,258	10350	46,451	80,709
5500	34,258	11385	51,096	85,354
6000	34,258	12420	55,741	89,999
6500	34,258	13455	60,386	94,644
7000	34,258	14490	65,031	99,289
7500	34,258	15525	69,676	103,934
8000	34,258	16560	74,321	108,579
8500	34,258	17595	78,966	113,224
9000	34,258	18630	83,611	117,869
9500	34,258	19665	88,257	122,515
	Average	9833	44,128	78,386

Discharge during shutdown = (916 ft3/min x 5 minutes x 7.48 gal/ft3 = 14,700 gallons total
Drain down volume based on area of pipeline x distance from high point x 0.6 draindown factor

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: September 30, 2014  1602 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.2° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,899 ppm or 20.2%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Burning Puddle / Pool Fire
  Puddle Diameter: 231 feet               Average Puddle Depth: 3 inches
  Initial Puddle Temperature: Air temperature
  Flame Length: 93 yards                  Burn Duration: 8 minutes
  Burn Rate: 53,200 pounds/min
  Total Amount Burned: 429,087 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from pool fire
  Red    : 153 yards --- (15.7 kW/(sq m))

 Distance reduced by 0.7 to account for crude vs petroleum =
```

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: September 30, 2014  1602 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.2° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,899 ppm or 20.2%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Diameter: 231 feet               Average Puddle Depth: 3 inches
  Ground Type: Default soil               Ground Temperature: 77° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 1,820 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 91,923 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Heavy Gas
  Red    : 45 yards --- (12000 ppm = LEL)
  Note: Threat zone was not drawn because effects of near-field patchiness
    make dispersion predictions less reliable for short distances.
  Distance reduced by 0.7 to account for crude vs petroleum = 95 feet
```

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: September 29, 2014  1744 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.2° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,899 ppm or 20.2%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Burning Puddle / Pool Fire
  Puddle Diameter: 13 feet                Average Puddle Depth: 3 inches
  Initial Puddle Temperature: Air temperature
  Flame Length: 12 yards                  Burn Duration: 8 minutes
  Burn Rate: 168 pounds/min
  Total Amount Burned: 1,359 pounds

THREAT ZONE:
  Threat Modeled: Thermal radiation from pool fire
  Red    : 12 yards --- (15.7 kW/(sq m))

 Distance adjusted by 0.7 to account for crude vs petroleum = 25 feet
```

20-Inch Shell Crude Oil Pipeline
Leak - Flammable Vapor Cloud

Text Summary

ALOHA® 5.4.3

```
SITE DATA:
  Location: TRACY, CALIFORNIA
  Building Air Exchanges Per Hour: 0.63 (unsheltered single storied)
  Time: September 29, 2014  1744 hours PDT (using computer's clock)

CHEMICAL DATA:
  Chemical Name: N-HEXANE                 Molecular Weight: 86.18 g/mol
  AEGL-1 (60 min): N/A   AEGL-2 (60 min): 3300 ppm   AEGL-3 (60 min): 8600 ppm
  IDLH: 1100 ppm     LEL: 12000 ppm       UEL: 72000 ppm
  Ambient Boiling Point: 155.2° F
  Vapor Pressure at Ambient Temperature: 0.20 atm
  Ambient Saturation Concentration: 201,899 ppm or 20.2%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
  Wind: 3 meters/second from N at 3 meters
  Ground Roughness: urban or forest       Cloud Cover: 5 tenths
  Air Temperature: 77° F                  Stability Class: D
  No Inversion Height                     Relative Humidity: 50%

SOURCE STRENGTH:
  Evaporating Puddle (Note: chemical is flammable)
  Puddle Diameter: 13 feet                Average Puddle Depth: 3 inches
  Ground Type: Default soil               Ground Temperature: 77° F
  Initial Puddle Temperature: Air temperature
  Release Duration: ALOHA limited the duration to 1 hour
  Max Average Sustained Release Rate: 7.29 pounds/min
     (averaged over a minute or more)
  Total Amount Released: 335 pounds

THREAT ZONE:
  Threat Modeled: Flammable Area of Vapor Cloud
  Model Run: Gaussian
  Red    : less than 10 meters(10.9 yards) --- (12000 ppm = LEL)
  Note: Threat zone was not drawn because effects of near-field patchiness
     make dispersion predictions less reliable for short distances.
```

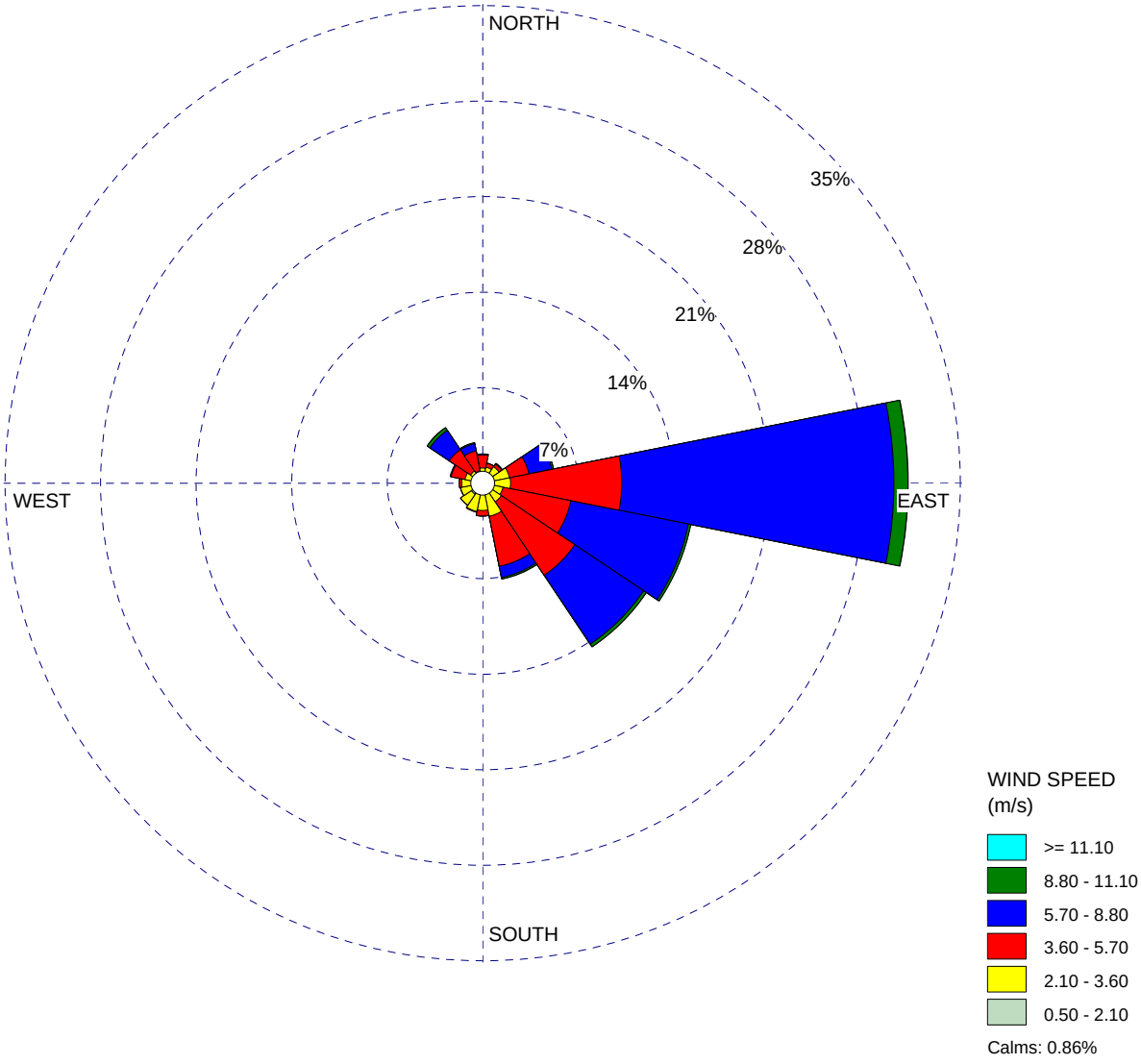
Distance adjusted by 0.7 to account for crude vs. petroleum = 23 feet

WIND ROSE PLOT:

Tracy Met Station

DISPLAY:

Wind Speed
Flow Vector (blowing to)



COMMENTS:	DATA PERIOD: **Start Date: 1/1/2004 - 00:00** **End Date: 12/31/2008 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **0.86%**	TOTAL COUNT: **43848 hrs.**	
	AVG. WIND SPEED: **4.84 m/s**	DATE: **10/1/2014**	PROJECT NO.:

Earthquake Probable Peak Ground Acceleration

PSH Deaggregation on NEHRP BC rock
Tracy_Hills_Spe 121.476º W, 37.684 N.

Peak Horiz. Ground Accel.>=0.3414 g

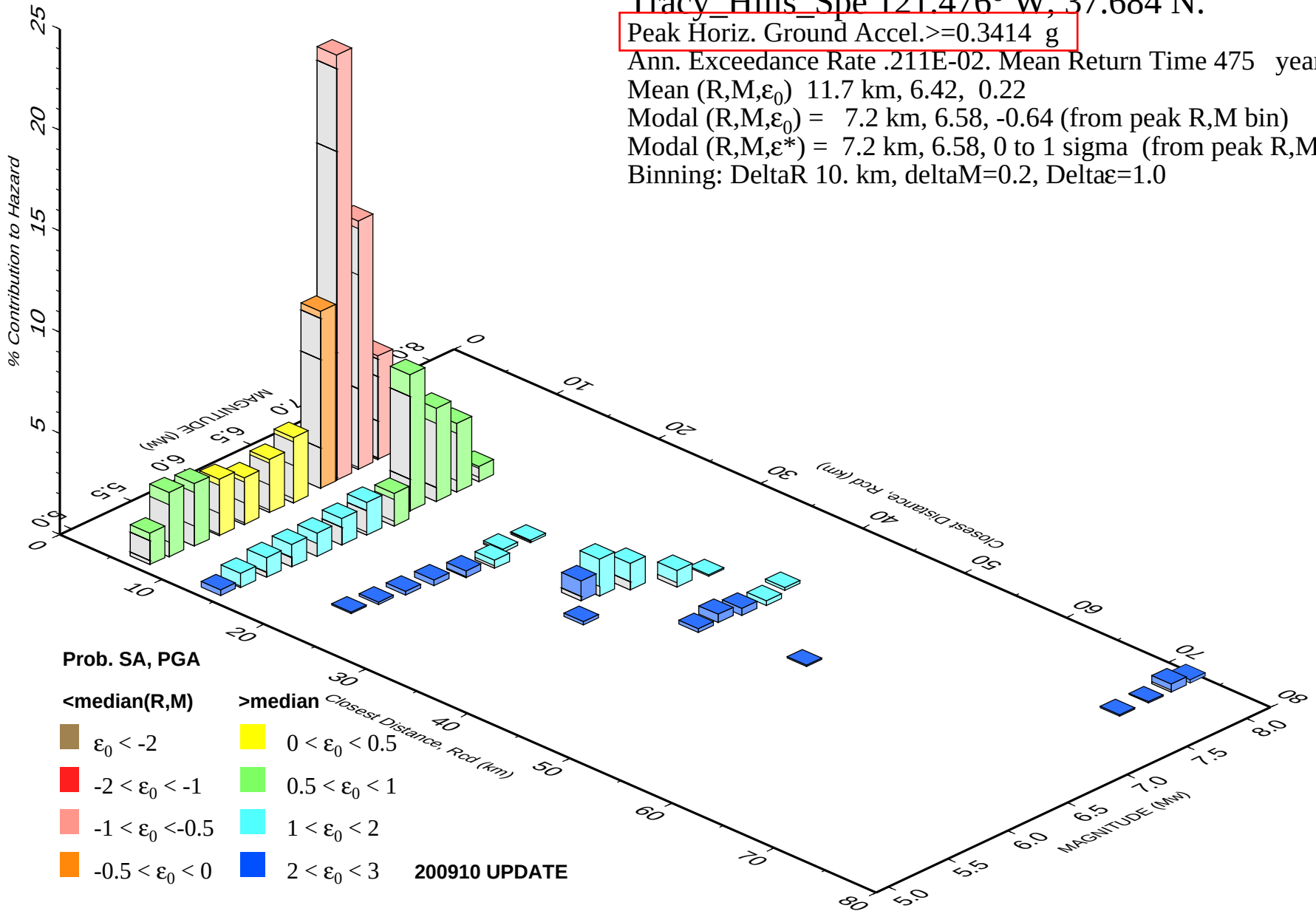
Ann. Exceedance Rate .211E-02. Mean Return Time 475 years

Mean (R,M,ε_0) 11.7 km, 6.42, 0.22

Modal (R,M,ε_0) = 7.2 km, 6.58, -0.64 (from peak R,M bin)

Modal (R,M,ε*) = 7.2 km, 6.58, 0 to 1 sigma (from peak R,M,ε bin)

Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0



Appendix B. Agency Correspondence

From:	Gilbert, Wayne A
To:	Steve Bush
Cc:	Gas Ops Support; Cathy Fitzgerald
Subject:	RE: follow up - Tracy Hills Specifc Plan
Date:	Wednesday, October 01, 2014 2:42:57 PM
Attachments:	image001.png image002.png image003.png image004.png image005.png

Steve, I can confirm the operating pressures and easement width are correct as you have referred to them.

Wayne

From: Steve Bush [mailto:sbush@placeworks.com]
Sent: Wednesday, October 01, 2014 2:33 PM
To: Gilbert, Wayne A
Cc: Gas Ops Support; Cathy Fitzgerald
Subject: RE: follow up - Tracy Hills Specifc Plan

Good Afternoon Wayne,
We are hoping to verify that the information we already have for Line 401 and 002 can be used for our evaluation of the pipelines near the Tracy Hills Specific Plan area. A map showing the pipelines within the easement would suffice. Whether an as-built, or a GIS based map with pipeline easement width specified. As-builts make it easier to determine the exact easement locations, to which we will recommend setback distances for development.

Can you help verify that the pipeline operating pressures are appropriate?

