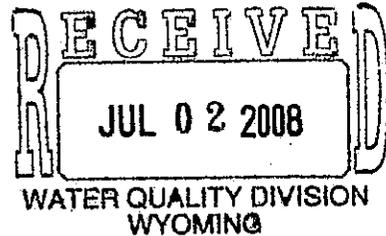




June 19, 2008

Project 12898

Jim Sewell
Shell Rocky Mountain Production
4582 South Ulster Street Parkway
Denver, Colorado 80237



**Re: Evaluation of Low Level Hydrocarbon Detections in Water Supply Well Samples
Pinedale Anticline Field
Sublette County, Wyoming**

Dear Mr. Sewell:

As requested, Geomatrix Consultants, Inc. (Geomatrix) prepared a summary of efforts completed to date to determine possible sources of or contributors to low levels of petroleum hydrocarbon compounds (PHC) detected in industrial water supply wells in the Pinedale Anticline Project Area (PAPA) of Wyoming. We also discuss the preliminary steps taken to mitigate some of the potential PHC sources or contributors. These measures are part of an ongoing effort by Shell to voluntarily address issues related to PHC detected in industrial water supply well samples in late 2006 and 2007. Supporting information and documentation, including laboratory reports, are attached.

EVALUATION OF POTENTIAL FACTORS CONTRIBUTING TO LOW LEVEL DETECTIONS

In an effort to determine possible sources of petroleum hydrocarbons detected in industrial water supply wells across the PAPA, Geomatrix completed several tasks which are described in the following sections. These tasks include:

- Investigated potential naturally-occurring sources of PHC in groundwater in the PAPA and elsewhere,
- Reviewed and observed water well drilling and water pump installation practices,
- Collected and analyzed samples of a pipe dope compound commonly used in water well drilling and water pump installation,
- Reviewed water well sampling procedures, and
- Conducted site-specific evaluation of potential sources associated with detections of PHC in samples from the water supply well at the Warbonnet 7-5 pad.

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AMEC Geomatrix

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Potential Naturally-Occurring Contributors

Given that the majority of PHC detections observed in the PAPA are at very low-levels (below state cleanup standards) and are not the result of a known or documented release from oil and gas activities, Geomatrix conducted a literature and internet search to determine if the detections could be due to naturally-occurring sources. Plausible naturally-occurring sources include shallow pockets or zones containing natural gas and condensate or oil shale.

Within the PAPA, natural gas and associated condensate is known to contain benzene, toluene, ethylbenzene, and xylenes (BTEX) as well as other PHC that would contribute to Total Petroleum Hydrocarbon (TPH) detections in water supply well samples. The literature review provided evidence of natural gas being emitted from water wells at two locations in and near the PAPA. The occurrence of natural gas at one location resulted in a water well drilling rig catching on fire.

Local media and Sublette County Conservation District (SCCD) personnel both have reported natural gas being present in water supply wells in the PAPA, as follows:

- The Casper Star Tribune reported that a fire occurred at JMG Exploration's Antelope 1-16 well site on December 16, 2005. The fire occurred when a water well drilling rig owned by Searle Brothers Construction encountered a gas pocket at a depth of approximately 440 feet below ground surface. The gas ignited and caught the rig on fire. Mr. Stoney Searle of Searle Brothers Construction stated that gas stopped flowing from the well on its own accord after about 12 hours.
- During annual sampling events, SCCD personnel documented natural gas in several industrial water wells across the Pinedale Anticline Field owned by various operators. The SCCD detected gas using a gas detection instrument (Lower Explosive Limit [LEL] meter) in six wells, mostly in the southern part of the field (Gannet 11-16, Highway #7, Warbonnet 1-21, Warbonnet 5-25, Warbonnet 8-25, and Warbonnet 13-11). SCCD personnel observed visible or audible bubbling at other wells (Mesa 5-33 and Riverside 11-25).

Although information gathered to date is anecdotal and has not been substantiated through scientifically defensible studies, it at least suggests the possibility that shallow natural gas-producing zones exist within some areas of the PAPA, which have the potential to contribute low levels of BTEX and TPH to water in the water supply wells or to water samples during collection.

