

**SOIL EXCAVATION AND LANDFARM WORK PLAN  
THREE HISTORIC PRODUCED WATER PITS**

**TERRACE GAS PLANT**

**And**

**KERN 43-33 WELL and TANK BATTERY**

**Weld County, Colorado**

**Prepared For:**



**Whiting Petroleum Corporation  
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**Prepared by:**



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**Olsson Project No. 012-0790**

**September 2012**

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## 1.0 INTRODUCTION

Olsson Associates, Inc. was contracted by Whiting Oil and Gas Company (Whiting) to perform subsurface investigations of three unlined produced water pits in Weld County to assess impacts. The following presents a work plan for closure of the pits. The pits have not been used by Whiting since acquiring the assets from Antelope Energy in 2010. Two pits (Pit 1 and Pit 2) are associated with the Terrace Gas Plant (latitude 40.84553, longitude -103.91039). The third pit (Pit 3) is associated with the Kern 43-33 well and tank battery (latitude 40.84568, longitude -103.91354). Soil samples were collected for laboratory analysis for comparison to the cleanup levels listed Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1.

For site specific information, a description of the local geology and hydrogeology, and a summary of the laboratory analytical results, please refers to the report prepared by Olsson describing the subsurface investigation.

## 2.0 SUBSURFACE INVESTIGATION

Olsson conducted site investigation activities on May 17, 2012 which included advancing five test pits in Pit 1, two test pits in Pit 2, and two test pits in Pit 3. K&K Oilfield Services was contracted to perform the excavations using a backhoe. Soil samples were collected at approximate one-foot intervals and placed into Ziploc<sup>®</sup> bags and field screened for volatile organic vapors using a photo-ionization detector (PID). The test pits were advanced until the soil no longer exhibited signs of impact or until the maximum depth of the excavation equipment was reached. Bedrock was not encountered during this investigation. One soil sample from each test pit exhibiting the highest PID reading was placed in a laboratory-supplied sample container and stored on ice in a cooler for laboratory analysis.

Two site background samples were collected using a hand auger near each historic produced water pit location from areas of apparent native undisturbed soil. Additionally, one sample of the liquid in the bottom of the tinhorn at Pit 2 and one sample of the sludge in the northwest corner of Pit 3 were collected for laboratory analysis.

Soil samples were hand delivered by Olsson to Summit Scientific of Golden, Colorado using standard chain-of-custody protocol for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX) and gasoline range organics (GRO) by EPA Method 8260B, diesel range organics (DRO) by EPA Method 8015, poly-nuclear aromatic hydrocarbons (PAHs) by EPA Method 8270D Selective Ion Monitoring (SIM), specific conductance (EC) by Standard Method SM 2510B, soluble nutrients and sodium absorption ratio (SAR) by EPA Method 6020, pH by EPA Method 9045B, total metals using EPA Methods 6020A, 7471B (mercury only), and hexavalent

chromium by EPA Method 3060A. Groundwater was not encountered during advancement of the test pits.

### **3.0 SUBSURFACE INVESTIGATION RESULTS**

Arsenic was reported above the COGCC cleanup level for arsenic in all nine soil samples collected from the three produced water pits and all six site specific background samples. According to *Elements in North American Soils* (Dragun and Cheriki, 2005), arsenic concentrations in Colorado soil range from 1.3 mg/kg to 16 mg/kg with a deviation of 3 mg/kg. Based on these published arsenic values and site specific background sample results, the arsenic concentrations reported for samples collected from the pits at Terrace Gas Plant and the Kern 43-33 battery appear to be within the naturally-occurring Colorado arsenic concentration soil ranges.

Pit 1: The extent of impact appears to be limited to the area of test pit 5 / soil sample SS5, shown on figure 2, where the pH was reported above of the COGCC range of 6-9. Soil sample SS5 was collected at a depth of 2.0 fbgs from the interval with the highest PID reading. Staining was observed between 4.5 and 6.0 fbgs.

Pit 2: Field screening, field observations, and analytical results reported for SS6 and SS7, shown on figure 3, indicate soil is impacted between 5.0 fbgs and at minimum 9.5 fbgs. The backhoe excavation depth was limited to 10 fbgs due to an obstruction posed by the steel gate around the pit. Hydrocarbon staining was still observed at 10 fbgs in test pit 7, thus the vertical extent of impact has not been determined for Pit 2. Benzene, total xylenes and GRO were reported above their respective COGCC cleanup levels for the sample collected from the liquid inside the tinhorn.

Pit 3: Based on analytical results and field observations, the vertical extent of impact appears to be limited to 2-3 fbgs. TPH (soil samples SS8 and SS9), pH and SAR (soil sample SS8) were reported above their respective COGCC cleanup levels in soil samples collected from Pit 3, as shown on figure 4.

### **4.0 PROPOSED SCOPE OF WORK**

Olsson recommends excavating impacted soil from each of the three former produced water pits and land farm the soil on site at terrace Gas Plant and at the Kern 43-33 Battery. Work will be conducted by performing the following tasks:

#### **4.1 Task 1: Planning and Safety**

This task includes preparation for conducting the field activities and involves the following:

- Amend the current health and safety plan to be used by field personnel. Olsson will conduct field activities in Level D personal protection equipment including fire retardant clothing, steel toe boots, hard hat and safety glasses;
- Olsson will contact the Utility Notification Center of Colorado (UNCC) to re-mark underground public utilities at the above referenced Sites. If the excavator has to dig close to the road at Pit 2, a fiber optic cable that runs alongside CR-118 will be day lighted using a hydrovac truck.
- Olsson will contact Weld County and obtain a Right-of-Way Use Permit for Weld County Road 118, and traffic control plan for Pit 2, which exists within the county road right-of-way.

## **4.2 Task 2: Excavation and Soil Sampling**

The liquid in the tinhorn at Pit 2 and the sludge and water in Pit 3 should be removed for offsite disposal in accordance with Rule 907 prior to excavation. Excavated soil will be placed within temporary earthen berms to contain the material onsite at each location. Soil confirmation samples will be collected from the bottom and sides of the excavations to ensure that all impacted soil has been removed. Whiting will provide soil to back fill the excavations.

### Terrace Gas Plant: Pit 1

The extent of impact at Pit 1 appears to be limited to the southeast corner of the pit. Soil sample SS5 was collected from test pit 5 in this area at a depth of 2.0 fbgs. When excavating at this location, Olsson will collect a soil sample from depth where staining was observed during the initial subsurface investigation. During the excavation at Pit 1, two tinorns that exist adjacent to the Pit will also be removed along with any visually impacted soil associated with these tinorns.

### Terrace Gas Plant: Pit 2

Two test pits were advanced into Pit 2, located approximately 800 feet east of Terrace Gas Plant on the south side of Weld County Road 118. Based on field observations and laboratory analytical results, soil appears to be impacted between 5 fbgs and 9.5 fbgs. During advancement of test pits into Pit 2, the excavator was limited to a depth of 9.5 fbgs due to a steel fence around the perimeter of the pit. Therefore, the vertical extent of impact at Pit 2 is unknown. Impacted soil excavated from Pit 2 will be hauled to Terrace Gas Plant and land farmed along with soils excavated from Pit 1.

Pit 2 is located within the right of way of Weld County Road 118. A Right-of-Way Use Permit, and accompanying traffic control plan has been issued allowing Olsson to excavate within the county road right-of-way. If excavation needs to occur within the road, the Right-of-Way Use Permit and traffic control plan will be amended accordingly.

#### Kern 43-33 Battery

Based on field observations and laboratory analytical results, soil appears to be impacted to a depth of 2 fbg to 3 fbg at Pit 3. The excavation will be filled with clean fillings, and impacted soil will be land farmed onsite within the existing pit.

### **4.3 Task 3: Soil Sample Analysis**

Soil samples will be analyzed for the COGCC Table 910-1 constituents that exceeded COGCC Cleanup Levels during the initial subsurface investigation:

- Pit 1 will be sampled for Total Petroleum Hydrocarbons – Gasoline Range Organics (TPH-GRO) using EPA Method 8260B, TPH – Diesel Range Organics (DRO) using EPA Method 8015B, and pH;
- Pit 2 will be sampled for benzene, toluene, ethylbenzene, total xylenes and TPH-GRO using EPA Method 8260B, and TPH-DRO using EPA Method 8015B;
- Pit 3 will be sampled for TPH-GRO using EPA Method 8260B, TPH-DRO using EPA Method 8015B, pH and Sodium Absorption Ratio (SAR).

### **4.4 Task 4: Periodic Site Visits and Progress Sampling**

K&K Oilfield Services will provide the equipment and labor necessary to excavate the impacted soil, and visit the sites monthly to disk, turn, till or wind-row the soil. Whiting will manage vegetation associated with the land farms. Olsson will visit the sites quarterly to add moisture and nutrients to the farmed soils to accelerate the biodegradation process. Progress samples will be collected at both land farms on a biannual basis and submitted for analysis of TPH-GRO by EPA Method 8260B and TPH-DRO by EPA Method 8015B. Olsson can coordinate activities by K&K Oilfield Services, or other contractors, and conduct oversight to document the work.

### **4.5 Task 5: Site Restoration**

Once concentrations for the contaminants of concern are below their respective COGCC Cleanup Levels, the pits will be re-contoured and re-seeded with native plant species to prevent erosion and return the locations to natural conditions. Land farmed soil will be thin spread

throughout the Terrace Gas Plant and the Kern 43-33 Battery, or can be used as fill dirt or for earthen berms onsite.

#### **4.6 Task 6: Report Preparation**

Once the concentrations for the Analytes of concern are below their respective COGCC Cleanup Levels, a report will be prepared summarizing Olsson's field activities and analytical results. Whiting and Olsson will then request that the COGCC issue no further action for the pits.