Line 401 – 1040 psig
Line 002 – 890 pgig
Easement width – 50ft

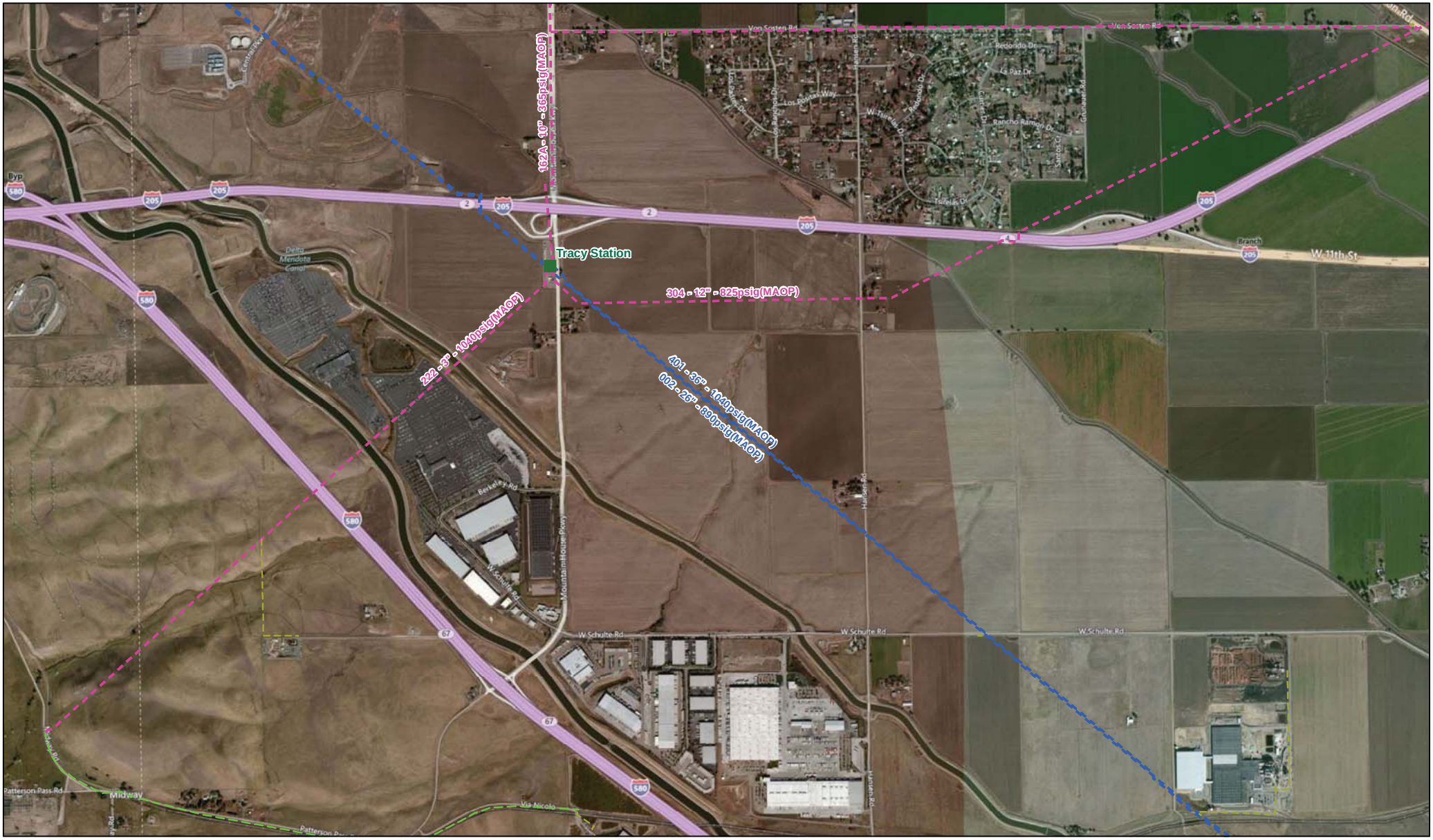
Thank you,

STEVE BUSH, EIT
Project Scientist

PLACEWORKS

1625 Shattuck Avenue, Suite 300 | Berkeley, California 94709
510.848.3815 | sbush@placeworks.com | placeworks.com

The Planning Center|DC&E is now PlaceWorks. Please update your records.



02/20/2013
PG&E Critical Infrastructure Information
Must Be Held In Confidence
Facilities to be Operated by PG&E Personnel Only
Call 811 Before You Dig

Cordes Ranch, Tracy, CA

Gas Transmission
Engineering & Operations
Geographic Information Services

1 inch = 1,500 feet (approx.)

0 — 1
Miles

N

Cathy Fitzgerald

From: Steve Bush
Sent: Thursday, September 18, 2014 3:16 PM
To: Cathy Fitzgerald
Subject: FW: Information Request - Tracy Hills Specific Plan
Attachments: RE: Tracy Hills Development

Information from Chevron.

From: Gross, Jeremy [Coates Field Service] [mailto:JGross@chevron.com]
Sent: Thursday, September 18, 2014 3:12 PM
To: Steve Bush
Subject: RE: Information Request - Tracy Hills Specific Plan

Hello Steve,

I have had several responses from multiple agencies regarding this development. Per your request I am forwarding you copies of the information already provided. Please see attached. Let me know if you have any further questions regarding Chevron's KLM pipeline.

Thanks,

Jeremy

Jeremy Gross
Conflict Inquiry Representative Contractor

Coates Field Service, Inc.
Contractor for Chevron Pipe Line Company
2360 Buchanan Rd.
Pittsburg, CA 94565
Tel: 925-753-2003
Fax: 925-753-2030
JGross@chevron.com

From: Steve Bush [mailto:sbush@placeworks.com]
Sent: Wednesday, September 17, 2014 2:25 PM
To: Gross, Jeremy [Coates Field Service]
Cc: Gross, Jeremy [Coates Field Service]
Subject: Information Request - Tracy Hills Specific Plan

Good Afternoon Jeremy,
Per our conversation this morning, attached is a formal request letter and land use map for the Tracy Hills Specific Plan. PlaceWorks is working with the The Tracy Hills Project Owner to evaluate hazardous material pipelines and recommend setback distances for development within the Plan area. Within the last month, a request for information *may* have been generated by a previous consultant for the Tracy Hills Project Owner (Willbros Group, Inc.). If that request was indeed received by Chevron, we would like to request a copy of the response as to not duplicate efforts.

As stated in the attached request letter, the online National Pipeline Mapping System identifies a Chevron pipeline bisecting the northeastern portion of the Specific Plan area. A 2013 Pipeline Safety Hazard Assessment for the nearby Cordes Ranch Specific Plan (just northwest of the Tracy Hills Plan area) evaluated a portion of this same pipeline. The information provided by Chevron for the pipeline is as follows:

Pipeline diameter: 18-inch
Classification or Status: active crude oil line (KLM)
Year of construction: 1945
Maximum available operating pressure: 920 psig (reported by State Fire Marshal's Office)
Capacity: 85,000 barrels per day

For the current Project, this letter requests verification that the above information for the Chevron pipeline is appropriate for the portion of the pipeline within the Tracy Hills Specific Plan area. Additionally, the following information is requested:

Pipeline location map,
Pipeline condition(s) and frequency of inspection,
Approximate depth of cover,
Distance to and location of nearest upstream and downstream shutoff valves, and
If available, "As-Built" drawings.

In the absence flow rate or operating pressure data, we assume that pipeline operating pressures are 80 percent of their maximum allowable operating pressure. The requested data will be used to assess consequence severity related to potential pipeline leaks or ruptures. Thank you for your assistance and please forward this information to my attention at the below address or via email, sbush@placeworks.com.

Regards,

STEVE BUSH, EIT
Project Scientist

PLACEWORKS

1625 Shattuck Avenue, Suite 300 | Berkeley, California 94709
510.848.3815 | sbush@placeworks.com | placeworks.com

The Planning Center|DC&E is now PlaceWorks. Please update your records.

Cathy Fitzgerald

From: Gross, Jeremy [Coates Field Service] <JGross@chevron.com>
Sent: Wednesday, August 13, 2014 3:31 PM
To: Schrunk, Rex
Subject: RE: Tracy Hills Development
Attachments: Tracy hills Specific Plan Project.pdf

Rex,

I'm attaching a letter I sent to Mr. Dean with the City of Tracy regarding the project and Chevron's requirements while working around the pipeline. Below I have answered the questions that I am able to answer for you. I have put in a request to get you more information, but until I get the green light this will have to do for now.

Information on the pipe within this property, including the following:

a. Line Name - KLM
b. OD- 18 inches
c. Wall thickness- Company Confidential
d. Grade- Company Confidential
e. Manufacturer- Company Confidential
f. Longitudinal Seam type- Company Confidential
g. Year of install- 1946
h. Depth of cover- typically buried 36-48 inches. Actual depth can only be determined by potholing
i. Product being transported by each pipeline- Crude oil
j. MAOP or MOP depending on whether the line is liquid or gas- Company Confidential
k. Date of last integrity assessment- Company Confidential
l. Type of last integrity assessment- Company Confidential
m. Results of last integrity assessment- Company Confidential
n. Leak detection capability on these lines- Company Confidential
o. Leak history on these lines- See below
p. Cathodic Protection history and current operation- Company Confidential
q. IMP and O&M procedures for these pipelines- Company Confidential

Additional information that may be useful for your study:

With regard to operating pressures, cathodic protection, inspection frequency and public information programs, and location of shutoff valves please be advised that Chevron Pipe Line Company's pipelines are governed by the Office of Pipeline Safety (OPS), which is part of the Research and Special Programs Administration, U.S. Department of Transportation (DOT) which regulates natural gas and hazardous liquid pipelines (interstate/ intrastate). In California, the California State Fire Marshal office (CSFM) is a division of the Department of Forestry which has been certified by the OPS to carry out the duties under 49 CFR 195 et seq. (hazardous liquid pipeline safety laws). The OPS regulates the interstate natural gas pipelines in California under 49 CFR 192 et seq. (natural gas pipeline safety laws).

Reportable incidents are available through the National Response Center Website. The URL for this site is http://www.nrc.uscg.mil/nrchp.html

Please note that it is the Law to notify Underground Service Alert (USA) at 800-227-2600 **at least** 48 hours prior to any excavation work.

COATES FIELD SERVICE, INC.
3021 CITRUS CIRCLE, SUITE 160
WALNUT CREEK, CALIFORNIA 94598

TEL. 925-935-5101 FAX. 925 935-8367

Please reply to:
Jeremy L. Gross
Contract Conflict Inquiry Representative
Chevron Pipe Line Company
2360 Buchanan Rd.
Pittsburg, CA 94565
TEL (925) 753-2003 FAX (925) 753-2030
jgpf@chevron.com

April 23, 2014

City of Tracy
Development Services Department
333 Civic Center Plaza
Tracy, CA 95376
Attn: Bill Dean, Assistant Director

PROPOSED TRACY HILLS SPECIFIC PLAN PROJECT

Dear Mr. Dean:

Thank you for giving us the opportunity to answer your questions. We would like to give you a little background on our pipelines and some of the safety requirements we require before allowing any work near our pipelines.

Chevron received your Notice of Preparation and Environmental Impact Report for the proposed "Tracy Hills Specific Plan" Project.

Chevron operates one (1) active pipeline in the vicinity of the project. This 18-inch buried pipeline appears to be within the "M1 Light Industrial" portion of the project . This high pressure pipeline transports crude oil. Extreme caution should be used when excavating, drilling, or grading around this pipeline.

You are being sent an aerial image delineating the approximate location of Chevron Pipe Line Company's KLM pipeline. Chevron assumes no responsibility for the accuracy of these drawings and they should be used only for the general location of our facilities. Actual depths and alignment can only be determined by field checking and potholing the pipeline. Chevron will provide a Facility Inspector to mark and help locate our pipeline. Your company would be responsible to provide a backhoe and operator and a surveyor if needed.

We consider your request as very preliminary fact finding. Chevron will require several weeks of lead time to provide any detailed information regarding facilities and right-of-way information. A request for more specific information should be requested through Jeremy Gross (Contract Conflict Inquiry Specialist) at (925) 753-2003, mailing address 2360 Buchanan Rd., Pittsburg, Ca. 94565.

Our pipelines are operated and maintained under Federal Regulations (D.O.T. 195) and State Regulations (California Pipeline Safety Act).

Chevron, Federal, and State regulations require 12-inches (minimum) clearance between petroleum pipeline and other cross-lines that intersect at a 90° angle (perpendicular to each other).
If the intersection angle is less than 90°, the minimum clearance between the two pipelines must be 24-inches or greater.

Chevron recommends that the potholing of the Chevron pipeline be done before construction plans are completed so conflicts between your proposed road reconstruction project and our pipeline can be avoided. Chevron requires that arrangements for potholing of its pipelines be made at least forty-eight (48) hours in advance with Jeremy Gross at (925) 753-2003. Chevron will provide a Facility Inspector to locate the pipelines and assist with the potholing.

Regarding restrictions on development over our pipelines, most of our easements do not restrict paving or landscaping as long as encroachment clearances are maintained. That is, no less than 24-inches of undisturbed clearance between the top of pipe and bottom of the subgrade for paving and grass or shallow rooted plants on the easements. Deep-rooted trees and all structures are prohibited. All excavations within 24-inches of Chevron's facilities must be done by hand tools only. I would also like to add that the use of heavy vibratory equipment is prohibited over our pipelines.

Chevron must review and approve all construction plans that involve right of way encroachments. All work that would affect our pipeline needs to be coordinated with our office at 2360 Buchanan Rd., Pittsburg, Ca. 94565.

Notify Underground Service Alert (USA) at 800-227-2600 at least 48 hours prior to any excavation work. If you have any questions or need additional information, please contact me at (925) 753-2003. Thank you for the advance notice on this project, we look forward to working with you.

Respectfully,

Jeremy Gross
Contract Conflict Inquiry Specialist
For Chevron Pipe Line Company

File: Tracy Hills Specific Plan Project.docx


Chevron
C-Map version 1.005
Chevron Pipe Line
Zoom: 1:17,961
Hybrid
Pan
Prev
Full
146
145
Tracy Municipal Airport
S Tracy Blvd
S Corral Hollow Rd
J2
0.3 Miles (0.48 Km)
©2013 Chevron Corp. All Rights Reserved & Confidential
Long = -121.451604, Lat = 37.683921 (WGS84)

Cathy Fitzgerald

From: Nichols, Frank: <Frank.L.Nichols@p66.com>
Sent: Tuesday, April 16, 2013 11:22 AM
To: John Zellmer
Cc: Lee, Ben K; Willey, Kenneth
Subject: PRW36209_Tracy Hills info for school risk assessment...Thats it for now..
Attachments: Pipeline information as of 3-10-13.pdf

John

I spoke with Ben Lee and Ken Willey. As you know, Phillips 66 Pipeline LLC (PPL) operates and maintains the 16-inch pipeline (Line 200) that lies across the proposed Tracy Hills Project. Below is the information requested in the attached table about Line 200:

Maximum operating pressure - 1130 psi

Flow rate - 4,000 bph - 4,200 bph (barrels per hour)

Historic pipeline releases - There are no known pipeline releases within the past 15 years.

Repair History - There are no known repairs on Line 200 within the proposed Tracy Hills development except for the installation of cathodic test leads and marker plates.

Other PPL activities to monitor, inspect, and maintain the safety and integrity of Line 200:

PPL has marked the route of Line 200 across the proposed Tracy Hills Project development.

Air patrol flies the pipeline 200 route twice a week to monitor surface activity near Line 200.

PPL is a member of Underground Service Alert (USA). PPL marks its pipelines prior to third-parties excavating near its facilities when it receives a USA notification..