The Green River Formation is contemporaneous with the Wasatch Formation which underlies the PAPA. The Green River Formation is located near the southern end of the PAPA. Although the Laney Member of the Green River Formation is reported to contain oil shale beds (Welder 1968), Geomatrix did not discover any record of oil shale recorded by well drillers on their logs of wells within the PAPA. Therefore, it is not

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known if oil shale exists in geologic materials intercepted by water supply wells in the PAPA.

We understand that Shell has also contacted Gore Environmental in an attempt to secure soil gas survey data that has been reportedly collected in the PAPA. Soil gas surveys such as 'GORE Surveys' have been used successfully for petroleum exploration, mineral exploration, and environmental assessment to detect, differentiate, and/or delineate inorganic and organic compounds migrating upward through the soil as a part of soil gas (Gore 2008). Data from the reported Gore assessment in the PAPA could indicate if naturally-occurring petroleum hydrocarbons are migrating as soil gas from subsurface reservoirs upward into water-bearing strata in the PAPA, thus causing the low-level detections of PHC in water supply well samples. To date, Shell has not been able to secure the survey data from this company as it has been contracted by other exploration companies and is proprietary.

Water Well Drilling and Pump Installation Practices

To evaluate well drilling and water pump installation practices, Geomatrix (1) compiled and reviewed water well driller's reports for Shell's water supply wells in the PAPA to determine typical procedures currently being used by water well drilling contractors, (2) interviewed personnel from Shell, the water well drilling contractor (White Mountain Drilling), and the water pump installation contractor (Premier Pumps) to identify site- and well-specific procedures that may contribute PHC to groundwater, and (3) completed field audits of well drilling and pump installation practices.

Our review revealed that the majority of water supply wells are installed using air rotary drilling rigs with a few wells being installed using mud rotary drilling rigs (mud rotary drilling techniques are necessary in the alluvial formation along the New Fork River due to the shallow water table). Geomatrix identified several procedures in air and mud rotary drilling that have the potential to contribute minor or de minimis amounts of PHC to water in the wells. First, the well supplies (e.g., pipe and screen) and installation practices do not meet industry standards for monitoring groundwater for environmental or domestic water well purposes. In some environmental applications, compressed air from air rotary drilling rigs is filtered to remove compressor oils from the air stream. Although the wells are constructed with welded steel casing with no joints requiring pipe dope, the well driller's reports and Geomatrix's observations of drilling practices indicated that the well casing was not steam cleaned prior to installation. Second, water well drillers used petroleum-based pipe dope for lubricating threads of drill rods, tools, and bits (Geomatrix's evaluation of pipe dope is discussed in more detail below). In spite of these findings, it is important to note that the operator's water supply wells in the PAPA are classified for industrial use and were not constructed with the intent of monitoring groundwater quality for volatile organic compounds in parts-per-billion levels. Wyoming Well Driller's rules do not require drillers to employ the more stringent installation standards for industrial water supply wells as required for wells installed for environmental monitoring purposes.

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Premier Pumps, a third-party company contracted by Shell, installs submersible electric pumps in Shell's water supply wells to provide make-up water during drilling, fracturing, and workover activities. The pump company owns the equipment and performs all labor and servicing during installation and operation of the pumps. Geomatrix's interviews and field audits conducted in 2007 revealed that, in keeping with their intended use in industrial water supply wells, pump equipment and installation practices do not necessarily meet accepted industry standards for use in wells intended to monitor groundwater for environmental purposes. For instance, the equipment is not manufactured or installed with the intent to be free of petroleum-based lubricants. Petroleum-based pipe dope was applied to the threaded joints of the drop pipe. Furthermore, prior to installation, the pump and equipment were not steam cleaned to remove residual hydrocarbons or other contaminants that may be present, which could cause cross contamination between effected and non-effected wells. In addition, during sampling we observed grease on the valve fittings at the well head. Each of these conditions could contribute low levels of hydrocarbons to groundwater in the well and/or samples during collection.