### **5.0 REFERENCES**

Dragun and Cheriki, 2005, Elements in North American Soils, 2<sup>nd</sup> edition, pg.29, Amherst Scientific Publishers

COGCC Table 910-1 Rules 900 Series – Exploration and Production Waste Management

Crabb, James A., 1982, Soil Survey of Weld County northern part, United States Department of Agriculture, Soil Conservation Service and Forest Service, in cooperation with Colorado Agricultural Experiment Station

Dragun and Cheriki, 2005, Elements in North American Soils, 2<sup>nd</sup> edition, pg.29, Amherst Scientific Publishers

Scott, G.R., Map showing geology, structure, and oil and gas fields in the Sterling 1 degree x 2 degrees quadrangle, Colorado, Nebraska and Kansas (Sheet 1). Map I-1092. 1:250000. Miscellaneous Investigations Series. U.S. Geological Survey. 1978

## Tables



Whiting Petroleum Corporation  
Samples collected May 17, 2012

Table 1: Subsurface Investigation: Summary of Analytical Results

Sample ID	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	GRO (mg/L)	DRO (mg/L)	pH	SAR
COGCC Cleanup Level	<b>0.17</b>	<b>85</b>	<b>100</b>	<b>175</b>	<b>500</b>	<b>500</b>	<b>6-9</b>	<b>&lt; 12</b>
<b>Pit 1</b>								
SS1	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.050	< 50	8.7	2.51
SS2	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.050	< 50	8.8	0.63
SS3	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.050	< 50	8.7	0.62
SS4	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.050	< 50	8.7	0.35
SS5	< 0.0050	< 0.0050	< 0.0050	2	38	58	<b>9.4</b>	9.63
<b>Pit 2</b>								
SS6	< 0.0050	< 0.0050	< 0.0050	< 0.0050	51	<b>1800</b>	8	0
SS7	<b>5.9</b>	0.092	34	<b>260</b>	<b>7800</b>	<b>2800</b>	8.4	0.34
<b>Pit 3</b>								
SS8	< 0.0050	< 0.0050	< 0.0050	0.063	490	<b>9400</b>	<b>9.5</b>	<b>20</b>
SS9	< 0.0050	< 0.0050	< 0.0050	< 0.0050	<b>1400</b>	<b>5100</b>	8.1	8.38

notes:

mg/L: milligrams per liter

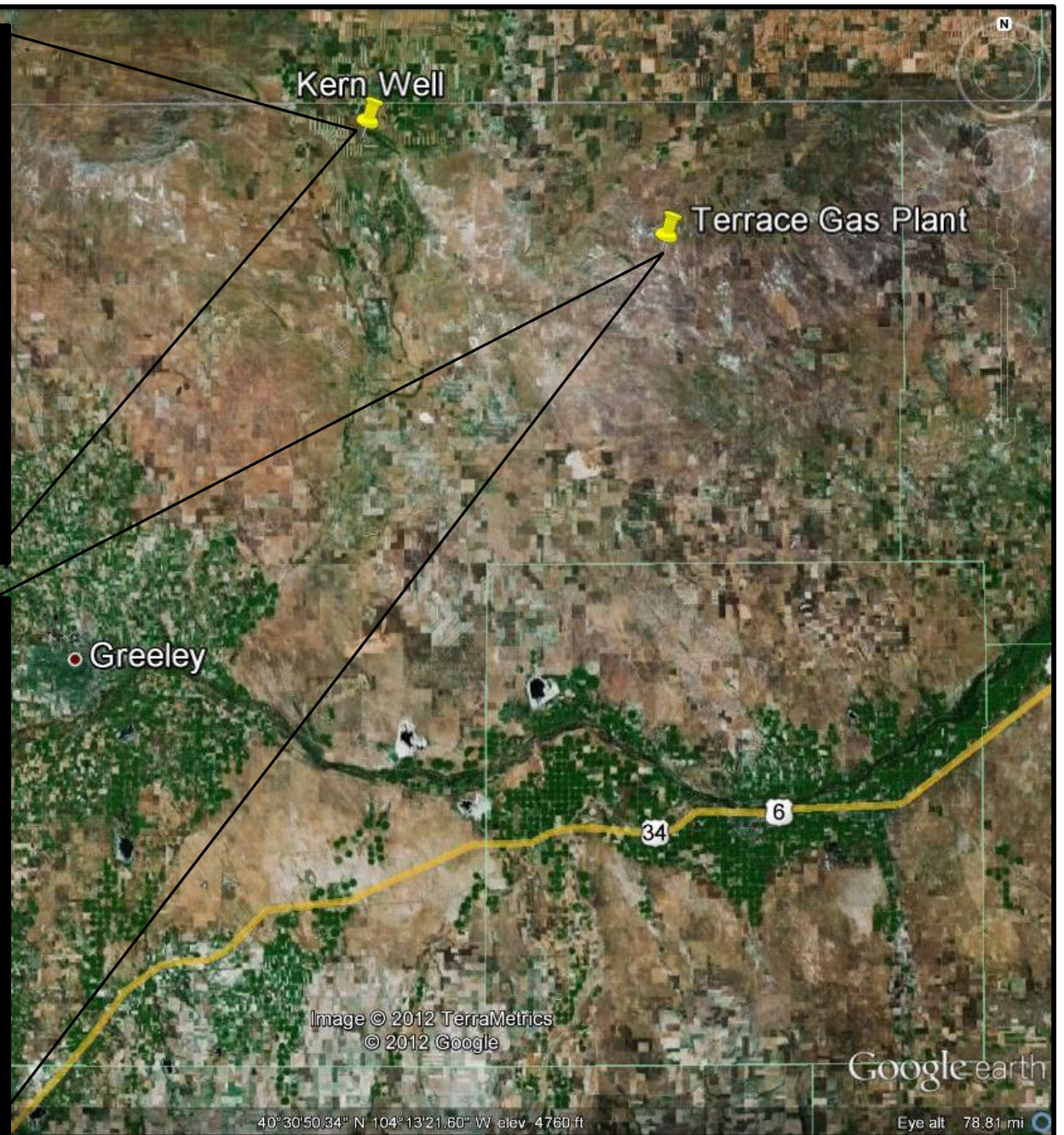
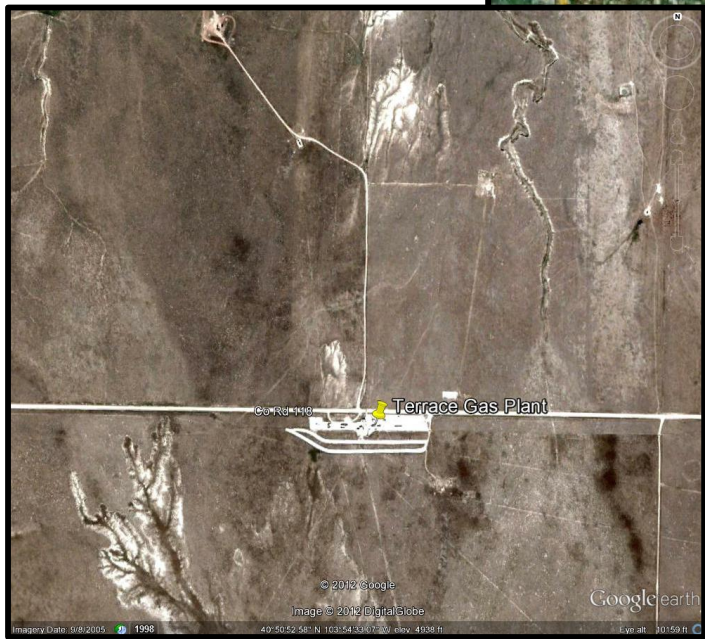
COGCC: Colorado oil and Gas Conservation Commission

**BOLD:** Value exceeds COGCC Cleanup Level

<: Analyte reported below Method Detection limit

## Figures





PROJECT  
NO: 012-0790

DRAWN BY: BB

DATE: 6-14-12

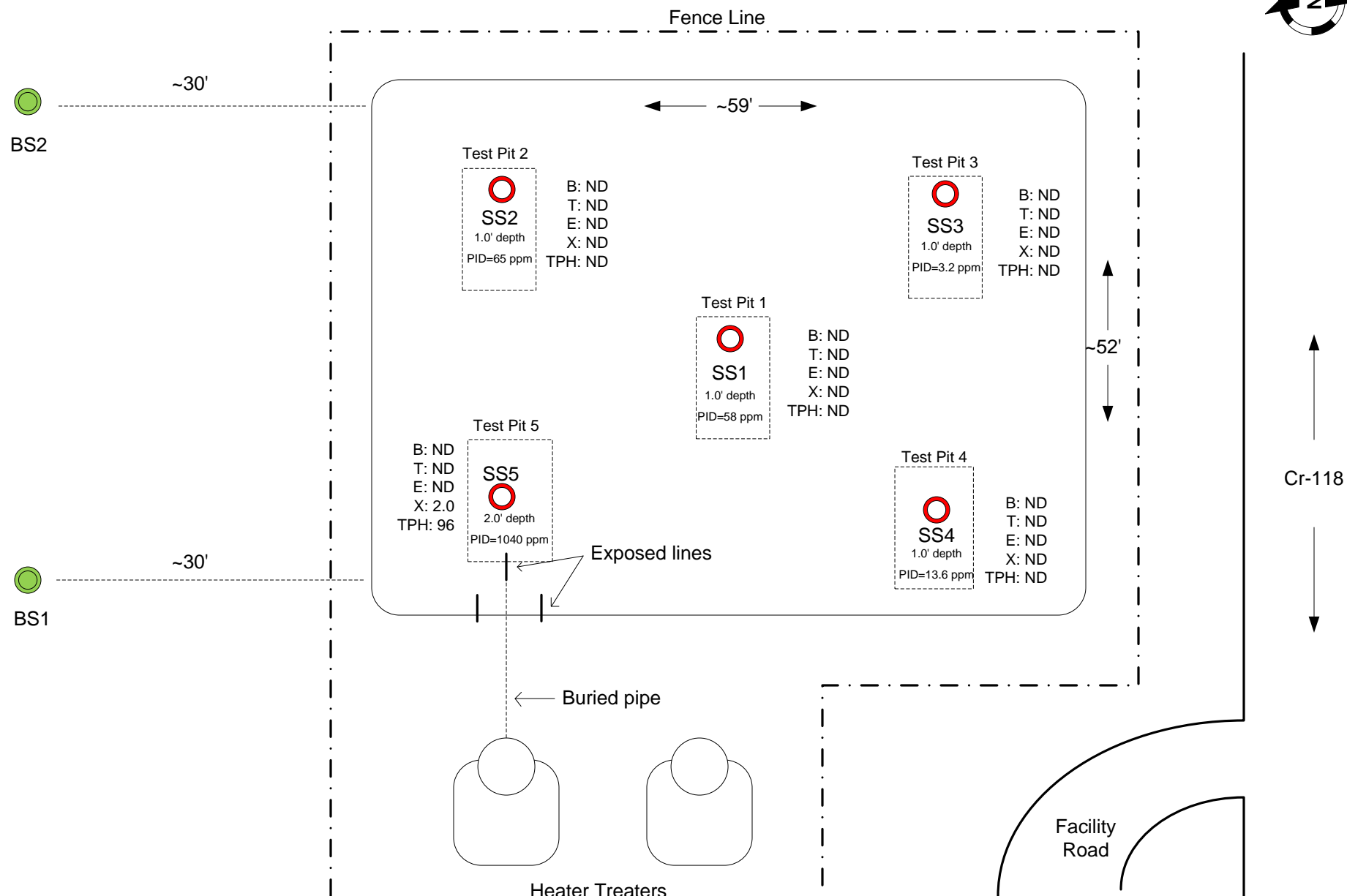
General Location Map of  
Terrace Gas Plant and Kern 43-33 Well  
Whiting Petroleum Corporation