PPL sends inspection tools through Line 200 every five years to detect anomalies in the pipeline wall and prepares a program to maintain the pipeline based on the report the tool generates.

A Pipeline Monitoring system constantly measures pipeline pressures and flow rates.

The California State Fire Marshal audits our pipeline records to confirm that PPL complies with the DOT standards.

PPL has an approved spill response plan that covers our emergency notifications and management of a pipeline release. PPL personnel are trained in the Incident Command Structure to team with local agencies to manage the response. PPL can mobilize and deploy a Incident Management Assist Team to aid in the response.

Property owners have been made aware of the presence of a pipeline on their property through our public awareness program. PPL reaches out to law enforcement agencies, fire departments, and other agencies that protect the public.

PPL reviews utility notices from private developers and public agencies to determine if proposed improvements will impact the operation and/or maintenance of Line 200.

Frank Nichols
PTRRC Western Region
Aut viam inveniam aut faciam.

-----Original Message-----
From: John Zellmer [mailto:jzellmer@rja-gps.com]
Sent: Tuesday, March 19, 2013 2:39 PM
To: Nichols, Frank:
Subject: [EXTERNAL]FW: Tracy Hills info for school risk assessment...Thats it for now..

Frank

Thanks again for the good mtg yesterday. As a reminder, here is the Table I needed your help completing. Just those 3 lines with missing Conoco info. You can complete by hand and pdf back.

Thanks!

Ruggeri~Jensen~Azar
ENGINEERS - PLANNERS - SURVEYORS

John S. Zellmer, PE, LEED AP
Principal

2541 Warren Drive, Suite 100
Rocklin, CA 95677
(916) 630-8900 (O)
(916) 630-8909 (F)
www.rja-gps.com

Cathy Fitzgerald

From: Lee, Ben K <Ben.K.Lee@p66.com>
Sent: Tuesday, April 16, 2013 3:01 PM
To: John Zellmer
Cc: Nichols, Frank:
Subject: FW: Shell Pipeline Crude Oil Line, I-580/Coral Hollow Rd. RA
Attachments: 200_093.pdf; NC20_NC21_LINE_200.pdf; 200_100.pdf

John,

The pipeline material specifications are in the attached alignment maps (look under pipe specifications) that were previously emailed to you. The pipe was installed in 1957.

Ben Lee, M.Eng
Division Engineer - West Coast Division Pipelines Phillips 66 Pipeline LLC
3900 Kilroy Airport Way, Suite #210
Long Beach, CA 90806
Office - 562-290-1505
Mobile - 562-248-8051
Fax - 562-290-1580
Efax - 918-977-9332
Email - ben.k.lee@p66.com

-----Original Message-----
From: Nichols, Frank:
Sent: Monday, April 15, 2013 4:19 PM
To: John S. Zellmer (jzellmer@rja-gps.com)
Cc: Lee, Ben K; Willey, Kenneth
Subject: FW: Shell Pipeline Crude Oil Line, I-580/Coral Hollow Rd. RA

John

I spoke with Ben Lee and Ken Willey. Here is the information requested in your three questions:

1. P66 transports Elk Hills crude oil, gas oil, and pressure distillate, and heavy distillate (pressure distillate blended with San Joaquin Heavy crude oil) on this pipeline.

2. The direction of flow is northwest from the proposed Tracy Hills development to the Phillips 66 Company SFAR facility in Rodeo, CA.

3. The nearest upstream and downstream valves are shown in the attached drawings (16" manual block valve C-21 on sheet 93 - located upstream of Tracy Hills, and 16" motor operated block valve on sheet 100 - located downstream of Tracy Hills). The key map shows the location of all the block valves for Line 200. The pipeline system can be shut off immediately from the Bartlesville control center in the event there is a release on the pipeline. Response time to manually close the valves, and isolate the release, can range from 30 minutes to 2 hours depending on the location of Phillips 66 Pipeline LLC personnel at the time of the event.

Frank Nichols
PTRRC Western Region
Aut viam inveniam aut faciam.

-----Original Message-----
From: John Zellmer [mailto:jzellmer@rja-gps.com]
Sent: Thursday, March 21, 2013 5:26 PM
To: Kenneth Wilson; dave.felger@shell.com; Nichols, Frank:
Subject: [EXTERNAL]RE: Shell Pipeline Crude Oil Line, I-580/Coral Hollow Rd. RA

Frank/Dave

I need to confirm the following. Please reply ASAP.

1. Both the Shell and P66 carry what can be classified as "crude oil"

2. The direction of flow is northwest (ie not southeast)

3. The locations of the closest valves to our Site. Your respective plans show no valves within our project limits. The concerns are distance between valves and locations relative to the Site in order to be able to determine the gravity down-drain after shutdown if a full rupture were to occur. Also are they manual or automatic, and how after a rupture does it take to shut them off?

Thank you

Ruggeri~Jensen~Azar
ENGINEERS - PLANNERS - SURVEYORS

John S. Zellmer, PE, LEED AP
Principal

2541 Warren Drive, Suite 100
Rocklin, CA 95677
(916) 630-8900 (O)
(916) 630-8909 (F)
www.rja-gps.com

-----Original Message-----
From: Kenneth Wilson [mailto:wilsongeosciencesinc@gmail.com]
Sent: Tuesday, March 19, 2013 10:27 AM
To: John Zellmer; dave.felger@shell.com
Subject: Re: Shell Pipeline Crude Oil Line, I-580/Coral Hollow Rd. RA

The concerns are distance between valves and locations relative to the Site in order to be able to determine the gravity down-drain after shutdown if a full rupture were to occur. Also are they manual or automatic, and how long to expected shutdown?

Kenneth Wilson, Principal Geologist
Wilson Geosciences Inc.

NC-20 & NC-21
LINE 200 JUNCTION TO RODEO
KEY MAP

RODEO REFINERY
RECEIVER VALVE
BLOCK VALVE C31
BLOCK VALVE C30
CHECK VALVE
BLOCK VALVE C29
BLOCK VALVE C28
BLOCK VALVE C27
CHECK VALVE
BLOCK VALVE C26
BLOCK VALVE C25
BLOCK VALVE C24
BLOCK VALVE C23
BYRON PUMP STATION
CHECK VALVE
BLOCK VALVE C22A
BLOCK VALVE C22
BLOCK VALVE C21
BLOCK VALVE C20
BLOCK VALVE
BLOCK VALVE C19
BLOCK VALVE C18
BLOCK VALVE C17
CHECK VALVE
BLOCK VALVE C16A
BLOCK VALVE C16
PATTERSON PUMP STATION
BLOCK VALVE C15
BLOCK VALVE C14
BLOCK VALVE C13
BLOCK VALVE C12
BLOCK VALVE C11C
CHECK VALVE
PANOCHE PUMP STATION
BLOCK VALVE C11B
BLOCK VALVE C11A
BLOCK VALVE C11
BLOCK VALVE C10
BLOCK VALVE C9
BLOCK VALVE C8
BLOCK VALVE C7
BLOCK VALVE C6
BLOCK VALVE C5
BLOCK VALVE
BLOCK VALVE
COALINGA PUMP STATION
BLOCK VALVE C33
BLOCK VALVE
BLOCK VALVE C52
BLOCK VALVE C4
BLOCK VALVE
BLOCK VALVE
BLOCK VALVE C3
BLOCK VALVE
TAR CANYON PUMP STATION
BLOCK VALVE C2
BLOCK VALVE C1
JUNCTION PUMP STATION
BLOCK VALVE C32
BLOCK VALVE C41

PACIFIC OCEAN

CONTRA COSTA
ALAMEDA
SAN JOAQUIN
STANISLAUS
SANTA CLARA
MERCED
MADERA
SAN BENITO
MONTEREY
FRESNO
KINGS
TULARE
SAN LUIS OBISPO
KERN
CALIFORNIA
NEVADA
LYON
NYE
MINERAL
TUOLUMNE
MONO
MARIPOSA
ESMERALDA
INYO

N

LEGEND

- BLOCK VALVE
- CHECK VALVE
- PUMP STATION, TERMINAL, OR REFINERY
- PIPELINE

ISSUE	DATE	SOURCE-DESCRIPTION	BY	CKD	APPD
5	10/02/09	REMADE FRAMES FOR NORTH UP	BLG		
4	02/11/09	SHEETCUTTER ISSUE	BLG		
3	05/03/07	BV & PMP STN EDITS	BLG		