Pipe Dope Analysis

As discussed in the preceding section, Geomatrix determined that petroleum-based pipe dope was used by both the water well drilling contractor and pump installation contractor. Premier Pumps used "Bestolife" *Copper Supreme Special Blend Plus* pipe dope for lubricating the threads of the drop pipes of its pumps. The Material Safety Data Sheet (MSDS) for this product (Attachment 1) shows that a "petroleum grease mixture" comprises 40-60% of product. The SCCD database contains observations of substances resembling pipe dope on pipe fittings, casing, and on downhole sampling equipment upon retrieval at several water supply well locations throughout the PAPA. In one instance, pipe dope was discharged from the well through piping during sample collection.

To evaluate the potential for this product to contribute PHC to water, Geomatrix analyzed a sample of material believed to be weathered pipe dope collected from the water supply well at Shell's Warbonnet 12-4 pad. The substance was adhered to the flatiron from which the pump is suspended. The sample was analyzed for PHC and toxicity. Results indicated the presence of aromatic hydrocarbons (benzene, xylenes, toluene), total petroleum hydrocarbons gasoline range organics (TPH-GRO), and total purgeable hydrocarbons (Attachment 2).

For comparison, Geomatrix also collected a sample of unused, unweathered *Copper Supreme Special Blend Plus* pipe dope obtained from "Bestolife". This sample was analyzed for BTEX, TPH-DRO, and TPH-GRO (Attachment 2). The sample was also analyzed for TPH-TX1005 which provides a breakdown of petroleum hydrocarbons by carbon chain ranges. The results from the unweathered product sample show the presence of aromatic hydrocarbons (toluene, ethylbenzene, and xylenes), TPH-DRO, and TPH-TX1005. The TPH-TX1005 results confirm that the petroleum hydrocarbons

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present in the unweathered product consist predominantly of longer chain hydrocarbons in the C12 to C35 range. Analytical results for both samples are summarized in Table 1.

From this information, we believe that the petroleum-based pipe dope used previously by Premier Pumps, and possibly by other water well drillers and water pump installation contractors, has the potential to contribute PHC to water supply wells in the PAPA. However, the degree to which PHC concentrations in groundwater samples could be attributed to contact with pipe dope or other lubricating compounds is uncertain and would depend on several factors, including:

- Mass and location of substance in contact with well water – possible scenarios include the substance being exposed at drop tube pipe joints (both inside and outside) and the material being inadvertently dropped into a well during pump installation;
- Degree of weathering of the substance – as shown in the comparison of data from weathered and unweathered pipe dope samples (Table 1), a fresh sample would be expected to contain higher concentrations of volatile compounds (e.g., BTEX) and TPH than a weathered sample;
- The relative concentrations and solubilities for all the petroleum compounds in the substance; and,
- Contact time and sampling methods – concentrations would be diluted by pumping but grab samples of stagnant well water collected via bailer could exhibit higher concentrations. Also, particles of pipe dope from inside drop tubes may be contaminating water samples collected from wells with installed pumps.

Water Well Sampling

Geomatrix reviewed water well sampling protocol being used to collect samples from water supply wells in the PAPA. The sampling protocol is outlined in the *Sampling and Analysis Plan* (SAP) developed by the Pinedale Anticline Working Group (PAWG) Water Resources Task Group (WRTG) (2007).

Water Well Sampling Protocol

The protocol for collecting water samples from water supply wells within the PAPA is primarily dependent on the presence/absence of a pump. At Shell's water supply wells equipped with pumps, a representative of Premier Pumps provided power to the pumps by means of a generator, and groundwater samples were collected downstream of ball-valves at the top of the well casing. Some wells flow at land surface under artesian pressure. For wells under artesian conditions or with pumps, the ball-valve was opened and water is allowed to flow out prior to collecting each sample.

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Non-flowing wells without pumps were sampled using a new disposable bailer. For these wells, the bailer was lowered to a depth at the approximate mid-point of the perforated interval and a grab sample was collected from static water in the well bore without purging. The decision not to purge these wells is specified in the SAP. Without purging, the water in the well bore has a higher likelihood of being influenced by equipment previously placed in the well (e.g., well pump) and/or pipe dope due to longer contact time. The water can be additionally influenced by exposure to hydrocarbons or other chemicals in the atmosphere which could allow a change in water chemistry. Consequently, data from water samples collected with a bailer without purging may not adequately represent Wasatch Formation water quality.