4690 TABLE MOUNTAIN  
DRIVE, SUITE 200  
GOLDEN, CO 80403  
TEL 303.237.2072  
FAX 303.237.2659

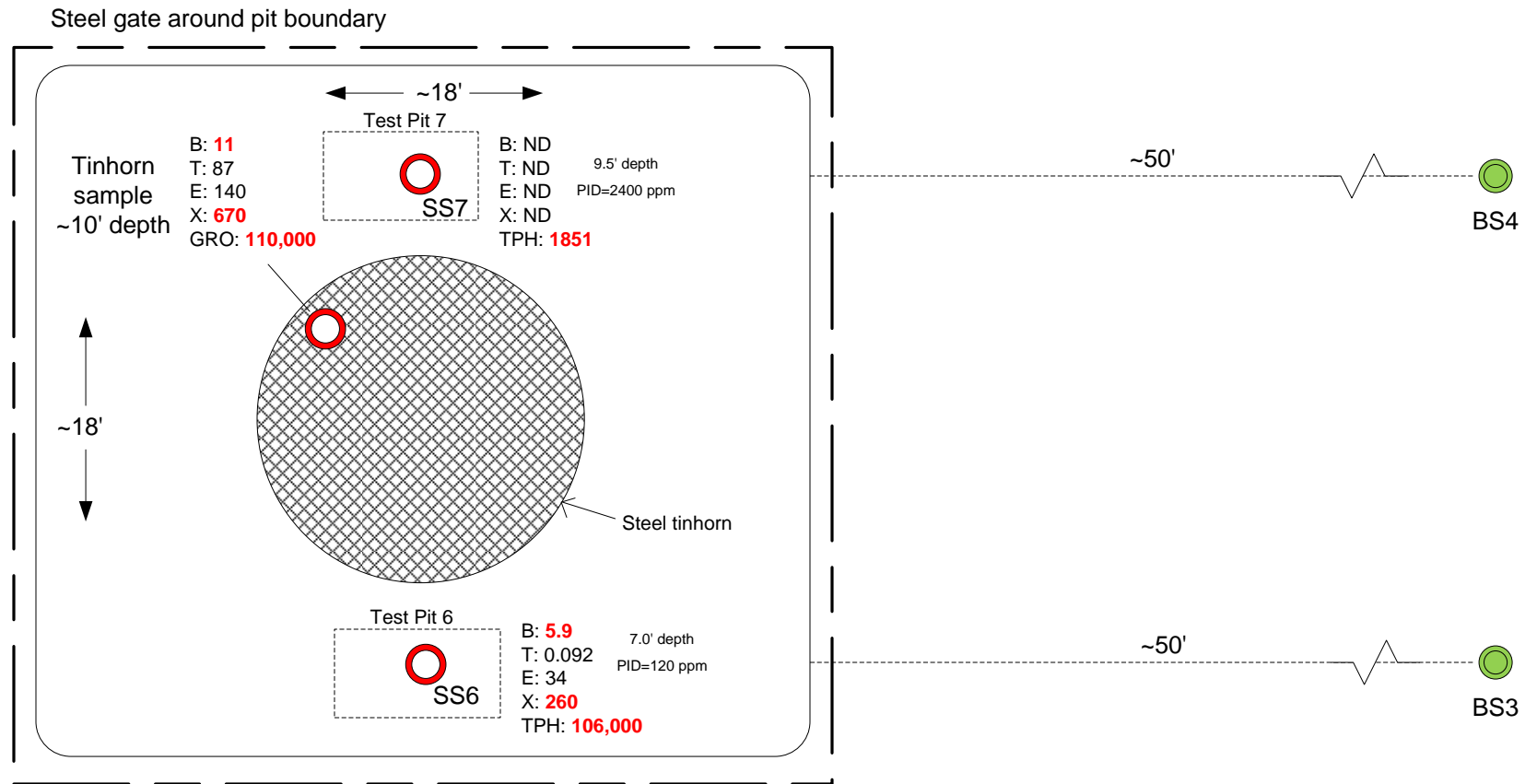
FIGURE 1



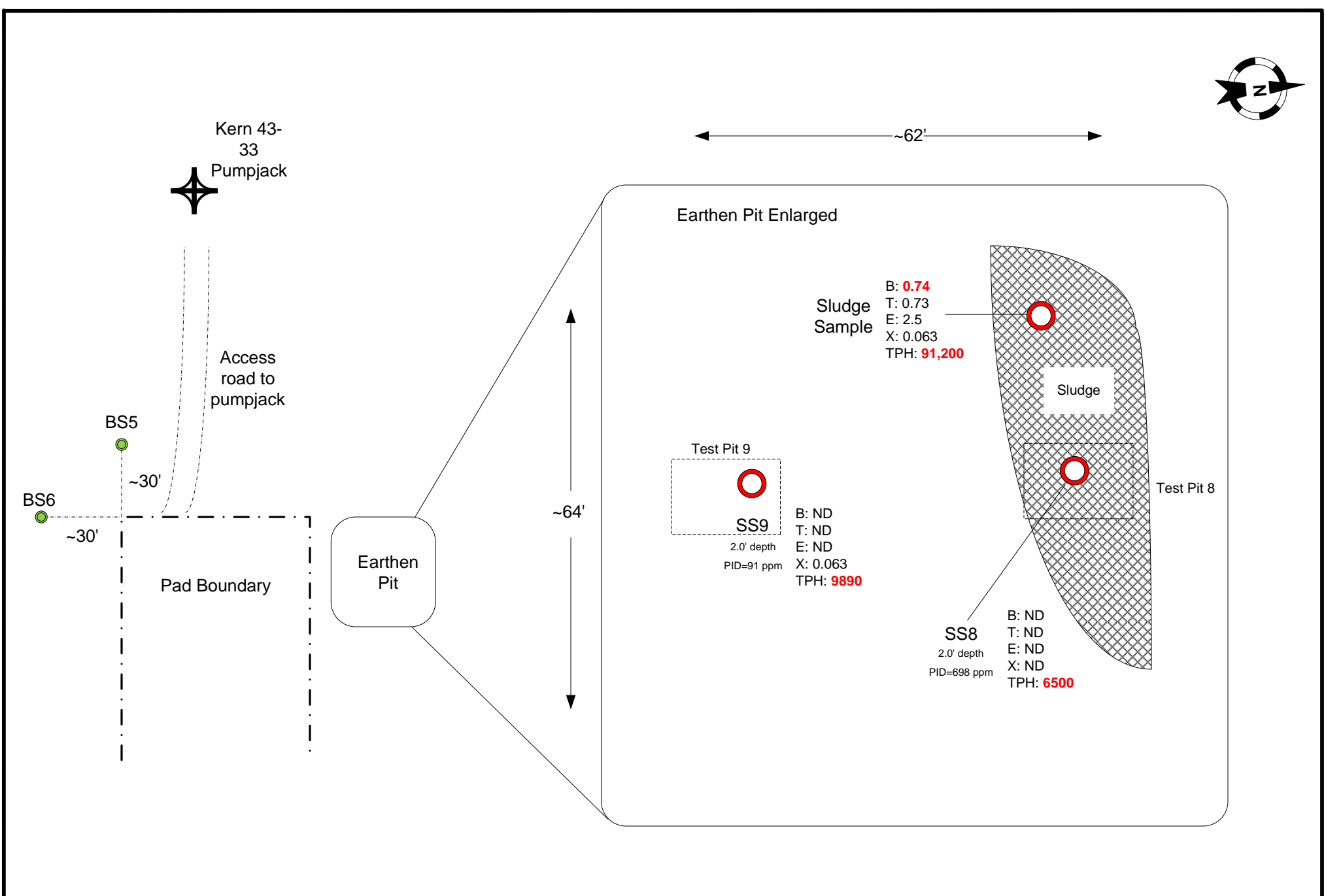


PROJECT NO: 012-0790	Sampling Locations for Pit 1 Terrace Gas Plant Whiting Petroleum Corporation	 4690 TABLE MOUNTAIN DRIVE, SUITE 200 GOLDEN, CO 80403 TEL 303.237.2072 FAX 303.237.2659	LEGEND <div> <div></div> Approx. Soil sampling location  <div></div> Approx. Background soil sampling location          *Analytical values are reported in mg/kg       </div> <div>         B: Benzene          T: Toluene          E: Ethylbenzene          X: Total xylenes          TPH: Total Petroleum Hydrocarbons          ND: Non-detect       </div>		FIGURE 2
DRAWN BY: BB					
DATE: 6-14-12					