2	04/05/07	BV & PMP STN EDITS	BLG		
1	4/25/05	ADDITIONS/CORRECTIONS	BLG		
A	1/25/05	GENERAL ISSUE	SLA		

CONOCOPHILLIPS PIPE LINE CO.
WESTERN REGION – NORTHERN CALIFORNIA DISTRICT

LINE 200
JUNCTION TO RODEO REFINERY
SCALE: N.T.S. (ALBERS-US48)
NAME: 200.DWG NO.
DIR: DWR.

PIPELINE STATIONING

8999+96 MAGNET V-85
8999+82 MARKER PLATE | 8999+82
8999+66 AGR | AGM - CPTS 1-9-40
8969+46 MARKER PLATE | 8969+46
8969+11 CL BURIED PWR LINE
8968+99 AERIAL MARKER J
8968+95 CL CORRAL HOLLOW ROAD
8964+62 CL ROAD
8964+62 SECTION LINE 18
8964+62 2593.42' S NE SC 18
8950+11 CL CREEK
8942+79 MARKER PLATE | 8942+79
8942+79 AGR | 8942+79
8939+85 CL RR TRACK
8931+02 CL ROAD
8931+02 SECTION LINE 17
8931+02 2656.20' E SW SC 17
8908+59 CL ROAD
8901+65 MAGNET V-83
8900+21 CL CALIFORNIA AQUEDUCT
8898+18 CL ROAD

ANC: 9002+33 — NC-21-50 - Patterson to Bryon — 8896+54

PLS: T3S R5E Sec 18 | T3S R5E Sec 17 | T3S R5E Sec 20

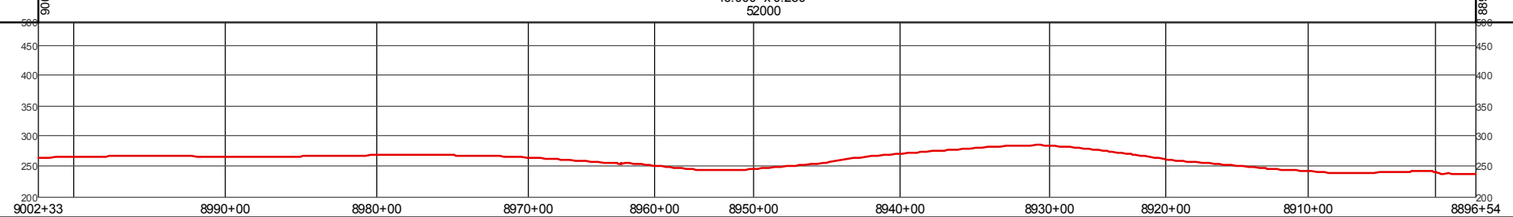
PLAN VIEW

PIPE DETAIL

8999+79 TEST LEAD
8969+34 TEST LEAD
8969+20 END CASING
8968+80 BEGIN 20" CASING
8968+65 TEST LEAD
8968+64 END CASING
8968+28 BEGIN 0" CASING
8964+86 END CASING
8964+46 TEST LEAD
8964+40 CL RECTIFIER UNIT N-250
8964+38 BEGIN 20" CASING
8964+26 16" BLOCK C-21 MANUAL VALVE
8964+03 TEST LEAD
8964+00 TEST LEAD
8931+02 TEST LEAD
8922+81 0" BLOCK MANUAL VALVE
8922+81 16" BLOCK C-20 MANUAL VALVE
8919+60 TEST LEAD
8918+64 CL TAP
8918+60 STOPPLE UPSTREAM OF MLV #20
8908+93 CL 16" X 16" TEE
8908+91 BEGIN 2.7' SLEEVE
8908+90 CL TAP
8908+82 BEGIN 4' SLEEVE
8908+48 BEGIN 6.5' SLEEVE
8902+51 BEGIN 1.6' SLEEVE
8902+36 CL TAP
8902+33 BEGIN 2.9' SLEEVE
8902+16 BEGIN 3' SLEEVE
8901+22 END CASING
8901+14 TEST LEAD
8899+05 BEGIN 0" CASING
8898+18 CL 16" X 16" TEE
8898+16 BEGIN 2.7' SLEEVE
8898+15 CL TAP
8898+13 CL TAP
8898+12 BEGIN 0.8' SLEEVE

9002+33 — 16.000" x 0.250" 52000 — 8896+54

PROFILE



PIPE SPECIFICATIONS

PIPE DETAIL

8896+54	9002+33 16.000" x 0.250" API-5LX 52000

CASING DETAIL

8899+05	8901+22 0.00" CANAL CASING
8964+38	8964+86 20.00" ROAD CASING
8968+28	8968+64 0.00" ROAD CASING
8968+80	8969+20 20.00" ROAD CASING

TEST PRESSURE

8896+54	9002+33 1428 (9/1/1991)

COATING DETAIL

8896+54	8902+02 OTHER
8902+02	8902+33 POLYGUARD
8902+33	8902+49 OTHER
8902+49	8902+63 TAPE
8902+63	8905+31 OTHER
8905+31	8905+43 TAPE
8905+43	8908+49 OTHER
8908+49	8908+89 TAPE
8908+89	9002+33 OTHER

Legend

- Focus Pipe Line
- Reference Pipe Line
- AIP or Sold Pipe Lines
- Township/Range Line
- Section/Abstract Line
- County Line
- State Line
- Sheet Note
- Waterway
- Road or Highway
- Railroad
- Fence
- Telephone Line
- OH Power Line
- Buried Power Line
- Television Cable / Fiber Optic Cable
- Water Line
- Pipeline
- Sewer Line, Field Tile
- Property Line
- Casing
- River Weight
- 1000' Station Increment
- Station Equation
- Test Lead
- AGM / AGR
- Bypass Valve
- Block Valve (MOV, Manual)
- Blowoff or Relief Valve
- Check Valve
- Sleeve
- Reducer
- Pig Signal
- Cathodic Protection System
- Meter
- Regulator Setting
- Tap, Tee, Branch Connect
- Aerial Marker
- Launcher, Receiver, or Scraper Trap
- Vent

Phillips 66 Pipeline LLC

ENGINEERING ALIGNMENT SHEET

JUNCTION TO RODEO REFINERY

WEST COAST DIVISION

SCALE: 0 500 1,000 2,000 Feet

GENERATION DATE	DRAWING NAME	MAP NUMBER
04/15/13	200	093 of 125

P66_cpConoco.mxt

PIPELINE STATIONING

9082+50 CL .75 IN BURIED WATER LINE
9078+05 MARKER PLATE | 9078+05
9078+02 SECTION LINE 1
9078+02 2311.35' W SE SC 1
9053+97 MARKER PLATE | 9053+97
9053+83 AGR | AGM - CPTS 1-9-41
9053+76 MAGNET V-86
9050+56 CL BURIED TELE LINE
9050+51 CL CREEK
9050+24 2485.51' N SW SC 7
9050+24 T3S R4E
9050+24 SECTION LINE 12
9022+02 MARKER PLATE | 9022+02
9018+30 CL CREEK
9005+26 CL BURIED TELE LINE
9004+95 3018.40' W SE SC 7
9004+95 SECTION LINE 7

ANC

9098+51 **NC-21-50 - Patterson to Bryon** 9002+33

PLS

T3S R4E Sec 1 | T3S R4E Sec 12 | T3S R5E Sec 7 | T3S R5E Sec 18

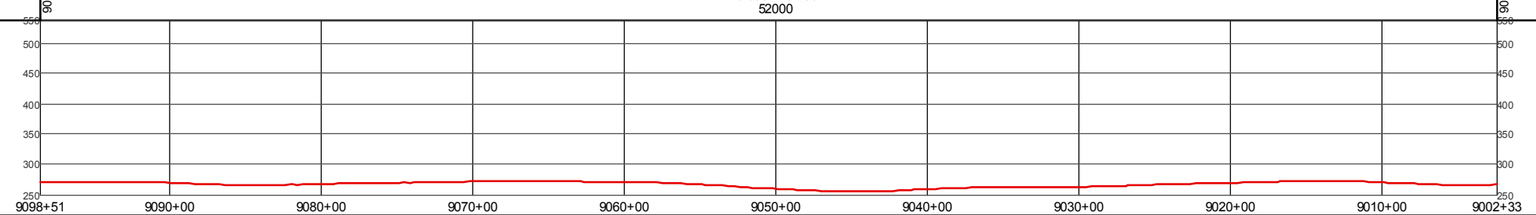
PLAN VIEW

PIPE DETAIL

9078+09 TEST LEAD
9054+05 TEST LEAD
9022+13 TEST LEAD

9098+51 — 16.000" x 0.250" 52000 — 9002+33

PROFILE



PIPE SPECIFICATIONS

PIPE DETAIL

9002+33	9098+51 16.000" x 0.250" API-5LX 52000

TEST PRESSURE

9002+33	9098+51 1428 (9/1/1991)

COATING DETAIL

9002+33	9098+51 OTHER

Legend

- Focus Pipe Line
- Reference Pipe Line
- AIP or Sold Pipe Lines
- Township/Range Line
- Section/Abstract Line
- County Line
- State Line
- Sheet Note
- Waterway
- Road or Highway
- Railroad
- Fence
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- OH Power Line
- Buried Power Line
- Television Cable / Fiber Optic Cable
- Water Line
- Pipeline
- Sewer Line, Field Tile
- Property Line
- Casing
- River Weight
- 1000' Station Increment
- Station Equation
- Test Lead
- AGM / AGR
- Bypass Valve
- Block Valve (MOV, Manual)
- Blowoff or Relief Valve
- Check Valve
- Sleeve
- Reducer
- Pig Signal
- Cathodic Protection System
- Meter
- Regulator Setting
- Tap, Tee, Branch Connect
- Aerial Marker
- Launcher, Receiver, or Scraper Trap
- Vent

Phillips 66 Pipeline LLC

ENGINEERING ALIGNMENT SHEET

JUNCTION TO RODEO REFINERY

WEST COAST DIVISION

SCALE: 0 500 1,000 2,000 Feet

GENERATION DATE	DRAWING NAME	MAP NUMBER
04/15/13	200	094 of 125

P66_cpConoco.mxt

OWNER

Refer to R/W DB

9196+00 — 9099+00

PIPELINE STATIONING

9190+84 MARKER PLATE
9190+84 TAP/TEE FEATURE
9177+51 T2S R4E
9177+51 29.58' W SE SC 34
9177+51 SECTION LINE 34
9177+42 AGM - CPTS 1-9-43
9176+90 MAGNET V-88
9176+81 CL ROAD
9176+70 SECTION LINE 3
9176+70 5258.62' N SE SC 3
9171+77 CL POLE LINE
9167+48 MARKER PLATE | 9167+48
9167+48 AGR | 9167+48
9146+42 CL RR TRACK
9145+43 AERIAL MARKER K
9142+91 MARKER PLATE | 9142+91
9133+74 CL CREEK
9133+66 CL ROAD
9113+79 SECTION LINE 2
9113+79 1882.92' N SE SC 2
9107+12 MAGNET V-87
9106+79 MARKER PLATE | 9106+79

ANC — 9196+00 — NC-21-50 - Patterson to Bryon — 9099+00

PLS

PLAN VIEW

PIPE DETAIL

9191+47 BEGIN 12' SLEEVE
9191+17 BEGIN 7.5' SLEEVE
9190+93 CL TAP
9190+84 CL TAP
9177+43 END CASING
9177+42 TEST LEAD
9177+36 TEST LEAD
9177+03 BEGIN 20" CASING
9167+47 TEST LEAD
9146+79 END CASING
9146+02 BEGIN 20" CASING
9142+93 TEST LEAD
9106+79 TEST LEAD

9196+00 — 16.000" x 0.250" 52000 — 9099+00

PROFILE

500
450
400
350
300
250
200
9196+00 9190+00 9180+00 9170+00 9160+00 9150+00 9140+00 9130+00 9120+00 9110+00 9099+00

PIPE SPECIFICATIONS

PIPE DETAIL

9099+00 — 9196+00 16.000" x 0.250" API-5LX 52000

CASING DETAIL

9146+02 — 9146+79 20.00" RAILROAD CASING
9177+03 — 9177+43 20.00" ROAD CASING

TEST PRESSURE

9099+00 — 9196+00 1428 (9/1/1991)

COATING DETAIL

9099+00 — 9190+82 OTHER
9190+82 — 9190+84 TAPE
9190+84 — 9191+17 OTHER
9191+17 — 9191+25 PRIMER
9191+25 — 9191+47 OTHER
9191+47 — 9191+59 PRIMER
9191+59 — 9196+00 OTHER

Legend

- Focus Pipe Line
- Reference Pipe Line
- AIP or Sold Pipe Lines
- Township/Range Line
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- County Line
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- Waterway