← CR-118 →



PROJECT NO: 012-0790	Soil and Tinhorn Sampling Locations for Pit 2 Terrace Gas Plant Whiting Petroleum Corporation		<p>4690 TABLE MOUNTAIN DRIVE, SUITE 200 GOLDEN, CO 80403 TEL 303.237.2072 FAX 303.237.2659</p>	<p><b>LEGEND</b></p> <p>○ Soil sampling location</p> <p>● Background soil sampling location</p> <p>*Analytical values are reported in mg/kg</p> <p>B: Benzene T: Toluene E: Ethylbenzene X: Total xylenes TPH: Total Petroleum Hydrocarbons ND: Non-detect <b>5.9</b>: Above COGCC cleanup level</p>	<b>FIGURE 3</b>
DRAWN BY: BB					
DATE: 6-14-12					



PROJECT NO: 012-0790	Soil Sampling Locations for Pit 3 Kern 43-33 Battery Whiting Petroleum Corporation	 4690 TABLE MOUNTAIN DRIVE, SUITE 200 GOLDEN, CO 80403 TEL 303.237.2072 FAX 303.237.2659	LEGEND <div> <span style="color: red;">●</span> Soil sampling location           <span style="margin-left: 20px;">B: Benzene</span> </div> <div> <span style="color: green;">●</span> Background soil sampling location           <span style="margin-left: 20px;">T: Toluene</span> </div> <div> <span style="color: blue;">●</span> <span style="margin-left: 20px;">E: Ethylbenzene</span> </div> <div> <span style="color: magenta;">●</span> <span style="margin-left: 20px;">X: Total xylenes</span> </div> <div> <span style="color: cyan;">●</span> <span style="margin-left: 20px;">TPH: Total Petroleum Hydrocarbons</span> </div> <div> <span style="color: black;">●</span> <span style="margin-left: 20px;">ND: Non-detect</span> </div> <div> <span style="color: red;">●</span> <span style="margin-left: 20px;">5.9: Above COGCC cleanup level</span> </div>		FIGURE 4
DRAWN BY: BB					
DATE: 6-14-12					

**Appendix A**  
**Health and Safety Plan**

## SITE SAFETY PLAN

PROJECT NAME Whiting Pit Closures PROJECT NUMBER 012-0790

### A. SITE DESCRIPTION

Date Fall 2012 Location Pawnee Grasslands, Weld County, northeast Colorado  
Hazards Driving, Weather, Petroleum Hydrocarbons, Heavy Machinery  
Area affected Three pits located at Terrace Gas Plant (2) and the Kern #43-33 battery (1)  
  
Surrounding population Sparsely populated, rural communities  
Topography Gentle slopes, generally flat  
Weather conditions Extremely variable, 40-95°F, cool mornings, afternoon thunderstorms  
Wind Direction Likely from the northwest  
Additional information

### B. ENTRY OBJECTIVES: The objective of the initial and following entries to the contaminated area is to:

Excavate impacted soil from pits and stock pile onsite, screening soil with a PID, sampling the bottoms and sides of excavations.  
Backfill pits with soil hauled in from off site. Periodic site visits to add nutrients and moisture to soil

### C. ONSITE ORGANIZATION AND COORDINATION: The following personnel are designated to carry out the stated job functions on site. (Note: One person may carry out more than one job function.)

Project Manager	<u>James Hix</u>
Site Safety Officer	<u>Ben Baugh</u>
Field Team Leader	<u>James Hix, Ben Baugh</u>
Field Team Members	<u>James Hix, Ben Baugh, Danielle Pucherelli, Brian Scott, Kevin Taylor</u>

All activities on site must be cleared through the Project Manager or the Site Supervisor.

### D. ONSITE CONTROL

Plant Office has been designated to coordinate access control and security onsite. A safe perimeter has been established at (distance or description of controlled area)

100-200 feet west of Terrace Gas Plant along CR-118 for the pits located at Terrace Gas Plant. 100-200 feet south along CR-79 for the Kern 43-33 battery

No unauthorized person(s) should be within this area.

The onsite Command Post and staging area have been established at

The prevailing wind conditions are from the west. The Command Post is located upwind from the Execution Zone.

Control boundaries have been established and the Exclusion Zone, Contamination Reduction Zone, and Support Zone (clean area).

### E. PREVENTION PROGRAMS AND PERSONAL PROTECTIVE EQUIPMENT: No changes to the specified levels of protection shall be made without the approval of the Site Safety Officer and the Project Manager.



## F. ONSITE WORK PLANS:

Work Task #	Task Objective and Description	Level of Protection
1	Drive to Site (refer to attached "Driving" Job Safety Analysis (JSA))	Level D
2	Excavation of the pits (refer to the attached "Contractor Supervision" JSA)	Level D
3	Soil Sampling (refer to the attached "Sampling at Gas Plants" JSA)	Level D

## G. COMMUNICATION PROCEDURES

Personnel in the Exclusion Zone will be within sight of the Project Team Leader and all personnel will be assigned a cell phone. Personnel will be alerted of an incident that requires evacuation of the work area by verbal command and/or one long air-horn blast . Emergency numbers are as follows:

AGENCY/FACILITY	PHONE #	CONTACT
Police	911	
Fire	911	
Hospital	911	See attached map to hospital in Cheyenne, WY
Ambulance	911	

## **H. Personnel Documentation:**

All site personnel have read above plan and are familiar with its provisions.

Title

Name

Signature

Date

## **I. Site-specific Health and Safety Plan Site Characterization and Analysis Certification**

Olsson & Associate's Health and Safety Officer, Project Manager or Site Safety Officer certifies that a site characterization and analysis has been completed to identify site hazards and develop safety control procedures for site work at various locations in Colorado.

Certification Completed by: \_\_\_\_\_

Date: \_\_\_\_\_

Printed Name and Title: \_\_\_\_\_

Job Safety Analysis Worksheet		Date:
Title of Job/Operation: <b>Contractor Supervision</b>		Log Number:
Employee Name and Job Title:		Analyst/ Date:
Division/Bureau/Section:		Approved By/ Date:
Personal Protective Equipment Recommended or Required: Hat, Sunscreen, Bug repellent, Snake Boots, Chemical deferent gloves (rubber).		
Sequence of Basic Job Steps	Potential Accidents or Hazards	Recommended Safe Job Procedures
Prepare for site visitation	STF	Prepare listing of emergency phone numbers, both on and offsite; complete appropriate training before going on site. Provide appropriate person in district office you itinerary. Familiarize yourself with site prior to visit.
Calibrate Equip.	Exposure to Calgas	Review Equipment manuals. Follow OSHA guidance.
Load Vehicle	Lifting injury	Follow OSHA guidance
Fuel Vehicle	Exposure to Fumes	Employ safe fueling standards. Avoid contact with fuel and fumes.
Drive to/from site	Traffic accidents	Buckle up; Use defensive driving tactics, Obey traffic laws, and keep vehicle in safe operating condition. Observe General Order 7 (EVOC).
Assess the Site	STF	Be alert, watch where you make your steps, wear safety shoes.
Ground Proof Incident	Chemical contact (liquid and vapor), Fire/Explosion/Reactivity, Heat and Severe Weather.	Wear proper PPE, Snake Boots, Insect Repellent, Seek Shelter from Storms, Take Breaks, Monitor conditions, Engineer safeguards apply foam ventilate.
Establish RP action	Hostile RP	Use communication Skills/Buddy System Task contractor if no RP action.
Contractor Oversight		
Supervise container Removal	Chemical exposure (liquid and vapor), Fire/	Avoid chemical exposure, wear proper PPE, snake Boots, Insect repellent, Take breaks, Wear hat, Seek shelter from storms, Engineer safeguards, monitor worker safety, proceed/cease operation.
Enforce Site Safety Plan	Explosion/Reactivity, Heat and Weather, Heavy Equipment/Objects	
Supervise soil or spill excavation	Chemical exposure (liquid and vapor), Heavy Equipment, STF at open excavations, Overhead/underground Utilities (water, sewer, electric), Heat and Weather.	Avoid chemical exposure, Wear proper PPE, Sunscreen, and Bug repellent, Be alert, Stay safe distance, Wear hard hat/steel toed boots, Drink fluids, Take breaks.

Supervise Operation	Sampling	Chemical exposure, Heat and Weather	Avoid chemical exposure, Wear proper PPE, sunscreen, wear hat seek shelter from storms.
Secure Waste/Package for Transport		Chemical exposure and Cleaning Solvents	Avoid chemical exposure, Wear proper PPE.
Exit site  Supervise labeling and securing of containers. Follow DOT Guide for labels and placards. Complete DEP documentation.		Shifting containers can leak	Block all containers

\*Codes for Potential Hazards:

Struck By (SB)		Caught On (CO)		Fall To Below (FB)
Struck Against (SA)		Caught In (CI)		Overexertion
Contacted By (CB)		Caught Between (CBT)		Exposure (E)
Contact With (CW)		Fall - Same Level (FS)		