- Road or Highway
- Railroad
- Fence
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- Television Cable / Fiber Optic Cable
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- Blowoff or Relief Valve
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- Reducer
- Pig Signal
- Cathodic Protection System
- Meter
- Regulator Setting
- Tap, Tee, Branch Connect
- Aerial Marker
- Launcher, Receiver, or Scraper Trap
- Vent

ConocoPhillips Pipe Line Company

ENGINEERING ALIGNMENT SHEET

JUNCTION TO RODEO REFINERY
WSTR REGION - NCD DISTRICT

SCALE: 0 500 1,000 2,000 Feet

GENERATION DATE	DRAWING NAME	MAP NUMBER
10/02/09	200	095 of 123

PIPELINE STATIONING

9729+17 CL CREEK
9719+25 AGR | AGM - LM 177
9718+99 SECTION LINE 4
9718+21 AGR | 9718+21
9718+21 MARKER PLATE | 9718+21
9695+95 CL SUPPORT
9693+25 BYRON STATION
9689+89 AERIAL MARKER O
9686+31 CL ROAD
9680+87 CL BURIED PWR LINE
9679+74 CL BURIED PWR LINE
9667+92 CL STATE OF CALIFORNIA PRIVATE ROAD
9662+15 SECTION LINE 3
9657+69 BRIDGE
9657+69 CL CALIFORNIA AQUEDUCT
9656+13 ICS N-144 ANODE
9639+72 MAGNET V-97
9639+72 AGR | AGM - CPTS 1-9-64
9619+15 UNKN
9618+71 AGR | 9618+71
9618+71 MARKER PLATE | 9618+71

ANC: 9729+85 — NC-21-70 - Bryon to Rodeo — 9693+25 — NC-21-50 - Patterson to Bryon — 9614+23

PLS: T2S R3E Sec 4 | T2S R3E Sec 3 | T2S R3E Sec 2

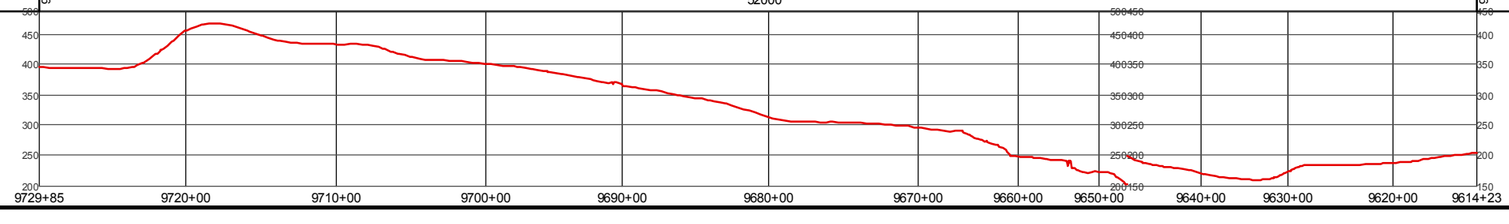
PLAN VIEW

PIPE DETAIL

9718+29 TEST LEAD
9711+15 BEGIN 2.8" SLEEVE
9711+09 BEGIN 2.5" SLEEVE
9711+05 BEGIN 2.7" SLEEVE
9698+62 BEGIN 3" SLEEVE
9696+08 CL TAP
9696+06 CL 16" X 16" TEE
9696+05 TEST LEAD
9696+04 CL FLANGE
9696+02 16" BLOCK C-23
9696+02 MANUAL VALVE
9696+01 CL FLANGE
9695+98 CL 16" X 16" TEE
9693+25 CL RECTIFIER UNIT N-246
9690+75 0" CHECK NA VALVE
9690+56 0" BLOCK MOV VALVE
9689+97 16" CHECK NA VALVE
9689+89 16" BLOCK C-22A
9689+89 MANUAL VALVE
9688+87 TEST LEAD
9688+87 TEST LEAD
9688+75 TEST LEAD
9688+75 16" BLOCK C-22
9688+75 MANUAL VALVE
9682+88 CL TAP
9669+78 BEGIN 5" SLEEVE
9665+19 BEGIN 4.5" SLEEVE
9664+10 CL TAP
9664+08 BEGIN 2.8" SLEEVE
9664+07 CL TAP
9658+59 TEST LEAD
9658+35 END CASING
9656+13 ICS N-144 ANODE
9655+93 BEGIN 0" CASING
9655+01 TEST LEAD
9655+50 CL RECTIFIER UNIT N-144
9652+47 CL TAP
9652+46 BEGIN 2.7" SLEEVE
9652+43 CL TAP
9639+90 TEST LEAD
9618+68 TEST LEAD

16.000" x 0.250"
52000

PROFILE



PIPE SPECIFICATIONS

PIPE DETAIL

9614+23	9729+85 16.000" x 0.250" API-5LX 52000

CASING DETAIL

9655+93	9658+35 0.00" CANAL CASING

TEST PRESSURE

9614+23	9729+85 1428 (9/1/1991)

COATING DETAIL

9614+23	9655+93 OTHER
9655+93	9656+35 POLYGUARD
9656+35	9665+20 OTHER
9665+20	9665+29 PRIMER
9665+29	9710+96 OTHER
9710+96	9711+19 TAPE
9711+19	9721+38 OTHER
9721+38	9721+62 FBG
9721+62	9729+85 OTHER

Legend

- Focus Pipe Line
- Reference Pipe Line
- AIP or Sold Pipe Lines
- Township/Range Line
- Section/Abstract Line
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- Road or Highway
- Railroad
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- Tap, Tee, Branch Connect
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- Vent

Phillips 66 Pipeline LLC

ENGINEERING ALIGNMENT SHEET

JUNCTION TO RODEO REFINERY

WEST COAST DIVISION

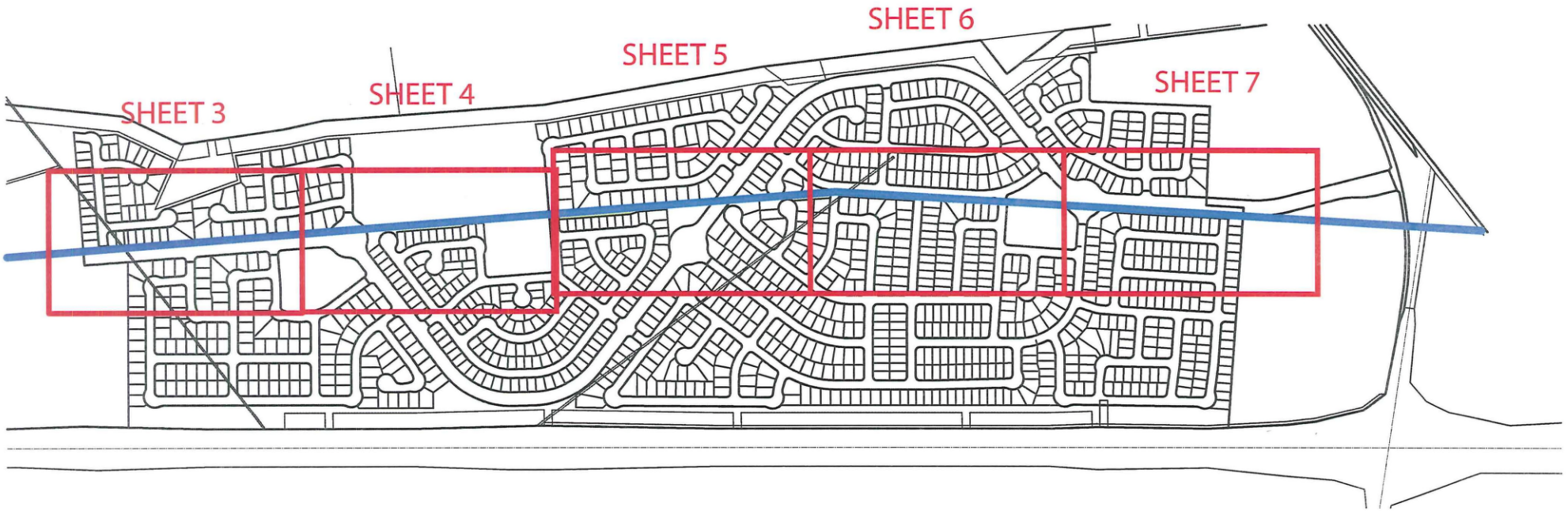
SCALE: 0 500 1,000 2,000 Feet

GENERATION DATE	DRAWING NAME	MAP NUMBER
04/15/13	200	100 of 125

P66_cpConoco.mxt

TRACY HILLS PROJECT
PHILLIPS 66 EASEMENT EXHIBIT

CITY OF TRACY, CALIFORNIA
AUGUST 2013



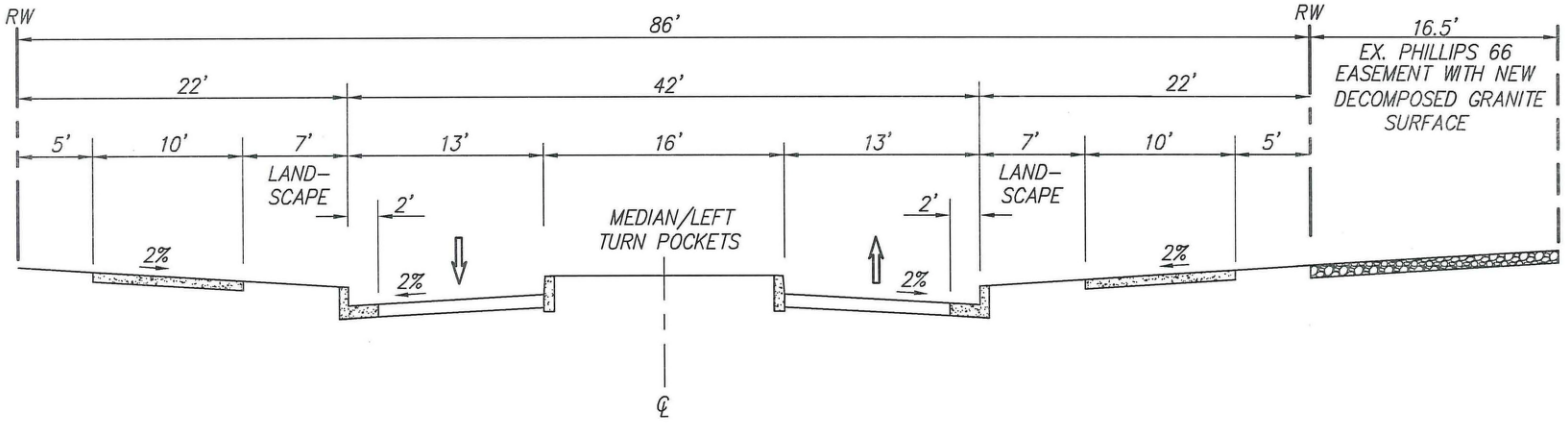
REVIEWED & ACCEPTED:

8/29/13

PHILLIPS 66 DATE

Benjamin K. Lee

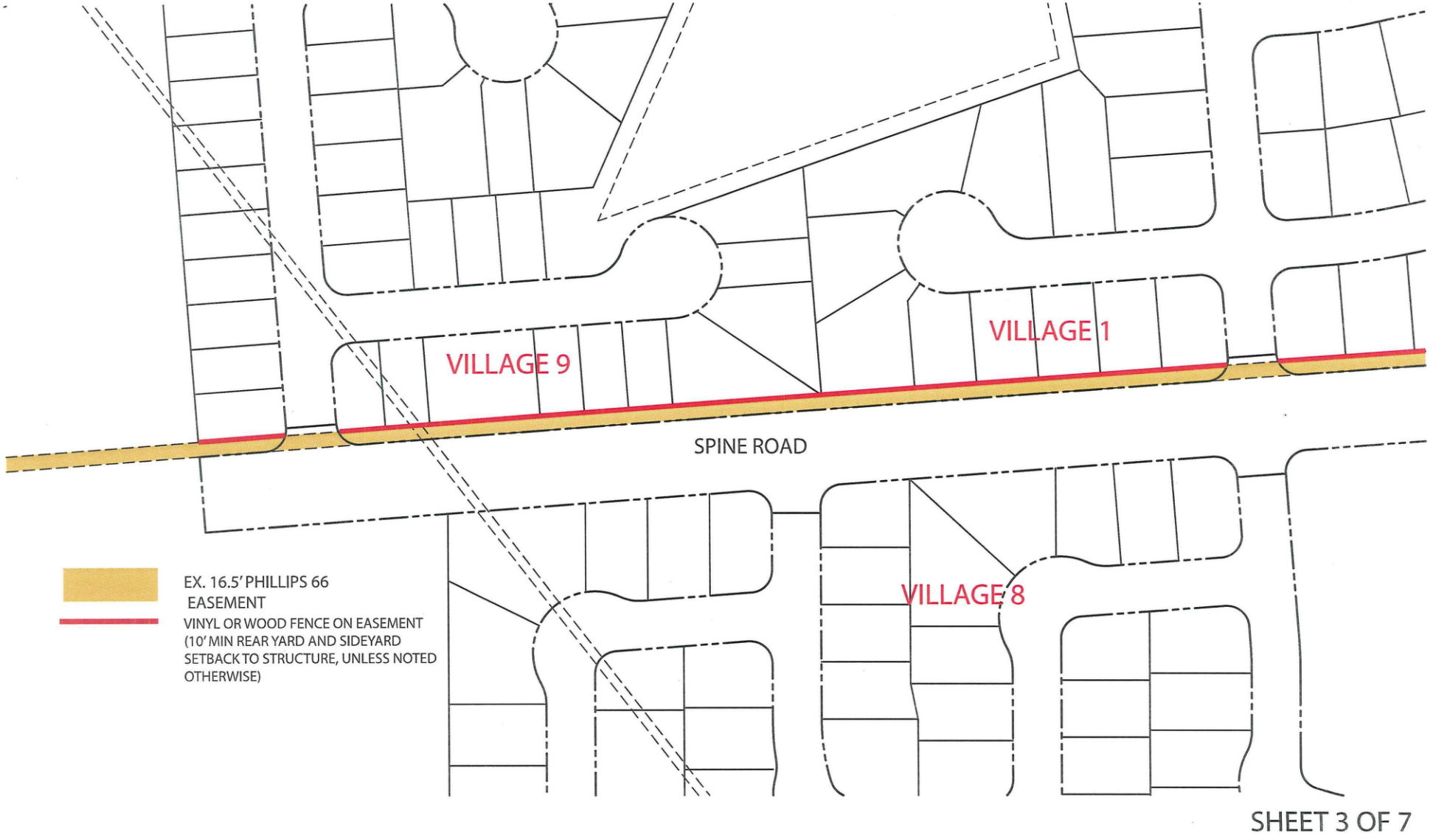
SHEET 1 OF 7

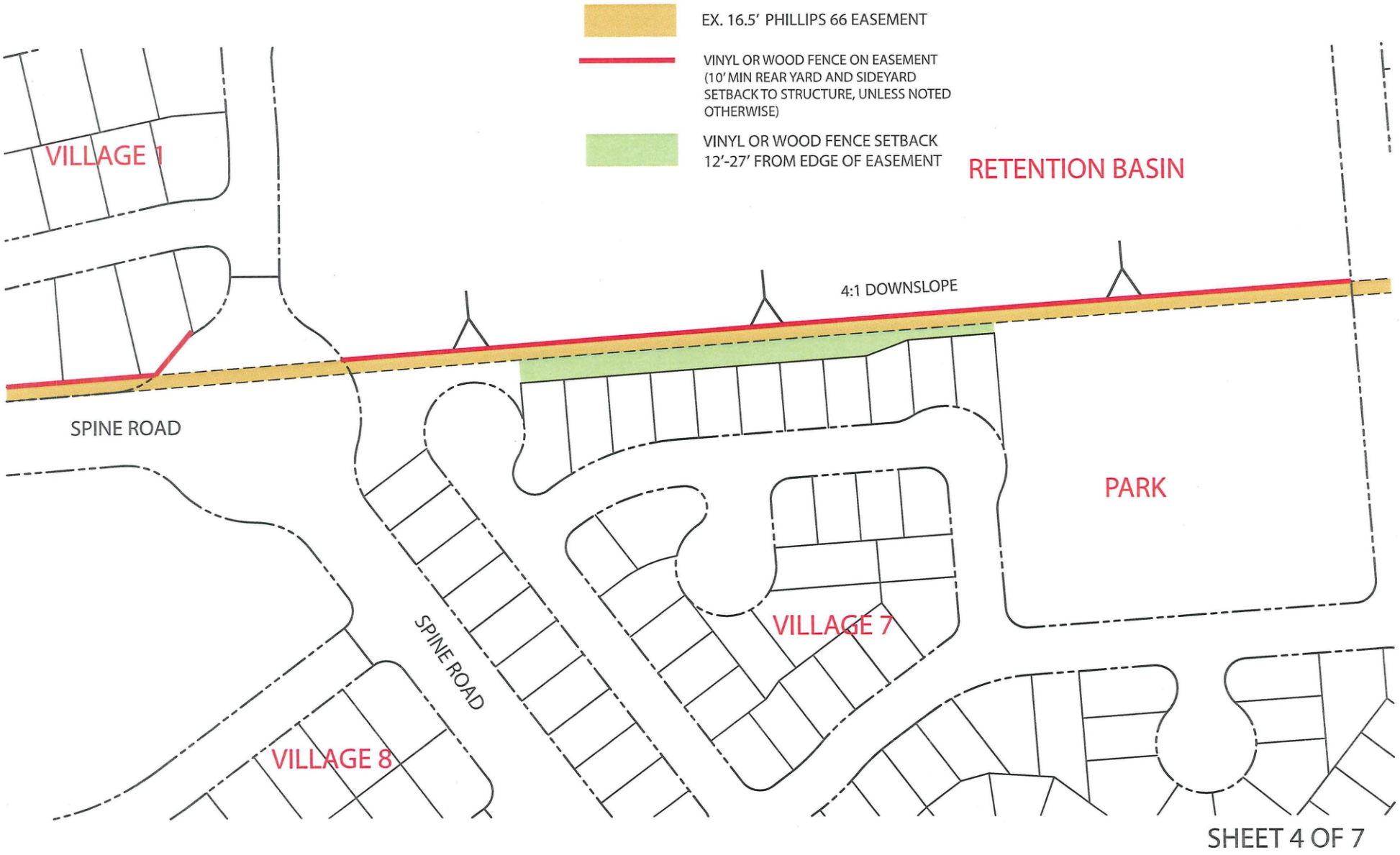


CROSS-SECTION

SPINE ROAD

NO SCALE


VILLAGE 9
VILLAGE 1
SPINE ROAD
VILLAGE 8
EX. 16.5' PHILLIPS 66
EASEMENT
VINYL OR WOOD FENCE ON EASEMENT
(10' MIN REAR YARD AND SIDEYARD
SETBACK TO STRUCTURE, UNLESS NOTED
OTHERWISE)


EX. 16.5' PHILLIPS 66 EASEMENT
VINYL OR WOOD FENCE ON EASEMENT (10' MIN REAR YARD AND SIDEYARD SETBACK TO STRUCTURE, UNLESS NOTED OTHERWISE)
VINYL OR WOOD FENCE SETBACK 12'-27' FROM EDGE OF EASEMENT
VILLAGE 1
RETENTION BASIN
4:1 DOWNSLOPE
SPINE ROAD
PARK
VILLAGE 7
SPINE ROAD
VILLAGE 8


VILLAGE 1
VILLAGE 2
VILLAGE 7
VILLAGE 6
SPINE ROAD
5' PL TO STRUCTURE
5' PL TO STRUCTURE
5' PL TO STRUCTURE
5' PL TO STRUCTURE
EX. 16.5' PHILLIPS 66 EASEMENT
VINYL OR WOOD FENCE ON EASEMENT (10' MIN REAR YARD AND SIDEYARD SETBACK TO STRUCTURE, UNLESS NOTED OTHERWISE)
VINYL OR WOOD FENCE SETBACK 12'-27' FROM EDGE OF EASEMENT


VILLAGE 2
SPINE ROAD
PARK
5' PL TO STRUCTURE
5' PL TO STRUCTURE
VILLAGE 6
VILLAGE 5
EX. 16.5' PHILLIPS 66 EASEMENT
VINYL OR WOOD FENCE ON EASEMENT (10' MIN REAR YARD AND SIDEYARD SETBACK TO STRUCTURE, UNLESS NOTED OTHERWISE)
VINYL OR WOOD FENCE SETBACK 12'-27' FROM EDGE OF EASEMENT


EX. 16.5' PHILLIPS 66 EASEMENT
VINYL OR WOOD FENCE ON EASEMENT (10' MIN REAR YARD AND SIDEYARD SETBACK TO STRUCTURE, UNLESS NOTED OTHERWISE)
VINYL OR WOOD FENCE SETBACK 12'-27' FROM EDGE OF EASEMENT
VILLAGE 3
SPINE ROAD
5' PL TO STRUCTURE
FUTURE COMMERCIAL PARCEL
VILLAGE 4

Shell Pipeline Company, LP
20945 S. Wilmington Avenue
Carson, CA 90810

September 23, 2014

Placeworks
Attn: Steve Bush
1625 Shattuck Avenue, Suite 300
Berkeley, CA 94709

Dear Steve Bush:

SUBJECT: Your Project: Tracy Hills Development Project
Shell's Pipeline: Coalinga to Avon 20/24
Shell's Inquiry Record No. 11722
Thomas Brothers Map Book Page 2 Grid 3A

Please refer to your correspondence dated 9/18/2014 concerning your subject project. Based on your submitted plans, Shell Pipeline Company LP (Shell) is unable to determine if our facilities are in conflict with your project. When detailed plans are available, please send to:

Shell Pipeline Company LP
Attn: Utility Coordinator
20945 S. Wilmington Ave.
Carson, CA 90810

Enclosed for your review and further use are drawings A-10200-01, A-10258, A-10259, A-1025, A-10260, A-10261, & A-10262 depicting the approximate location of Shell's facilities.

The Coalinga to Avon 20/24 is an active crude oil transportation conduit with a 20" Diameter, 0.250" wall thickness, APL 5L Grade X52 carbon steel pipeline installed in 1967 with a minimum depth of cover of 36 inches. This pipeline meets or exceeds the current State and Federal operating requirements for oil transporting pipelines.

The pipeline is in compliance with our Integrity Management Program and is currently on an annual internal inspection assessment using in-line tools approved by the State Fire Marshall. The last inspection was in July 2014.

The Maximum Operating Pressure is 926 psi. The flow rates and operating pressures are proprietary information and can't be given out at this time.

Please include the following statement on your construction drawings: "48 hours prior to commencement of construction activities, contact Domingo Nunez (209) 834-8789 to arrange for field markings of Shell's facilities. This notification is in addition to notification through Underground Service Alert."

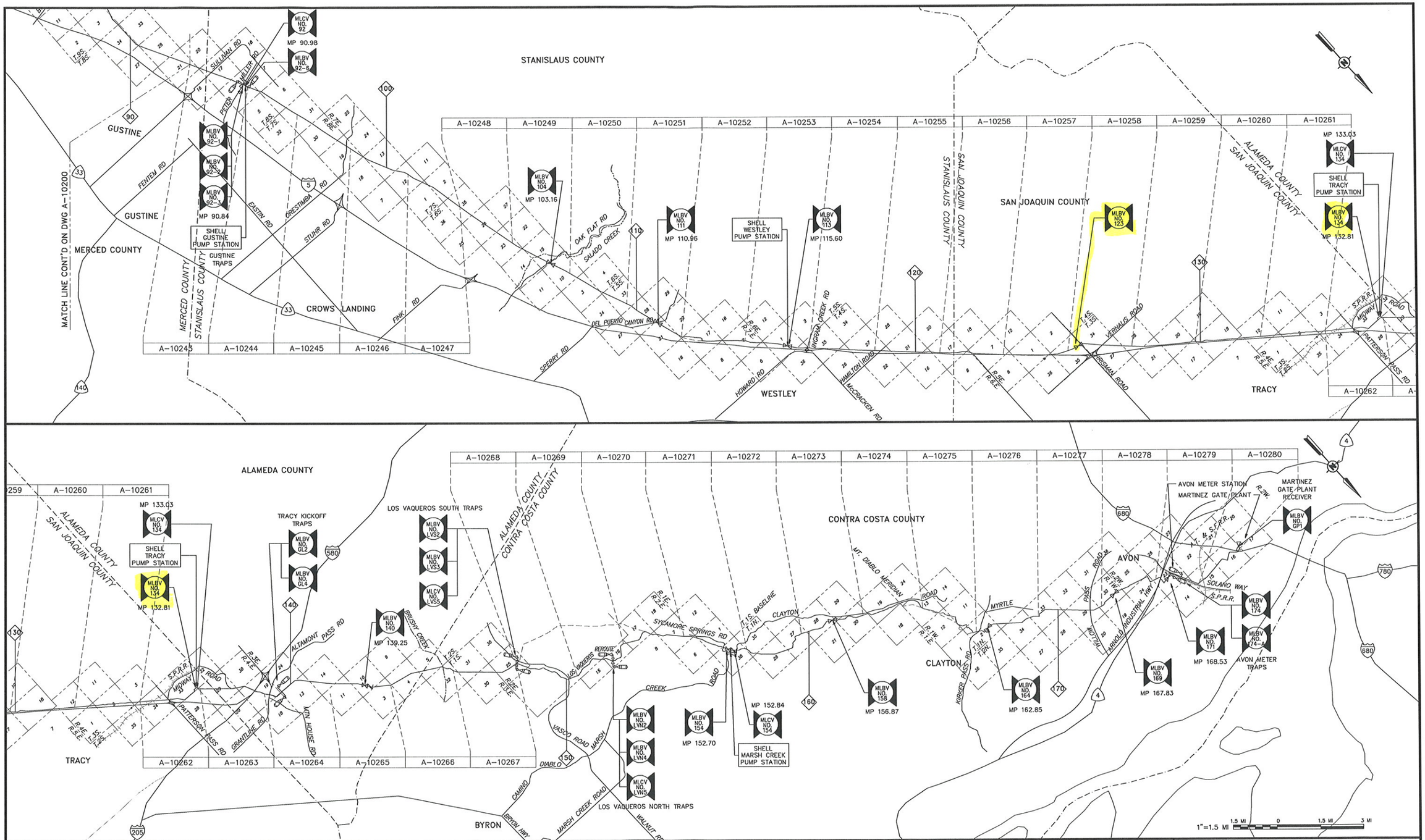
For further information, please refer Shell's "Requirements for Crossing" and the Dig Safely pamphlet enclosed. If you require additional information, please call the Utility Coordinator at (310)816-2063.

Sincerely,

David M. Felger
Field Services Team Lead

Enclosures

cc: Domingo Nunez



DWG. NUMBER	REFERENCE DRAWING DESCRIPTION	REV. NO.	DATE	REVISION DESCRIPTION	BY	CHK.	ENGR	APP.
		0	11/30/02	FORMERLY PART OF DWG A-10200	ORO	D.H.		

20" COALINGA–AVON PIPELINE

TITLE SHEET INDEX MAP

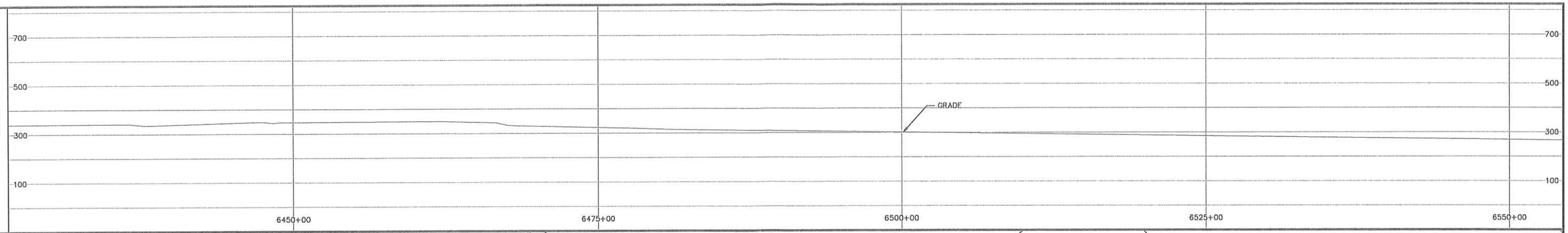
CALIFORNIA

FORMER DRAWING NUMBER	LOCATION CODE
650-W-100	77286

SCALE: AS SHOWN	DATE: 12-00	A-10200-01	REV. 0
DRAWN: SPEC SERV.	Sheet 1 of 1		

6-17-08 oro 10:33am

PROFILE



ALIGNMENT

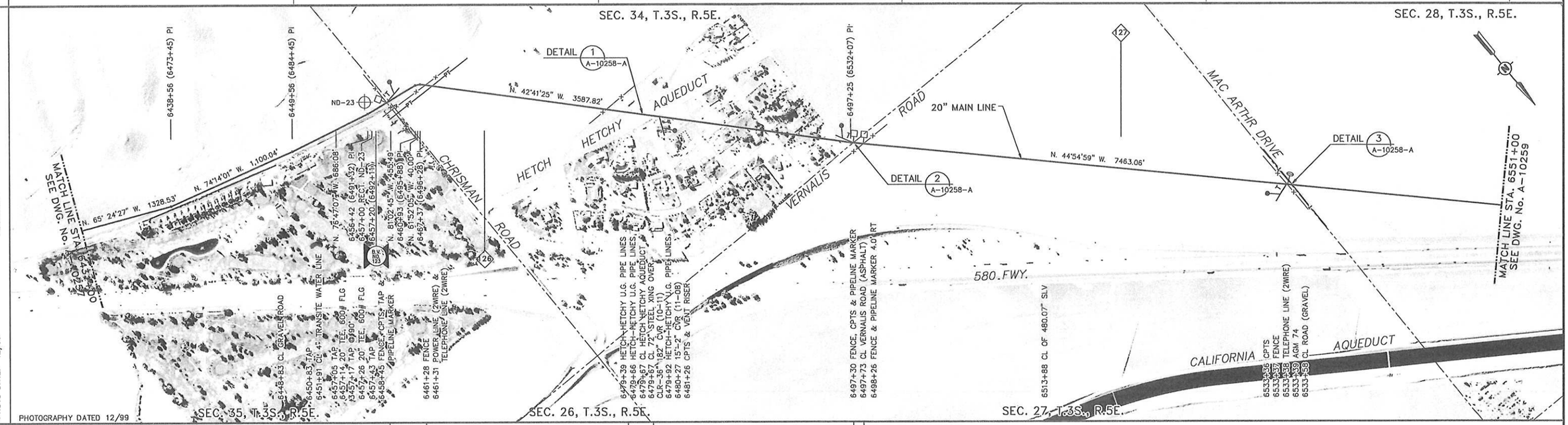


PHOTO DATE: 12/99

PHOTOGRAPHY DATED 12/99

R/W OWNERSHIP

JOAN B. SHEA	JOE & LEONA ESPARZA	BERNARD C. ELISSAGARAY, et al	CITY & COUNTY OF SAN FRANCISCO	RONALD & MARTHA BERDAK	COUNTY OF SAN JOAQUIN	EVA C. BRICHETTO, TRUST
CAV-234 *5807.63±/20'* APN 253-270-18	CAV-236 *283.30'/20'* APN 253-170-02	CAV-238 *1737.81±/20'* APN 253-170-05	CAV-239 *254.24'/20'* APN 253-170-02	CAV-240 *1600±/20'* APN 253-340-30	CAV-241X *85.06'/20'* APN XXX-XXX-XX	CAV-242 *7304.27'/20'* APN 253-180-13
651-U-177B	651-U-130B	651-U-151A	651-U-149A	651-U-151A	651-U-XXX	651-U-177A

PIPE & MATERIAL DATA

6431+00 — 6497+20 — 6479+67 — 6497+73 — 6551+00

253-270: 20" O.D. x 250 W.T. MAINLINE PIPE, A.P.I. 5L GRADE X-52, 52.73#/FT., ERW, 1967

253-170: 20" O.D. x 250 W.T. MAINLINE PIPE, A.P.I. 5L GRADE X-52, 52.73#/FT., ERW, 1967

253-340: N.G. EL. 319.1, T.P. EL. 304.11 — N.G. EL. 316.8, T.P. EL. 301.73 — 20" O.D. x 250 W.T. MAINLINE PIPE, A.P.I. 5L GRADE X-52, 52.73#/FT., ERW, 1967 — N.G. EL. 292.6, T.P. EL. 288.57 — N.G. EL. 292.7, T.P. EL. 288.40

253-180: 20" O.D.x .250" W.T., ERW, MAIN LINE PIPE, A.P.I. 5L GRADE X-52, 52.73 SQ. FT., JAPANESE, 1967

20" M.L. BLOCK VALVE NO. 123
CAMERON 20" BALL VALVE, FIG. NO. B00602-8-1A, WELD END, ANS 600 P.S.I. CLASS

HETCH HETCHY AQUEDUCT (REF. 651-U-428)
6479+15 — 6480+26
112.40' - 24" O.D.x .250" W.T., A.P.I. 5L GRADE B CASING, 63.41 SQ. FT., 12 INSULATORS @ 9' CENTERS
REF. F.B.#S-71, PG. 5 & F.B.#S-16, PG. 12

VERNALIS ROAD (REF. 651-U-479)
6497+27 — 6498+11
83.76' - 24" O.D.x .250" W.T., A.P.I. 5L GRADE B CASING, 63.41 SQ. FT., 9 INSULATORS @ 8' CENTERS
REF. F.B.#S-71, PG. 6 & F.B.#S-16, PG. 13

MISCELLANEOUS DETAILS

LEGEND:
- TEST STATION
- RECTIFIER
- BLOCK VALVE
- CHECK VALVE
- MOV
- AERIAL MARKER
- MILE POST (CALCULATED)
- P.I.
- LINE MARKER
- MAG MARKER

FIELD BOOK REFERENCES:

BOOK	PAGE	TITLE
S-4	6-10	PIPE PROFILES
S-16	10-13	MISC. DETAILS
S-70	7-18	AS BUILTS
S-71	1-8	AS BUILTS
S-110	10-17	GROUND PROFILES

CORROSION CONTROL TEST STATIONS

TYPE	STATION	LOCATION
2	6493+37.4	CHRISMAN ROAD
5	6516+12.18	HETCH HETCHY PIPELINES
5	6532+12	VERNALIS ROAD
2	6568+23	McARTHUR DRIVE

NOTE:
SURVEY STATIONING IN PARENTHESIS IS 'PIPELINE SLOPE STATIONING'.
ALL OTHER SURVEY STATIONING IS 'HORIZONTAL'.
(*) NO 'PIPELINE SLOPE STATIONING' FOR RELOCATIONS.

HORIZ. SCALE: 400' 0' 400' 800'
VERT. SCALE: 200' 0' 200' 400'

CAUTION
LOCATION OF PIPE LINES AS SHOWN MAY NOT BE EXACT. THE SPECIFIC LOCATIONS AND DEPTHS OF SUCH LINES MUST BE DETERMINED BY HAND EXCAVATION. BEFORE ANY EXCAVATION OR OTHER WORK NEAR THE LINES SHOWN ON THIS MAP, CONTACT SHELL PIPELINE COMPANY LP., AT (888) 257-0877 24HRS. 7 DAYS A WEEK

DWG. NUMBER	REFERENCE DRAWING DESCRIPTION	REV. NO.	DATE	REVISION DESCRIPTION	BY	CHK.	ENGR	APP.
		3	11/29/12	UPDATED 6481+26 & 6479+67 PER PL-746	DP	CIF		DMF
		2	3/12/10	SYNCHRONIZED PER FEATURES LIST OF SMART PIG RUN	ORO	DMF		DMF
		1	3/31/03	REVISED PER FIELD MARK UPS	ORO	D.H.	D.H.	D.H.
		0	01/05/01	REDRAWN	SS			

20" COALINGA-AVON PIPELINE

ALIGNMENT DRAWING

MP 125.3 TO MP 127.6
T.3S./R.5E. M.D.B. & M.

SAN JOAQUIN COUNTY

FORMER DRAWING NUMBER	LOCATION CODE	SCALE: AS SHOWN	DATE: 12-00		REV.
650-W-122	77286	DRAWN: SPEC SERV.	Sheet 1 of 1	A-10258	3

2-18-13 dp 10:30am

PROFILE

700
500
300
100

6550+00 6575+00 6600+00 6625+00 6650+00

GRADE

ALIGNMENT

SEC. 28, T.3S., R.5E. SEC. 29, T.3S., R.5E. SEC. 20, T.3S., R.5E. SEC. 19, T.3S., R.5E.

6571+88 (6606+81) PI 28
6603+26 125
6615+78 (6650+71) PI
29
6637+64 (6672+57) PI
6660+08 (6695+01) PI
N.54°31'18"W. 1002.83

SEE DWG. No. A-10258 MATCH LINE STA. 6551+00

N. 44°54'59" W. 7463.06'

20" MAIN LINE

S. TRACY BLVD.

DETAIL 4 A-10258-A

65'

DEEPWELL ND-22 ND-22

N. 52°06'16" W. 4389.41'

N. 52°21'50" W. 2185.88'

N. 53°26'21" W. 2244.29'

580

FWY.

CALIFORNIA AQUEDUCT

SLV

6571+08 FENCE
6572+55 CL OF 508.47' SLV
6572+82 FENCE
6595+10 CL OF 360.03' SLV
16603+26 AM 125 FENCE, GPTS
16603+26 CL JEFFERSON ROAD (ASPHALT)
16604+45 POWER LINE (UNREC)
16605+74 PIPELINE MARKER & FENCE GPTS
16606+44 DEEPWELL & RECTIFIER
16609+99 RECTIFIER ND-22
VENT RISER 2.0 RT
JEFFERSON ROAD
6615+74 FENCE
6617+15 U.G. IRRIGATION PIPE-12" OR 15" (BURIED 2/1/22)
6637+68 FENCE
6643+12 CL OF 512.59' SLV
6660+04 FENCE
6661+69 TAR
6664+14 OLD FENCE POST LINE
MATCH LINE STA. 6669+00 SEE DWG. No. A-10260

PHOTO DATE: 12/99

PHOTOGRAPHY DATED 12/99

SEC. 21, T.3S., R.5E. SEC. 17, T.3S., R.5E.