<b>Job Safety Analysis Worksheet</b>		Date: 5/21/12
Title of Job/Operation: <b>Driving to Jobsite</b>		Review Date:
Employee Name and Job Title: <b>Ben Baugh – Associate Scientist</b>		Analyst/ Date:
<b>Approved By: John Lohner</b>		Approval Date: 5/21/12
Personal Protective Equipment Recommended or Required: Sun glasses		
Sequence of Basic Job Steps	Potential Accidents or Hazards	Recommended Safe Job Procedures
Schedule Vehicle	NA	<ul style="list-style-type: none"> <li>Reserve vehicle and allow time for the trip</li> </ul>
Inspect Vehicle	Slip, trips, and falls (FS) (FW)	<ul style="list-style-type: none"> <li>Shoes with non-skid soles</li> </ul>
Load Vehicle	Overexertion (O)	<ul style="list-style-type: none"> <li>Lift small loads, take multiple trips</li> <li>Use proper lifting techniques</li> <li>Do not store materials or samples in the driver compartment</li> </ul>
Fuel and Maintenance	Fumes, Fire, breakdown (E)	<ul style="list-style-type: none"> <li>Check fuel, oil, tires, lights, breaks, windshield washer fluid</li> <li>Locate emergency shut off switch when fueling</li> <li>No smoking while fueling</li> <li>Adjust seat and mirrors</li> </ul>
Determine Route	Lost, Rush to jobsite (O)	<ul style="list-style-type: none"> <li>Map out directions prior to start of trip</li> </ul>
Drive to Site	Adverse Weather (E)	<ul style="list-style-type: none"> <li>Check weather conditions</li> <li>Ensure good tread on tires</li> <li>Delay trip during adverse weather conditions if possible</li> <li>Remove frost and snow from the vehicle</li> <li>Listen to local weather broadcasts</li> <li>Adjust speeds for the weather conditions</li> <li>Drive with lights on</li> </ul>
	Fatigue (O)	<ul style="list-style-type: none"> <li>Get ample rest prior to the trip</li> <li>Take short breaks</li> <li>At the onset of drowsiness, stop and take a short nap</li> </ul>
	Mechanical (CB) (CW)	<ul style="list-style-type: none"> <li>Maintain the mechanical integrity of the vehicle</li> <li>Check for leaks</li> </ul>
	Human Factor (CB) (CW)	<ul style="list-style-type: none"> <li>Use defensive driving skills and Follow driving laws</li> <li>Stay aware of other vehicles</li> <li>Wear seatbelt</li> <li>Avoid being rushed and allow ample time for the trip</li> <li>Leave proper distance you and the next driver</li> <li>Accessional look 8 vehicles ahead</li> </ul>
	Road Emergency/vehicle breakdown (CB) (CW)	<ul style="list-style-type: none"> <li>Keep vehicle maintained and up-to-date</li> <li>Keep tools and spare tire in vehicle</li> <li>Recommended carrying a fire extinguisher, first aid kit, flashlight, jumper cables, first aid kit, cell phone, blanket, water, emergency food, shovel.</li> </ul>

\*Codes for Potential Hazards:

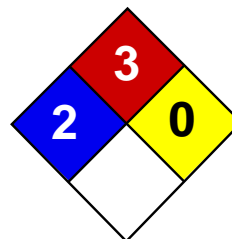
Struck By (SB)		Caught On (CO)		Fall To Below (FB)
Struck Against (SA)		Caught In (CI)		Overexertion (O)
Contacted By (CB)		Caught Between (CBT)		Exposure (E)
Contact With (CW)		Fall - Same Level (FS)		

<b>Job Safety Analysis Worksheet</b>		Date:
Title of Job/Operation: <b>Sampling at Gas Plants</b>		Review Date:
Employee Name and Job Title:		Analyst/ Date:
Approved By:		Approval Date:
Personal Protective Equipment Recommended or Required: Hardhat, safety shoes, eye protection, nitrile or latex gloves, respirator, protective clothing, snow ice/ice cleats, FRC, hearing protection		
<b>Sequence of Basic Job Steps</b>	<b>Potential Accidents or Hazards</b>	<b>Recommended Safe Job Procedures</b>
Arrival at site Meet with representative Assess site conditions Review site emergency procedures	Slips, trips and falls (FS) (FW)	<ul style="list-style-type: none"> <li>Avoid muddy, wet, icy, and slippery areas</li> </ul>
Commuting onsite	Exposure to vehicles and traffic (SB)	<ul style="list-style-type: none"> <li>Be attentive to vehicle traffic</li> <li>Give vehicles and heavy equipment the right-of-way</li> <li>Avoid standing between vehicles.</li> </ul>
Sampling	Exposure to confined spaces (E)	<ul style="list-style-type: none"> <li><u>Do not enter the confined space.</u> Notify the area Team Leader and the Corporate Safety and Health officer for instruction</li> </ul>
	Biological hazards (e.g. Bees, Wasps, Mosquitoes, Rodents, Birds and, Snakes) (E)	<ul style="list-style-type: none"> <li>Identify allergies of co-workers, use mosquitoes repellent on exposed skin surfaces during active mosquito season</li> <li>Avoid areas of accumulated animal and bird droppings</li> <li>Avoid contact with spiders</li> <li>Snakes and insects including areas of habitation</li> </ul>
	Environmental (E)	<ul style="list-style-type: none"> <li>Review MSDS if available</li> <li>Identify the hazardous material exposure and determine the level of personal protective equipment necessary for protection</li> <li>Wear the proper personal protective equipment appropriate for exposure conditions before sampling</li> <li>Store chemical samples in appropriate containers.</li> </ul>
	Fire (CB) (CW)	<ul style="list-style-type: none"> <li>Locate fire extinguishers, wear FRC on sites where highly flammable materials are present, and store flammables in approved containers</li> <li>Review site emergency action plans and procedures</li> </ul>
	Heat Stress and sunburns (E)	<ul style="list-style-type: none"> <li>Drink ample fluids before and during work avoiding caffeinated drinks</li> <li>Wear sunscreen of at least sun protection factor (SPF) of 15 on exposed skin areas</li> <li>Wear loose clothing, and avoid working in the heat of the day</li> </ul>
	Cold Stress (E)	<ul style="list-style-type: none"> <li>Wear winter clothing and gloves</li> <li>Dress in loose layers of dry clothing with wool underneath and water proof top layer</li> <li>Avoid getting wet</li> <li>Change clothing immediately if you get wet</li> <li>Take warm-up breaks and avoid consuming caffeine drinks</li> </ul>
	Noise (E)	<ul style="list-style-type: none"> <li>Use hearing protection as appropriate</li> </ul>

	Contamination (E)	<ul style="list-style-type: none"> <li>Wash hands promptly, dispose of contaminated PPE (booties, latex or nitrile gloves, respirator cartridge)</li> </ul>
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\*Codes for Potential Hazards:

Struck By (SB)		Caught On (CO)		Fall To Below (FB)
Struck Against (SA)		Caught In (CI)		Overexertion (OE)
Contacted By (CB)		Caught Between (CBT)		Exposure (E)
Contact With (CW)		Fall - Same Level (FS)		



Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet

### Benzene MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Benzene

**Catalog Codes:** SLB1564, SLB3055, SLB2881

**CAS#:** 71-43-2

**RTECS:** CY1400000

**TSCA:** TSCA 8(b) inventory: Benzene

**CI#:** Not available.

**Synonym:** Benzol; Benzine

**Chemical Name:** Benzene

**Chemical Formula:** C<sub>6</sub>H<sub>6</sub>

#### Contact Information:

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

##### Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

**Toxicological Data on Ingredients:** Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

#### Section 3: Hazards Identification

##### Potential Acute Health Effects:

Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

##### Potential Chronic Health Effects:

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. **MUTAGENIC EFFECTS:** Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures



**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 497.78°C (928°F)

**Flash Points:** CLOSED CUP: -11.1°C (12°F). (Setaflash)

**Flammable Limits:** LOWER: 1.2% UPPER: 7.8%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

**Special Remarks on Fire Hazards:**

Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powerful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

**Special Remarks on Explosion Hazards:**

Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid ( or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:**

Aromatic. Gasoline-like, rather pleasant. (Strong.)

**Taste:** Not available.

**Molecular Weight:** 78.11 g/mole

**Color:** Clear Colorless. Colorless to light yellow.

**pH (1% soln/water):** Not available.

**Boiling Point:** 80.1 (176.2°F)

**Melting Point:** 5.5°C (41.9°F)

**Critical Temperature:** 288.9°C (552°F)

**Specific Gravity:** 0.8787 @ 15 C (Water = 1)

**Vapor Pressure:** 10 kPa (@ 20°C)

**Vapor Density:** 2.8 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 4.68 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 2.1

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:**

Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatibles.

**Incompatibility with various substances:** Highly reactive with oxidizing agents, acids.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid ( or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

**Chronic Effects on Humans:**

**CARCINOGENIC EFFECTS:** Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. **MUTAGENIC EFFECTS:** Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

**Other Toxic Effects on Humans:**

Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia)) Human: passes the placental barrier, detected in maternal milk.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism, and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Benzene UNNA: 1114 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:35 PM

**Last Updated:** 11/01/2010 12:00 PM

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# Material Safety Data Sheet

## NATURAL GAS CONDENSATE

April 28, 1995

PHILLIPS PETROLEUM COMPANY  
Bartlesville, Oklahoma 74004

### PHONE NUMBERS

Emergency: (918) 661-8118

General MSDS Information:

(918) 661-8327

For Additional MSDSs: (918) 661-5952

## A. Product Identification

Synonyms: Drip; Hydrocarbon gas drip; Gas drip

Chemical Name: Natural gas condensate

Chemical Family: Mixture

Chemical Formula: Mixture

CAS Reg. No.: 68919-39-1

Product No.: Not Established

Product and/or Components Entered on EPA's TSCA Inventory: YES

This product is in U.S. commerce, and is listed in the Toxic Substances Control Act (TSCA) Inventory of Chemicals; hence, it may be subject to applicable TSCA provisions and restrictions.

## B. Components

Ingredients	CAS Number	% By Wt.	OSHA PEL	ACGIH TLV
-------------	---------------	-------------	-------------	--------------

Hydrogen sulfide	7783-06-4	0-20	10 ppm	10 ppm
C2 Hydrocarbons (As ethane)	Various	0-5	NE	Simple
Asphyxiant				
C3 Hydrocarbons (As propane)	Various	0-15	1000 ppm	Simple
Asphyxiant				
C4 Hydrocarbons (As butane)	Various	0-45	800 ppm	800 ppm
C5 Hydrocarbons (As pentane)	Various	5-70	600 ppm	600 ppm
C6 Hydrocarbons (As n-hexane)	Various	25-95	50 ppm(1)	50 ppm(1)
may include: Cyclohexane	110-82-7	NE	300 ppm	300 ppm
C7 Hydrocarbons (As heptane)	Various	25-95	400 ppm	400 ppm
C8 Hydrocarbons (As octane)	Various	25-95	300 ppm	300 ppm
Aromatic Hydrocarbons	Various	0-10	NE	NE
may include: Benzene	71-43-2	NE	1 ppm(2)	10 ppm
Toluene	108-88-3	NE	100 ppm	100 ppm
Mixed xylene	1330-20-7	NE	100 ppm	100 ppm
Ethylbenzene	100-41-4	NE	100 ppm	100 ppm

(1) As n-Hexane. As Hexane isomers 500 ppm.