R/W OWNERSHIP

EVA C. BRICHETTO	BERNAR C. ELISSAGARY, et al	MARIA SUK, et al	STATE OF CALIFORNIA	STELLA L. SIMON, et al	GEORGE SANDOVAL	HERBERT KERLINGER, et al	HERBERT KERLINGER
CAV-242 *7304.27'/20'* APN 253-180-13	CAV-244 *170.24'/20'* APN 253-150-01	CAV-245 *3047.54'/10'* APN 253-140-06	CAV-246X *251.98'/20'* APN XXX-XXX-XX	CAV-247 *991.34'/20'* APN 253-090-14	CAV-249 *2215.68'/20'* APN 253-90-17	CAV-250 *2204.08'/20'* APN 253-090-01	CAV-251 *1020.70'/20'* APN 253-100-07
651-U-177A	651-U-151B	651-U-94	651-U-226	651-U-148	651-U-117	651-U-224	651-U-111, 115 & 109

PIPE & MATERIAL DATA

6551+00 — 6604+45 — 6669+00

20" O.D.x .250" W.T., ERW, MAIN LINE PIPE, A.P.I. 5L GRADE X-52, 52.73 SQ. FT., JAPANESE, 1967

N.G. EL. 256.3 T.P. EL. 250.08

N.G. EL. 253.2 T.P. EL. 247.91

20" O.D.x .250" W.T., ERW, MAIN LINE PIPE, A.P.I. 5L GRADE X-52, 52.73 SQ. FT., JAPANESE, 1967

JEFFERSON ROAD REF. DWG. 651-U-481

6603+66 — 6605+27

160.6' – 24" O.D.x .250" W.T., A.P.I. 5L GRADE B CASING, 63.41 SQ. FT., 17 INSULATORS @ 6' CENTERS REF. F.B.#5-71, PG. 9 & F.B.#5-16, PG. 14-15

MISCELLANEOUS DETAILS

LEGEND:

- TEST STATION
- RECTIFIER
- BLOCK VALVE
- CHECK VALVE
- MOV
- AERIAL MARKER
- MILE POST (CALCULATED)
- P.I.
- LINE MARKER
- MAG MARKER

FIELD BOOK REFERENCES:

BOOK	PAGE	TITLE
S-16	14-16	MISC. DETAILS
S-71	8-18	AS BUILTS
S-72	1-8	AS BUILTS
S-111	1-13	GROUND PROFILES

CORROSION CONTROL TEST STATIONS

TYPE	STATION	LOCATION
5	6638+18.7	JEFFERSON ROAD
1	6640+72.2	FENCE

NOTE:
SURVEY STATIONING IN PARENTHESIS IS 'PIPELINE SLOPE STATIONING'.
ALL OTHER SURVEY STATIONING IS 'HORIZONTAL'.
(*) NO 'PIPELINE SLOPE STATIONING' FOR RELOCATIONS.

HORIZ. SCALE: 400' 0' 400' 800'
VERT. SCALE: 200' 0' 200' 400'

CAUTION

LOCATION OF PIPE LINES AS SHOWN MAY NOT BE EXACT. THE SPECIFIC LOCATIONS AND DEPTHS OF SUCH LINES MUST BE DETERMINED BY HAND EXCAVATION. BEFORE ANY EXCAVATION OR OTHER WORK NEAR THE LINES SHOWN ON THIS MAP, CONTACT SHELL PIPELINE COMPANY LP., AT (888) 257-0877 24HRS. 7 DAYS A WEEK

DWG. NUMBER	REFERENCE DRAWING DESCRIPTION	REV. NO.	DATE	REVISION DESCRIPTION	BY	CHK.	ENGR	APP.
		5	3/12/10	SYNCHRONIZED PER FEATURES LIST OF SMART PIG RUN &	CET	JDB		
		4	5/15/05	ADDED RECTIFIER & DEEPWELL @ 6606+44	ORO	J.B.	J.B.	J.B.
		3	3-31-03	REVISED PER FIELD MARK UPS	ORO	D.H.	D.H.	D.H.
		2	5-28-02	TOWNSHIP AND RANGE CORRECTED FROM T4S, R6S	CIF			
		1	5/17/02	REVISED NAME OF S. TRACY BLVD	ORO	DH		
		0	01/05/01	REDRAWN	SS			
				ADDED RECTIFIER ND-22 @ 6609+00				

FORMER DRAWING NUMBER 650-W-123 | LOCATION CODE 77286

20" COALINGA-AVON PIPELINE

ALIGNMENT DRAWING

MP 127.6 TO MP 129.8
T.3S./R.5E. M.D.B. & M.
SAN JOAQUIN COUNTY

SCALE: AS SHOWN | DATE: 12-00 | A-10259 | REV. 5
DRAWN: SPEC SERV. | Sheet 1 of 1

3-12-10 oro 12:39pm

PROFILE

700
500
300
100

EQ 6700+81 (6736+14) BK PI
6700+45 (6736+14) AHD PI

6675+00 6700+00 6725+00 6750+00 6775+00

ALIGNMENT

SEC. 19, T.3S., R.5E. SEC. 13, T.3S., R.4E. SEC. 12, T.3S., R.4E.

SEE DWG. No. A-10259
MATCH LINE STA. 6669+00

6670+11 (6705+05) PI
N. 43°29'48" W. 737.40'
6677+48 (6712+43) PI
N. 52°06'55" W. 364.83'
6683+13 (6718+08) PI
N. 72°14'17" W. 525.37'
6688+38 (6723+34) PI
N. 43°15'08" W. 1242.91'
6712+30 (6747+99) PI
N. 51°36'22" W. 1185.47'
6728+12 (6763+82) PI
N. 52°06'13" W. 1582.38'
6746+75 (6782+45) PI
N. 52°25'10" W. 1862.89'
N. 52°02'34" W. 4169.36'

R.4E.
R.5E.

20" MAIN LINE

DETAIL 1 A-10260-A

HOLLOW CREEK
CORRAL HOLLOW ROAD
580 FWY.

6670+10 FENCE
6675+41 CORRAL HOLLOW CREEK UPSTREAM @ 6675+41. CORRAL HOLLOW
LAT:37.6696 LONG:-121.4539
DOC:59", SOIL COND.: DRY (7-07)
6675+90 CORRAL HOLLOW CREEK DOWNSTREAM @ 6675+90, CORRAL HOLLOW
LAT:37.6697 LONG:-121.4540
DOC:59", SOIL COND.: DRY (7-07)
6686+29 4" PVC XING OVER CLR-25" 65" CVR (11-08)
6687+44 4" PVC XING OVER CLR-25" 65" CVR (11-08)
6688+59 FENCE & PIPELINE MARKER
6688+69 4" PVC XING OVER CLR-25" 65" CVR (11-08)
6689+73 CL CORRAL HOLLOW ROAD & TELEPHONE LINE (3WIRE)
6690+88 POWER LINE (3WIRE) & TELEPHONE LINE (1WIRE)
6690+95 FENCE
6690+96 CPTS & VENT RISER
6693+60 TAP
6693+61 TEE
6704+53 FENCE
6705+18 HOG & B-WIRE FENCE
6705+74 HOG & B-WIRE FENCE
6706+36 CL OF 122.64' SLV
6709+78 CL OF 120.05" SLV
6709+88 CL OF 59.26" SLV
6731+06 SINKHOLE OVER LINE
LAT:37.6789 LONG:-121.4691
DOC:49", SOIL COND.: DRY (7-07)
6741+52 HIGHWAY DRAINAGE
LAT:37.6806 LONG:-121.4720
DOC:64", SOIL COND.: DRY (7-07)
6748+67 FENCE & PIPELINE MARKER
6757+72 FENCE, CPTS & PIPELINE MARKER
6757+97 AGM 75
6758+87 CL OF 36.29" SLV
6770+05 CL OF 35.81" SLV
6770+21 CL OF 64.32" SLV
6770+46 HIGHWAY DRAINAGE
LAT:37.6845 LONG:-121.4865
DOC:71", SOIL COND.: DRY (7-07)
6771+46 CL DIRT ROAD
6780+56 WASHOUT
LAT:37.6871 LONG:-121.4827
DOC:61", SOIL COND.: DRY (7-07)
6786+87 CL OF 479.49" SLV
MATCH LINE STA. 6787+00
SEE DWG. No. A-10261

SEC. 17, T.3S., R.5E. SEC. 18, T.3S., R.5E. SEC. 7, T.3S., R.5E.

PHOTO DATE: 12/99
PHOTOGRAPHY DATED 12/99

R/W OWNERSHIP

HERBERT KERLINGER et al	CITY OF TRACY & COUNTY OF SAN JOAQUIN	STATE OF CALIFORNIA	HERBERT KERLINGER, et al	ARTHUR R. SASSER	MAURICE G. VIEIRA
CAV-252 737.40'/20' APN 253-030-02	CAV-253 1110.85'/20' APN 253-030-05	CAV-254X 217.98'/20' APN XXX-XXX-XX	CAV-256 1432.48'/20' APN 253-030-02	CAV-257 4181.36'/20' APN 253-030-09	CAV-258 12122.55'/20' APN 253-020-05
651-U-224	651-U-202	651-U-222	651-U-224	651-U-216	651-U-156A & B

PIPE & MATERIAL DATA

6669+00 6688+73 6689+73 EQ 6700+81 BK 6700+45 AHD 253-030 253-020 6787+00

2073' – 20" O.D. X .250" W.T., ERW, MAIN LINE T.P. EL. 290.58' T.P. EL. 291.63
PIPE, A.P.I. 5L GRADE X-52, 52.73#/FT., JAPANESE, 1967

20" O.D.x .250" W.T., ERW, MAIN LINE PIPE, A.P.I. 5L GRADE X-52, 52.73 SQ. FT., JAPANESE, 1967

CORRAL HOLLOW ROAD REF. 651-U-482
200' – 24" O.D.x .250" W.T., A.P.I. 5L GRADE B CASING, 53.41 SQ. FT., 9 INSULATORS @ 8' CENTERS
REF. F.B.#S-71, PG. 15 & F.B.#S-16, PG. 16

MISCELLANEOUS DETAILS

LEGEND:
- TEST STATION
- RECTIFIER
- BLOCK VALVE
- CHECK VALVE
- MOV
- AERIAL MARKER
- MILE POST (CALCULATED)
- P.I.
- LINE MARKER
- MAG MARKER
- WATER XING

FIELD BOOK REFERENCES:

BOOK	PAGE	TITLE
S-16	14-16	MISC. DETAILS
S-71	8-18	AS BUILTS
S-72	1-8	AS BUILTS
S-111	1-13	GROUND PROFILES

CORROSION CONTROL TEST STATIONS

TYPE	STATION	LOCATION
5	6725+99	CORRAL HOLLOW ROAD
2	6793+41.1	FENCE

NOTE:
SURVEY STATIONING IN PARENTHESIS IS 'PIPELINE SLOPE STATIONING'.
ALL OTHER SURVEY STATIONING IS 'HORIZONTAL'.
(*) NO 'PIPELINE SLOPE STATIONING' FOR RELOCATIONS.

HORIZ. SCALE: 400' 0' 400' 800'
VERT. SCALE: 200' 0' 200' 400'

CAUTION

LOCATION OF PIPE LINES AS SHOWN MAY NOT BE EXACT. THE SPECIFIC LOCATIONS AND DEPTHS OF SUCH LINES MUST BE DETERMINED BY HAND EXCAVATION. BEFORE ANY EXCAVATION OR OTHER WORK NEAR THE LINES SHOWN ON THIS MAP, CONTACT SHELL PIPELINE COMPANY LP., AT (888) 257-0877 24HRS. 7 DAYS A WEEK

DWG. NUMBER	REFERENCE DRAWING DESCRIPTION	REV. NO.	DATE	REVISION DESCRIPTION	BY	CHK.	ENGR	APP.
		4	11/29/12	PIPE CROSSING @ 6686+29, 6687+44 & 6688+69 PER PL-746	DP	CIF		DMF
		3	3/12/10	SYNCHRONIZED PER FEATURES LIST OF SMART PIG RUN	ORO	DMF		DMF
		2	1/30/08	ADDED CORRAL HOLLOW UPSTREAM @ 6675+41. CORRAL HOLLOW DOWNSTREAM @ 6675+90, SINKHOLE OVER LINE @ 6731+06, HWY DRAINAGES @ 6741+52 & 6770+65 & WASHOUT @ 6780+56 PER GPS DATA	ORO	JMT	JMT	JMT
		1	10/30/02	REVISED PER FIELD MARK UPS	ORO	D.H.	D.H.	D.H.
		0	01/05/01	REDRAWN	SS			

20" COALINGA-AVON PIPELINE

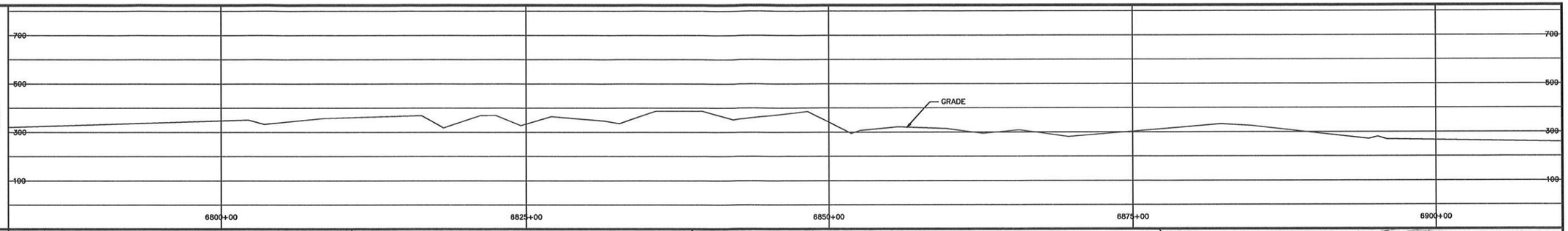
ALIGNMENT DRAWING

MP 129.8 TO MP 132.1
T.3S./R.5E. T.3S./R.4E. M.D.B. & M.
SAN JOAQUIN COUNTY

FORMER DRAWING NUMBER	LOCATION CODE	SCALE: AS SHOWN	DATE: 12-00		REV.
650-W-123	77286	DRAWN: SPEC SERV.	Sheet 1 of 1	A-10260	4

09-03-13 JAL 1:45pm

PROFILE



ALIGNMENT

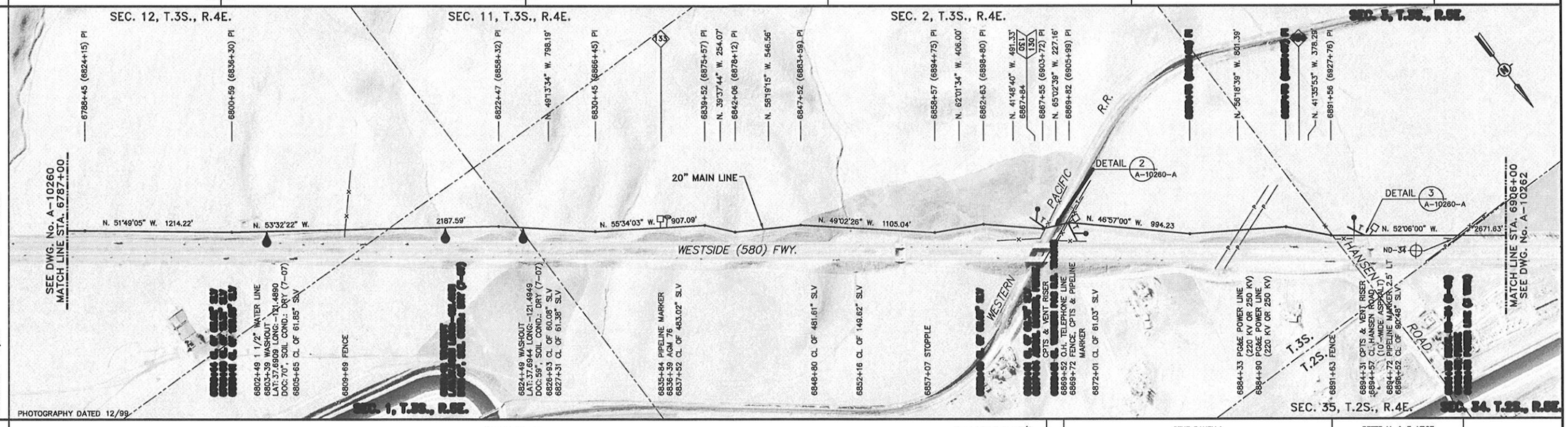


PHOTO DATE: 12/99

R/W OWNERSHIP

MAURICE VIEIRA	WESTERN PACIFIC R/R	GENE PANELLA	PETER M. & F. YBOZ
CAV-258 *12122.55'/20'* APN 253-020-05	CAV-261X *198.10'* APN XXX-XXX-XX	CAV-262 *2178.97'/20'* APN 251-040-01	CAV-263 *1074.40'/20'* APN 251-320-14
651-U-156A & 156B	651-U-176	651-U-162	651-U-160

PIPE & MATERIAL DATA

6787+00 — 253-020 — 6904+81 — 251-040 — 6924+57 — 251-320 — 6906+00

20" O.D.x .250" W.T., ERW, MAIN LINE PIPE, A.P.I. 5L GRADE X-52, 52.73 SQ. FT., JAPANESE, 1967

N.G. EL. 282.7 T.P. EL. 276.21

N.G. EL. 279.3 T.P. EL. 269.33

20" O.D. x 250 W.T. MAINLINE PIPE, A.P.I. 5L GRADE X-52, 52.73#/FT., ERW, 1967

20" O.D. x 250 W.T. MAINLINE PIPE A.P.I. 5L GRADE X-52, 52.73#/FT., ERW, 1967

WESTERN PACIFIC R.R. (REF. 651-U-403)
6905+19 — 6906+52
132.78' – 24" O.D.x .250" W.T., A.P.I. 5L GRADE B CASING, 63.41 SQ. FT., 14 INSULATORS @ 9' CENTERS
REF. F.B.#S-72, PG. 6 & 7, & F.B.#S-17, PG. 1-3

HANSON ROAD (REF. DWG. 651-U-485)
6924+41 — 6924+68
27.20' – 24" O.D.x .250" W.T., A.P.I. 5L GRADE B CASING, 63.41 SQ. FT., 3 INSULATORS @ 10' CENTERS
REF. F.B.#S-72, PG. 11 & F.B.#S-18, PG. 17

MISCELLANEOUS DETAILS

LEGEND:
- TEST STATION
- AERIAL MARKER
- WATER XING
- RECTIFIER
- MILE POST (CALCULATED)
- BLOCK VALVE
- P.I.
- CHECK VALVE
- LINE MARKER
- MOV
- MAG MARKER

FIELD BOOK REFERENCES:

BOOK	PAGE	TITLE
S-16	14-17	MISC. DETAILS
S-17	1-11	MISC. DETAILS
S-71	8-18	AS BUILTS
S-72	1-16	AS BUILTS
S-73	1-14	AS BUILTS
S-111	1-16	GROUND PROFILES
S-112	1-3	GROUND PROFILES

CORROSION CONTROL TEST STATIONS

TYPE	STATION	LOCATION
5	6904+01	WESTERN PACIFIC R.R.
1	6905+89	WESTERN PACIFIC R.R.
5	6930+51	HANSEN ROAD

NOTE:
SURVEY STATIONING IN PARENTHESIS IS 'PIPELINE SLOPE STATIONING'.
ALL OTHER SURVEY STATIONING IS 'HORIZONTAL'.
(*) NO 'PIPELINE SLOPE STATIONING' FOR RELOCATIONS.

HORIZ. SCALE: 400' 0' 400' 800'
VERT. SCALE: 200' 0' 200' 400'

CAUTION

LOCATION OF PIPE LINES AS SHOWN MAY NOT BE EXACT. THE SPECIFIC LOCATIONS AND DEPTHS OF SUCH LINES MUST BE DETERMINED BY HAND EXCAVATION. BEFORE ANY EXCAVATION OR OTHER WORK NEAR THE LINES SHOWN ON THIS MAP, CONTACT SHELL PIPELINE COMPANY LP., AT (888) 257-0677 24HRS. 7 DAYS A WEEK

DWG. NUMBER	REFERENCE DRAWING DESCRIPTION	REV. NO.	DATE	REVISION DESCRIPTION	BY	CHK.	ENGR	APP.
		4	4/25/14	CORRECTED TOWNSHIP/RANGE # FROM 5E TO 4E	JAL	CIF		DMF
		3	3/12/10	SYNCHRONIZED PER FEATURES LIST OF SMART PIG RUN &	ORO	DMF		DMF
				ADDED NEW RECTIFIER INSTALLATION ❶ 6901+36				
		2	1/30/08	ADDED WASHOUTS 6803+39, 6818+12 & 6824+49 ❶ PER GPS DATA	ORO	JMT	JMT	JMT
		1	3/31/03	REVISED PER FIELD MARK UPS	ORO	D.H.	D.H.	D.H.
		0	01/05/01	REDRAWN	SS			

20" COALINGA–AVON PIPELINE

ALIGNMENT DRAWING

MP 132.1 TO MP 134.3
T.3S./R.4E. & T.2S./R.4E. M.D.B. & M.
SAN JOAQUIN COUNTY

FORMER DRAWING NUMBER	LOCATION CODE
650-W-123 & 124	77286

SCALE: AS SHOWN	DATE: 12-00	A-10261	REV. 4
DRAWN: SPEC SERV.	Sheet 1 of 1		

4-25-14 jal 10:59am

PROFILE

ALIGNMENT

PHOTO DATE: 12/99

PHOTOGRAPHY DATED 12/99

SEC. 3, T.3S., R.4E.

SEC. 33, T.2S., R.4E.

SEC. 32, T.2S., R.4E.

SEC. 29, T.2S., R.4E.

SEC. 34, T.2S., R.4E.

SEC. 28, T.2S., R.4E.

TRACY PUMP STATION
SEE DWG. A-10262-A

MATCH LINE STA. 7029+00
SEE DWG. No. A-10263

SEE DWG. No. A-10261
MATCH LINE STA. 6906+00

OLD PATTERSON PASS ROAD

PATTERSON PASS ROAD

S.P.R.R.

580 FWY.

CALIFORNIA AQUEDUCT

20" MAIN LINE

24" MAIN LINE

DETAIL 4 A-10260-A

DETAIL 1 A-10262-C

DETAIL 2 A-10262-C

R/W OWNERSHIP

PAUL & DIANE HARPAINTER	STUDLEY CO.	SOUTHERN PACIFIC R.R.	STUDLEY CO.	MAURICE G. VIEIRA	STATE OF CALIFORNIA	MAURICE G. VIEIRA	MARVYN H. HAERA	WILLIAM J. BROCKMAN, et ol
CAV-265 *2231.20'/20'* APN 209-110-06	CAV-266 *837.18'/20'* APN 209-110-31	CAV-268X *754.78'/20'* APN 209-110-13	CAV-269 *1748.99'±/20'* APN 209-110-31	CAV-271 *1620'±/20'* APN 209-100-24	CAV-272X *176.50'±/20'* APN XXX-XXX-XX	CAV-273 *4296.1±/20'* APN 209-100-14	CAV-275 *303'±/20'* APN 209-100-18	CAV-276 *505'±/20'* APN 209-090-15
651-U-155	651-U-154	651-U-175	651-U-154	651-U-156C	651-U-XXX	651-U-XXX	651-U-235	651-U-24

PIPE & MATERIAL DATA

209-110 — 209-100

20" O.D.x .250" W.T., ERW, MAIN LINE PIPE
A.P.I. 5L GRADE X-52, 52.73 SQ. FT., JAPANESE, 1967

20" – O.D.x .250" W.T., ERW, MAIN LINE PIPE
A.P.I. 5L GRADE X-52, 52.73 SQ. FT., JAPANESE, 1967

SOUTHERN PACIFIC R.R. (REF. 651-U-404)
79.2' – 24" O.D.x .250" W.T., A.P.I. 5L GRADE B CASING, 63.41 SQ. FT., 9 INSULATORS @ 8' CENTERS
REF. F.B.#S-72, PG. 15 & F.B.#S-17, PG. 4

NEW PATTERSON PASS ROAD (REF. 651-U-488)
79.20' – 24" O.D.x .250" W.T., A.P.I. 5L GRADE B CASING, 63.41 SQ. FT., 9 INSULATORS @ 8' CENTERS
REF. F.B.#S-73, PG. 4 & F.B.#S-17, PG. 5

MISCELLANEOUS DETAILS

LEGEND:
TEST STATION, RECTIFIER, BLOCK VALVE, CHECK VALVE, MOV, AERIAL MARKER, MILE POST (CALCULATED), P.I., LINE MARKER, AGM

FIELD BOOK REFERENCES:

BOOK	PAGE	TITLE
S-16	17	MISC. DETAILS
S-17	1-11	MISC. DETAILS
S-72	6-16	AS BUILTS
S-73	1-14	AS BUILTS
S-111	13-16	GROUND PROFILES
S-112	1-3	GROUND PROFILES

CORROSION CONTROL TEST STATIONS

TYPE	STATION	LOCATION
5	6973+85.74	SOUTHERN PACIFIC R.R.
5	7012+19.24	NEW PATTERSON PASS ROAD
4	7048+57.97	PUMP SITE NO. 4
4	7060+32.1	PUMP SITE NO. 4

NOTE:
SURVEY STATIONING IN PARENTHESIS IS 'PIPELINE SLOPE STATIONING'. ALL OTHER SURVEY STATIONING IS 'HORIZONTAL'.
(*) NO 'PIPELINE SLOPE STATIONING' FOR RELOCATIONS.

(A) 20" MAINLINE BLOCK VALVE NO. 134 CAMERON BALL VALVE FIG. NO. 800403-4-1, A.S.A. 400 LB. CLASS, MAX. TEMP. 250°F., MAX. C.W.P. 960 P.S.I., BODY MAT. STEEL, ASSM. NO. 39491-20, SERIAL NO. 57669' REF. F.B. #S-73 PG. 6
(B) INSULATING FLANGE WELDED DIRECTLY TO BLOCK VALVE NO. 134
(C) 20" INSULATING FLANGE 400 LB., SCH. 10, A105 G2, 34C7, REF. F.B. #S-73 PG. 8

(2) 24" O.D. X .260" W.T., DSAW, A.P.I. 5L GRADE X-60, UNK.
(10) 20" O.D. X .250" W.T., ERW, A.P.I. 5L GRADE X-52, JAPANESE.
(33) 20" O.D. X .375" W.T., ERW, A.P.I. 5L GRADE X-65, UNK.
(40) 20" O.D. X .250" W.T., ERW, A.P.I. 5L GRADE X-52, AMERICAN STEEL PAINT
(D) 20" MAINLINE CHECK VALVE NO. 134 WHEATLY VALVE, TYPE SC, END STYLE 8, BODY MAT. STEEL, RATING 960, W.O.G. TEST 1450 P.S.I. SER. NO. 930-208096-180 REF. F.B. #S-73 PG. 8

HORIZ. SCALE: 400' 0' 400' 800'
VERT. SCALE: 200' 0' 200' 400'

CAUTION

LOCATION OF PIPE LINES AS SHOWN MAY NOT BE EXACT. THE SPECIFIC LOCATIONS AND DEPTHS OF SUCH LINES MUST BE DETERMINED BY HAND EXCAVATION. BEFORE ANY EXCAVATION OR OTHER WORK NEAR THE LINES SHOWN ON THIS MAP, CONTACT EQUILON PIPELINE COMPANY LLC., AT (888) 257-0877 24HRS. 7 DAYS A WEEK

DWG. NUMBER	REFERENCE DRAWING DESCRIPTION

REV. NO.	DATE	REVISION DESCRIPTION	BY	CHK.	ENGR	APP.
11	10-8-12	ADDED SLEEVE @ 6946+22.6, 6938+81.3, 6938+93.2 & 6939+26.1	DP	DMF		DMF
10	05/17/12	ADDED VALVE NUMBERS IN PIPE BAR PER MARKUPS	CET	BJD		BJD
9	3/12/10	SYNCHRONIZED PER FEATURES LIST OF SMART PIG RUN	ORO	DMF		DMF
8	9/30/09	ADDED FULL SLEEVES PER SEVERAL PL-746s	CA	MGG	MGG	DMF
7	3/30/08	ADDED FULL SLEEVE @ 6927+89 PER PL-746	ORO	RJG	RJG	DMF
6	10/4/06	NEW SUCTION, DISCHARGE VALVES & PIPING	ORO	SCW	SCW	JJD

REV. NO.	DATE	REVISION DESCRIPTION	BY	CHK.	ENGR	APP.
5	10/21/05	ADDED FULL SLEEVE PER PL-746	ORO			
4	8/30/05	ADDED FULL SLEEVE PER PL-746	ORO			
3	9/3/04	REVISED BEARINGS OF PIPELINES	ORO	DRH	DRH	DRH
2	4/9/04	ADDED FULL SLEEVES PER PL-746's	ORO	D.H.	D.H.	D.H.
13	4/25/14	CORRECTED TOWNSHIP RANGE # FROM 5E TO 4E	JAL	CIF		DMF
12	10/30/12	ADDED 40' CASING TO MATERIAL BAR & 79.2' CASING TO MAP	CIF	KWP		DMF

20" COALINGA–AVON PIPELINE

ALIGNMENT DRAWING

MP 134.3 TO MP 136.7
T.2S./R.4E. M.D.B. & M.

SAN JOAQUIN COUNTY

FORMER DRAWING NUMBER	LOCATION CODE
650-W-124	77286

SCALE: AS SHOWN | DATE: 12-00
DRAWN: SPEC SERV. | Sheet 1 of 1

A-10262 REV. 13

4-25-14 jal 11:00am