(2) Areas exempted by the Benzene Standard, 29 CFR 1910.1028, will have a 10 ppm 8 hour TWA.

## C. Personal Protection Information

Ventilation: Use adequate ventilation to control exposure below recommended levels.

Respiratory Protection: For concentrations exceeding the recommended exposure level, use NIOSH/MSHA approved air supplied respirator. In case of spill or leak resulting in unknown concentrations, use NIOSH/MSHA approved supplied air respirator.

Eye Protection: Use chemical goggles.

Skin Protection: Use full-body, long-sleeved garments. Use polyvinyl alcohol or Buna-N gloves.

NOTE: Personal protection information shown in Section C is based upon general information as to normal uses and conditions. Where special or unusual uses or conditions exist, it is suggested that the expert assistance of an industrial hygienist or other qualified professional be sought.

## D. Handling and Storage Precautions

Do not get in eyes, on skin or on clothing. Do not breathe vapor, mist, fume or dust. May be harmful. Proper personal protective equipment must be used when handling this chemical. Launder contaminated clothing before reuse. Wash thoroughly after handling. Use only with adequate ventilation. Do not swallow. May be aspirated into lungs.

Store in a well-ventilated area. Store in tightly closed container. Keep away from heat, sparks, and flames. Bond and ground during transfer.

---

## E. Reactivity Data

Stability:	Stable
Conditions to Avoid:	Not Applicable
Incompatibility (Materials to Avoid):	Oxygen and strong oxidizing materials
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid:	Not Applicable
Hazardous Decomposition Products:	Carbon oxides and various hydrocarbons formed when burned. Sulfur oxides may be formed if hydrogen sulfide is present.

---

## F. Health Hazard Data

### Recommended Exposure Limits:

See Section B.



## Acute Effects of Overexposure:

Eye: May cause irritation including pain, blurred vision, redness, tearing and superficial corneal turbidity.

Skin: May cause slight irritation. Extreme exposure may produce discoloration, muscle weakness, breathing difficulties and other central nervous system effects.

Inhalation: Toxic by this route of exposure. May cause nausea, diarrhea, loss of appetite, dizziness, disorientation, headache, excitation, rapid respiration, drowsiness, labored breathing, anesthesia and other central nervous system effects. Hydrogen sulfide may cause lung paralysis and asphyxiation. Extreme overexposure may cause rapid unconsciousness and respiratory arrest.

Ingestion: May be mildly irritating to intestines. If swallowed, may be aspirated resulting in inflammation and possible fluid accumulation in the lungs.

## Subchronic and Chronic Effects of Overexposure:

Benzene has been designated as a carcinogen by the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), and the Occupational Safety and Health Administration (OSHA). Benzene may produce blood changes which include reduced platelets, reduced red blood cells, reduced white blood cells, aplastic anemia, and acute nonlymphocytic leukemia. Benzene has produced fetal death in laboratory animals and caused chromosome changes in humans and mutation changes in cells of other organisms.

Chronic high level n-hexane exposure damages the nervous system initially producing a lack of feeling in the extremities and possibly progressing to a more severe nerve damage.

Inhalation of high levels (1000 and 5000 ppm) of n-hexane has produced testicular damage in rats. Mice exposed to the same dose levels showed no testicular effects.

## Other Health Effects:

The odor of hydrogen sulfide may not be recognized after prolonged inhalation due to paralysis of the sense of smell. Effects from inhaling the fume may lead to chronic bronchitis, respiratory irritation, increased loss of pulmonary function, and tearing of the eyes.

Some isoparaffins have produced kidney damage in male rats only. No comparable kidney disease is known to occur in humans.

## Health Hazard Categories:

	Animal	Human		Animal	Human
Known Carcinogen	<u>  X  </u>	<u>  X  </u>	Toxic	<u>  X  </u>	<u>      </u>
Suspect Carcinogen	<u>      </u>	<u>      </u>	Corrosive	<u>      </u>	<u>      </u>
Mutagen	<u>  X  </u>	<u>      </u>	Irritant	<u>      </u>	<u>      </u>
Teratogen	<u>      </u>	<u>      </u>	Target Organ Toxin	<u>  X  </u>	<u>  X  </u>
Allergic Sensitizer	<u>      </u>	<u>      </u>	Specify - Nerve Toxin; Liver and Kidney		
Highly Toxic	<u>      </u>	<u>      </u>	Toxin; Lung-Aspiration Hazard		

## First Aid and Emergency Procedures:

**Eye:** Flush eyes with running water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

**Skin:** Wash skin with soap and water for at least fifteen minutes. If irritation or adverse symptoms develop, seek medical attention.

**Inhalation:** Immediately remove from exposure. If breathing is difficult, give oxygen. If breathing ceases, administer artificial respiration followed by oxygen. Seek immediate medical attention.

**Ingestion:** Do not induce vomiting. Seek immediate medical attention.

**Note to Physician:** Gastric lavage using a cuffed endotracheal tube may be performed at your discretion.

---

## G. Physical Data

Appearance:	Colorless to dark liquid
Odor:	Rotten egg odor if hydrogen sulfide is present.
Boiling Point:	Not Established
Vapor Pressure:	< 40 psia @ 70F (21C) (Estimated)
Vapor Density (Air = 1):	>1
Solubility in Water:	Negligible
Specific Gravity (H2O = 1):	0.5-0.7 (Estimated)
Percent Volatile by Volume:	100
Evaporation Rate (Butyl Acetate = 1):	>1
Viscosity:	< 40 SUS @ 68F (20C)

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## H. Fire and Explosion Data

Flash Point (Method Used):	<-100F (<-73C)(Estimated)
Flammable Limits (% by Volume in Air):	LEL - Not Established UEL - Not Established
Fire Extinguishing Media:	Dry chemical, foam or carbon dioxide (CO2)
Special Fire Fighting Procedures:	Evacuate area of all unnecessary personnel. Use NIOSH/MSHA approved self-contained breathing apparatus and other protective equipment and/or garments described in Section C if conditions warrant. Shut off source, if possible. Water fog or spray may be used to cool exposed equipment and containers. Allow fire to burn until gas flow is shut off, if possible.
Fire and Explosion Hazards:	Carbon oxides and possibly sulfur oxides formed when burned. Highly flammable vapors which are heavier than air may accumulate in low areas and/or spread along

ground away from handling site.

---

## I. Spill, Leak and Disposal Procedures

### Precautions Required if Material is Released or Spilled:

Evacuate area of all unnecessary personnel. Wear protective equipment and/or garments described in Section C if exposure conditions warrant. Shut off source, if possible. Protect from ignition. Ventilate area thoroughly.

Waste Disposal (Insure Conformity with all Applicable Disposal Regulations):  
Incinerate or otherwise manage at a RCRA permitted waste management facility.

---

## J. DOT Transportation

For Natural Gas Condensate with an IBP < 68F

Shipping Name: Hydrocarbon gases mixtures, liquefied, n.o.s.  
(contains Propanes and Butanes)

Hazard Class: 2.1 (Flammable gas)

ID Number: UN 1965

Packing Group: Not applicable

Marking: Hydrocarbon gases mixtures, liquefied,, n.o.s.  
(contains Propanes and Butanes), UN 1965, RQ\*

Label: Flammable gas

Placard: Flammable gas/1965

Hazardous Substance/RQ: Benzene/10#; Toluene/1000#; Cyclohexane/1000#;  
Xylene/1000#; Ethylbenzene/1000#

Shipping Description: Hydrocarbon gases mixtures, liquefied, n.o.s.  
(contains Propanes and Butanes), 2.1  
(Flammable gas), UN 1965, RQ\*

Packaging References: 49 CFR 173.304, 173.306, 173.314, 173.315

\*Enter the letters "RQ" and the name of the hazardous substance as shown only if the hazardous substance is present in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) shown for the hazardous substance.

For Natural Gas Condensate with an IBP > 68F

Shipping Name: Natural gasoline

Hazard Class: 3 (Flammable liquid)  
ID Number: UN 1257  
Packing Group: I (if IBP < 95F) or II (if IBP > 95F)  
Marking: Natural gasoline, Un 1257, RQ\*  
Label: Flammable liquid  
Placard: Flammable liquid/1257  
Hazardous Substance/RQ: Benzene/10#; Toluene/1000#; Cyclohexane/1000#;  
Xylene/1000#; Ethylbenzene/1000#  
Shipping Description: Natural gasoline, 3 (Flammable liquid),  
UN 1257, PG I or II, RQ\*  
Packaging References: 49 CFR 173.150, 173.201, 173.202, 173.242, 173.243

\*Enter the letters "RQ" and the name of the hazardous substance as shown only if the hazardous substance is present in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) shown for the hazardous substance.

---

## K. RCRA Classification - Unadulterated Product as a Waste

Ignitable (D001)

Prior to disposal, consult your environmental contact to determine if TCLP (Toxicity Characteristic Leaching Procedure, EPA Test Method 1311) is required. Reference 40 CFR Part 261.

---

## L. Protection Required for Work on Contaminated Equipment

Contact immediate supervisor for specific instructions before work is initiated. Wear protective equipment and/or garments described in Section C if exposure conditions warrant.

---

## M. Hazard Classification

  X   This product meets the following hazard definition(s) as defined by

the Occupational Safety and Health Hazard Communication Standard (29 CFR Section 1910.1200):

<input type="checkbox"/> Combustible Liquid	<input type="checkbox"/> Flammable Aerosol	<input type="checkbox"/> Oxidizer
<input type="checkbox"/> Compressed Gas	<input type="checkbox"/> Explosive	<input type="checkbox"/> Pyrophoric
<input type="checkbox"/> Flammable Gas	<input checked="" type="checkbox"/> Health Hazard (Section F)	<input type="checkbox"/> Unstable
<input checked="" type="checkbox"/> Flammable Liquid	<input type="checkbox"/> Organic Peroxide	<input type="checkbox"/> Water Reactive
<input type="checkbox"/> Flammable Solid		

☐ Based on information presently available, this product does not meet any of the hazard definitions of 29 CFR Section 1910.1200.

---

## N. Additional Comments

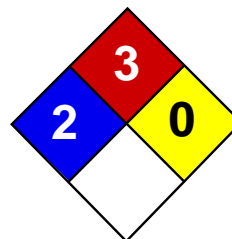
SARA 313

This product contains the following chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. (See Section B).

Hexane  
Benzene  
Toluene  
Mixed xylene  
Ethylbenzene  
Cyclohexane

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet

### Toluene MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Toluene

**Catalog Codes:** SLT2857, SLT3277

**CAS#:** 108-88-3

**RTECS:** XS5250000

**TSCA:** TSCA 8(b) inventory: Toluene

**CI#:** Not available.

**Synonym:** Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

**Chemical Name:** Toluene

**Chemical Formula:** C<sub>6</sub>H<sub>5</sub>-CH<sub>3</sub> or C<sub>7</sub>H<sub>8</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Toluene	108-88-3	100

**Toxicological Data on Ingredients:** Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 480°C (896°F)

**Flash Points:** CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

**Flammable Limits:** LOWER: 1.1% UPPER: 7.1%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:**

Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N<sub>2</sub>O<sub>4</sub>; AgClO<sub>4</sub>; BrF<sub>3</sub>; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.



**Large Spill:**

Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

**Section 7: Handling and Storage****Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

**Storage:**

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m<sup>3</sup>) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Liquid.

**Odor:** Sweet, pungent, Benzene-like.

**Taste:** Not available.

**Molecular Weight:** 92.14 g/mole

**Color:** Colorless.

**pH (1% soln/water):** Not applicable.

**Boiling Point:** 110.6°C (231.1°F)

**Melting Point:** -95°C (-139°F)

**Critical Temperature:** 318.6°C (605.5°F)

**Specific Gravity:** 0.8636 (Water = 1)

**Vapor Pressure:** 3.8 kPa (@ 25°C)

**Vapor Density:** 3.1 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 1.6 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 2.7

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether, acetone.

**Solubility:**

Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources (flames, sparks, static), incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

**Special Remarks on Chronic Effects on Humans:**

Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Causes mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abrasions. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia, ), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophosphatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

## Section 12: Ecological Information

### Ecotoxicity:

Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

**BOD5 and COD:** Not available.

### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** : Toluene UNNA: 1294 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

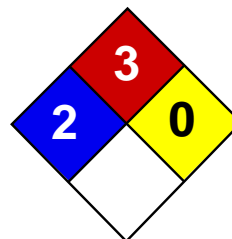
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:30 PM

**Last Updated:** 11/01/2010 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet

### Xylenes MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Xylenes

**Catalog Codes:** SLX1075, SLX1129, SLX1042, SLX1096

**CAS#:** 1330-20-7

**RTECS:** ZE2100000

**TSCA:** TSCA 8(b) inventory: Xylenes

**CI#:** Not available.

**Synonym:** Xylenes; Dimethylbenzene; xylol; methyltoluene

**Chemical Name:** Xylenes (o-, m-, p- isomers)

**Chemical Formula:** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Xylenes	1330-20-7	100

**Toxicological Data on Ingredients:** Xylenes: ORAL (LD50): Acute: 4300 mg/kg [Rat]. 2119 mg/kg [Mouse]. DERMAL (LD50): Acute: >1700 mg/kg [Rabbit].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:** Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 464°C (867.2°F)

**Flash Points:** CLOSED CUP: 24°C (75.2°F). (Tagliabue.) OPEN CUP: 37.8°C (100°F).

**Flammable Limits:** LOWER: 1% UPPER: 7%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>).

**Fire Hazards in Presence of Various Substances:**

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of heat.

**Fire Fighting Media and Instructions:**

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

**Special Remarks on Fire Hazards:** Vapors may travel to source of ignition and flash back.

**Special Remarks on Explosion Hazards:**

Vapors may form explosive mixtures with air. Containers may explode when heated. May polymerize explosively when heated. An attempt to chlorinate xylene with 1,3-Dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin) caused a violent explosion

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

### Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

TWA: 100 (ppm) [Canada] TWA: 435 (mg/m<sup>3</sup>) [Canada] TWA: 434 STEL: 651 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States]  
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Sweetish.

**Taste:** Not available.

**Molecular Weight:** 106.17 g/mole

**Color:** Colorless. Clear

**pH (1% soln/water):** Not available.

**Boiling Point:** 138.5°C (281.3°F)

**Melting Point:** -47.4°C (-53.3°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 0.864 (Water = 1)

**Vapor Pressure:** 0.9 kPa (@ 20°C)

**Vapor Density:** 3.7 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 1 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil;  $\log(\text{oil/water}) = 3.1$

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**

Insoluble in cold water, hot water. Miscible with absolute alcohol, ether, and many other organic liquids.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, ignition sources, incompatibles

**Incompatibility with various substances:** Reactive with oxidizing agents, acids.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Store away from acetic acid, nitric acid, chlorine, bromine, and fluorine.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2119 mg/kg [Mouse]. Acute dermal toxicity (LD50): >1700 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5000 4 hours [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS).

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:**

Lowest Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Man] - Route: Oral; Dose: 10000 ppm/6H

**Special Remarks on Chronic Effects on Humans:**

Detected in maternal milk in human. Passes through the placental barrier in animal. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects (male and female fertility (spontaneous abortion and fetotoxicity)) and birth defects based animal data.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation. Can be absorbed through skin. Eyes: Causes eye irritation. Inhalation: Vapor causes respiratory tract and mucous membrane irritation. May affect central nervous system and behavior (General anesthetic/CNS depressant with effects including headache, weakness, memory loss, irritability, dizziness, giddiness, loss of coordination and judgement, respiratory depression/arrest or difficulty breathing, loss of appetite, nausea, vomiting, shivering, and possible coma and death). May also affects blood, sense organs, liver, and peripheral nerves. Ingestion: May cause gastrointestinal irritation including abdominal pain, vomiting, and nausea. May also affect liver and urinary system/kidneys. May cause effects similar to those of acute inhalation. Chronic Potential Health Effects: Chronic inhalation may affect the urinary system (kidneys) blood (anemia), bone marrow (hyperplasia of bone marrow) brain/behavior/Central Nervous system. Chronic inhalation may also cause mucosal bleeding. Chronic ingestion may affect the liver and metabolism (loss of appetite) and may affect urinary system (kidney damage)



## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification :** Xylenes UNNA: 1307 PG: III

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Connecticut hazardous material survey.: Xylenes Illinois chemical safety act: Xylenes New York acutely hazardous substances: Xylenes Rhode Island RTK hazardous substances: Xylenes Pennsylvania RTK: Xylenes Minnesota: Xylenes Michigan critical material: Xylenes Massachusetts RTK: Xylenes Massachusetts spill list: Xylenes New Jersey: Xylenes New Jersey spill list: Xylenes Louisiana spill reporting: Xylenes California Director's List of Hazardous Substances: Xylenes TSCA 8(b) inventory: Xylenes SARA 302/304/311/312 hazardous chemicals: Xylenes SARA 313 toxic chemical notification and release reporting: Xylenes CERCLA: Hazardous substances.: Xylenes: 100 lbs. (45.36 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

**DSCL (EEC):**

R10- Flammable. R21- Harmful in contact with skin. R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

**HMIS (U.S.A.):**

**Health Hazard:** 2

**Fire Hazard:** 3

**Reactivity:** 0

**Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

**Health:** 2

**Flammability:** 3

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 12:54 PM

**Last Updated:** 11/01/2010 12:00 PM

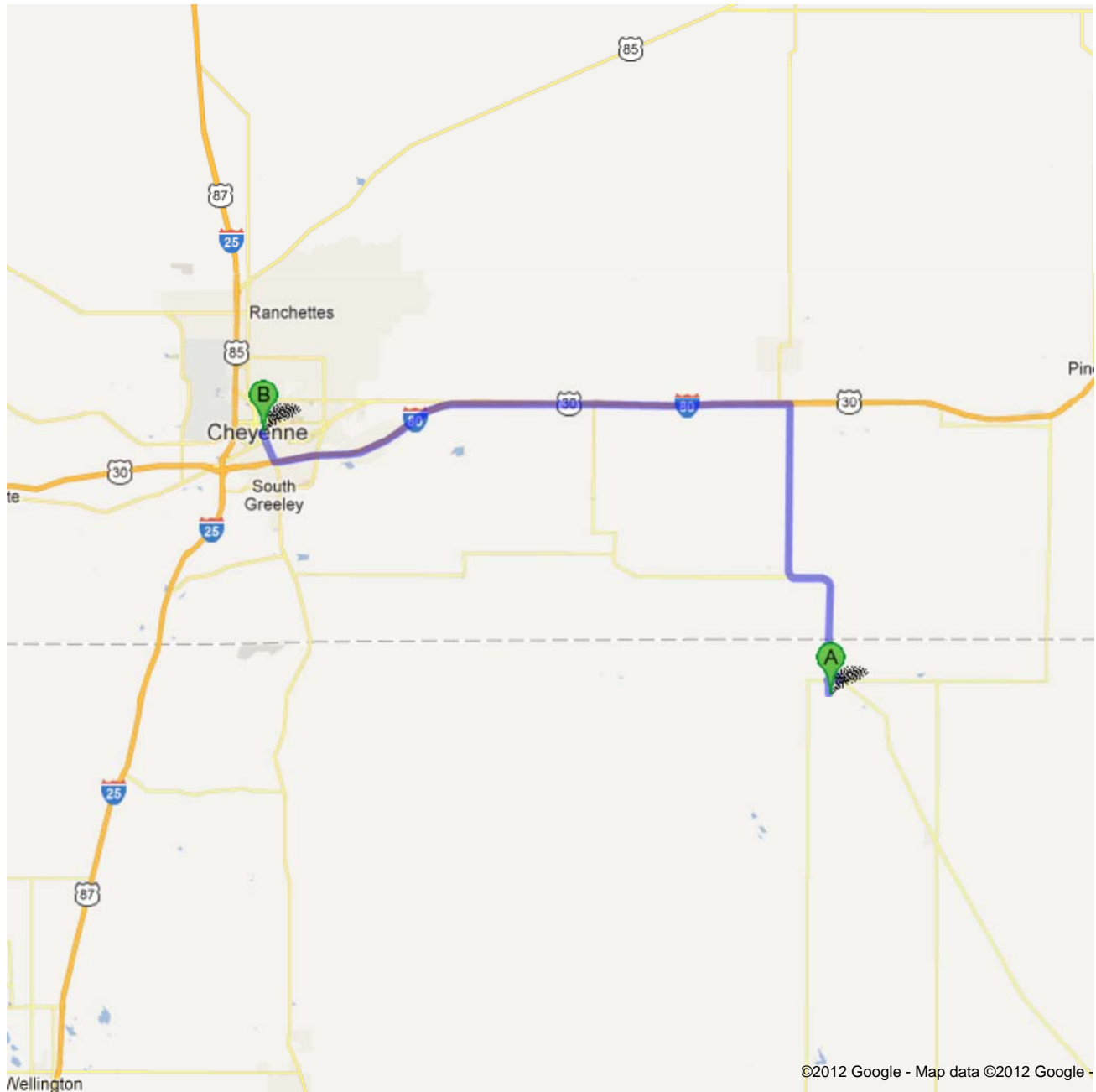
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**Directions to Cheyenne Regional Medical Center**

214 East 23rd Street, Cheyenne, WY 82001 - (307) 634-2273

**41.9 mi** – about **51 mins**

From Kern 43-33





## Co Rd 79

- |  |   |                             |
|--|---|-----------------------------|
|  | 1. Head <b>north</b> on <b>Co Rd 79</b> toward <b>Co Rd 136</b><br>About 2 mins   | go 0.6 mi<br>total 0.6 mi   |
|  | 2. Turn right onto <b>Co Rd 136</b><br>About 2 mins   | go 0.6 mi<br>total 1.3 mi   |
|  | 3. Sharp left onto <b>Co Rd 390</b><br>About 2 mins   | go 0.8 mi<br>total 2.1 mi   |
|  | 4. Continue onto <b>Co Rd 79</b><br>Entering Wyoming<br>About 3 mins  | go 1.4 mi<br>total 3.5 mi   |
|  | 5. Continue onto <b>Carpenter South Rd/Co Rd 151</b><br>About 4 mins  | go 2.5 mi<br>total 5.9 mi   |
|  | 6. Keep left at the fork<br>About 1 min   | go 0.5 mi<br>total 6.5 mi   |
|  | 7. Continue onto <b>Co Rd 203</b><br>About 2 mins   | go 1.4 mi<br>total 7.9 mi   |
|  | 8. Slight right onto <b>WY-214 N/Carpenter Rd/Co Rd 149</b><br>Continue to follow WY-214 N/Carpenter Rd<br>About 9 mins               | go 8.1 mi<br>total 16.0 mi  |
|  | 9. Turn left onto the ramp to <b>Cheyenne</b><br>About 1 min  | go 0.2 mi<br>total 16.2 mi  |
|  | 10. Merge onto <b>I-80 W</b><br>About 22 mins   | go 23.8 mi<br>total 40.0 mi |
|  | 11. Take exit <b>362</b> to merge onto <b>I-180 N/US-85 N</b> toward <b>Central Ave</b><br>Continue to follow US-85 N<br>About 4 mins | go 1.8 mi<br>total 41.9 mi  |
|  | 12. Turn right onto <b>E 23rd St</b><br>Destination will be on the left   | go 52 ft<br>total 41.9 mi   |

**Cheyenne Regional Medical Center**

214 East 23rd Street, Cheyenne, WY 82001 - (307) 634-2273

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

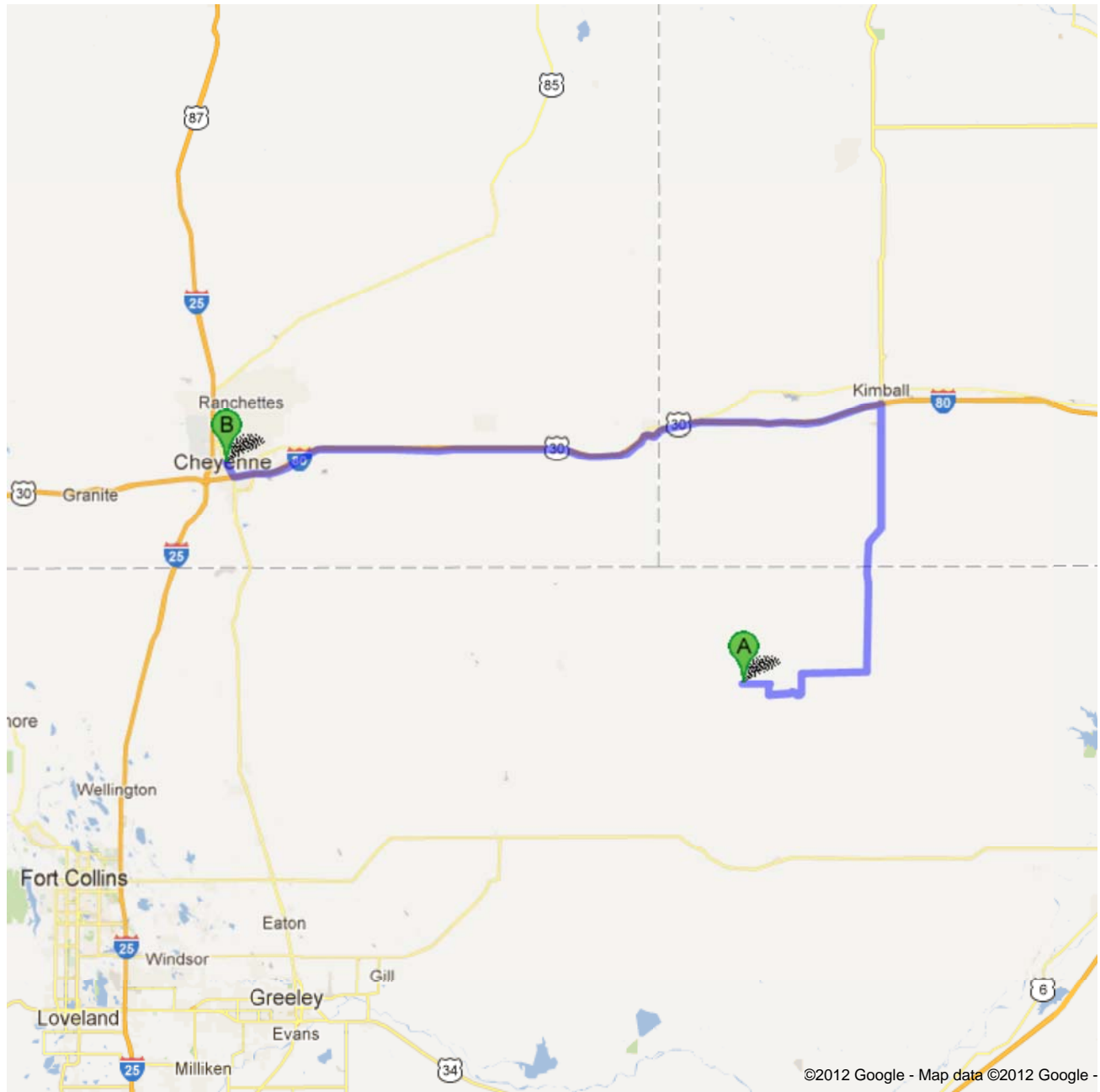
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**Directions to Cheyenne Regional Medical Center**

214 East 23rd Street, Cheyenne, WY 82001 - (307) 634-2273

**103 mi** – about **2 hours 25 mins**  
From Terrace Gas Plant



**Co Rd 118**

- |  |  |                             |
|--|--|-----------------------------|
| 1.   | Head <b>east</b> on <b>Co Rd 118</b> toward <b>Co Rd 127</b><br>About 10 mins  | go 2.5 mi<br>total 2.5 mi   |
|   | 2. Turn right onto <b>Co Rd 127</b><br>About 4 mins  | go 1.0 mi<br>total 3.6 mi   |
|   | 3. Take the 1st left onto <b>Co Rd 116</b><br>About 13 mins  | go 3.2 mi<br>total 6.8 mi   |
|   | 4. Turn left onto <b>Co Rd 133</b><br>About 8 mins   | go 2.0 mi<br>total 8.8 mi   |
| 5.   | Continue onto <b>Co Rd 120</b><br>About 23 mins  | go 6.0 mi<br>total 14.8 mi  |
|   | 6. Turn left onto <b>NE-71 N/CO-71 N/Co Rd 145</b><br>Continue to follow NE-71 N<br>Entering Nebraska<br>About 26 mins               | go 25.0 mi<br>total 39.8 mi |
|   | 7. Turn left to merge onto <b>I-80 W</b><br>Entering Wyoming<br>About 57 mins  | go 61.1 mi<br>total 101 mi  |
|   | 8. Take exit <b>362</b> to merge onto <b>I-180 N/US-85 N</b> toward <b>Central Ave</b><br>Continue to follow US-85 N<br>About 4 mins | go 1.8 mi<br>total 103 mi   |
|  | 9. Turn right onto <b>E 23rd St</b><br>Destination will be on the left   | go 52 ft<br>total 103 mi    |

**Cheyenne Regional Medical Center**

214 East 23rd Street, Cheyenne, WY 82001 - (307) 634-2273

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