Because of the depth of the wells, when collecting samples using a bailer, the SCCD lowers and raises the bailer with the winch on its service truck (which they were instructed to do by HydroGeo, Inc. during initial training on water well sampling). The steel cable (presumably braided or wound) is cleaned using a water/Alconox solution as the bailer is being raised. The cable spool is then covered with a plastic container. Based on the difficulty in adequately cleaning a steel cable, we believe that this method has the potential for allowing cross-contamination between wells. In addition, the plastic cover probably wouldn't seal the cable spool from dust and other contaminants during transportation to other well sites. Ideally, sampling equipment should be decontaminated immediately before use in a well. It should be noted that, to avoid the above-mentioned problems during Shell-directed quarterly and annual sampling, Geomatrix uses new polyethylene rope for lowering the bailer, which is discarded after use in a well.

Based on the above discussion, it is our opinion that several practices currently specified in the SAP and used by the SCCD and others, are not ideal for collecting water samples for analysis of low levels of BTEX and other PHC. We are fully aware of the efforts the WRTG of the PAWG has made to modify and improve the SAP; however, during the March 12, 2008 WRTG meeting, these issues were discussed but not acted upon, and we understand the SCCD has initiated its annual water well sampling program using the same protocol.

Site Conditions at the Time of Sampling

During sampling, we observed several conditions which could potentially provide false positive PHC results in groundwater samples. As mentioned in the above section, we observed grease on the valve fittings at the well head of several water supply wells. In addition, where active natural gas well drilling or fracturing operations were being conducted, we smelled hydrocarbons in the air, and the well heads and discharge lines appeared to have an oily residue on the outside. While these observed conditions are not likely to cause petroleum hydrocarbon impacts to groundwater, they could result in contamination of groundwater samples during collection.

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Split Samples

As part of Geomatrix's sampling of select water supply wells completed in February 2007, split (field duplicate) samples were collected to evaluate potential for laboratory error. Of the 16 wells sampled during this event, split samples were collected from five wells (Boulder 14-32, New Fork Unit 11-24W, North Pinedale 14-8, Rainbow 7-31, and Warbonnet 13-14) and submitted to different laboratories to compare the precision of the results between laboratories.

The primary set of samples was sent to Energy Laboratories, Inc. (ELI) in Casper, Wyoming, which has conducted the previous analyses for Shell. Split samples were sent to STL Laboratories (now TestAmerica) in Houston, Texas. Geomatrix compared the agreement between detected constituents in the five split samples analyzed by STL Laboratories to those analyzed by ELI by calculating the relative percent difference (RPD) between sample results. This included non-detects (Boulder 14-32), low-level detections (New Fork Unit 11-24, Rainbow 7-31, Warbonnet 13-14), and detections in a known impacted well (North Pinedale 14-8). A RPD of 20 percent or less is considered an acceptable control limit without data qualification if concentrations of both samples are $\geq 5X$ the Practical Quantification Limit (PQL). If results are $< 5X$ the PQL, the PQL will be the control limit.

The RPD is defined by the following equation:

$$RPD = [(sample - duplicate\ value) \div ((sample + duplicate\ value) \div 2)] \times 100$$

Except for two values that were above the acceptable control limit, the RPD calculations showed that the results from samples analyzed by STL Laboratories were generally similar to those from samples analyzed by ELI (Table 2). Of the two values were above the acceptable control limit; the RPD calculated for TPH-GRO for the North Pinedale 14-8 was 20.8% (only marginally above the 20% control limit), and the RPD calculated for toluene for the Warbonnet 13-14 was 75.9%. These data suggest that the results from samples analyzed by ELI for the February 2007 sampling event do not appear to be the result of laboratory error.

MITIGATION MEASURES

As discussed above, our review revealed several potential sources for the PHCs detected in water supply wells in the PAPA. In an effort to help eliminate and/or minimize the potential for impact to Shell's water supply wells, Shell implemented several mitigation measures as follows:

- Shell instructed water well pump installation contractors to install and maintain backflow prevention devices that meet the requirements of the Wyoming Department of Environmental Quality (WDEQ) Water Quality Division (WQD) Rules and Regulations, Chapter 12, Section 9(b) in water supply wells during the entire time a pump is in the well (see photograph in Attachment 3). Also, frac

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tanks are now filled from the top creating an air break to prevent siphoning/backflow of fluids from the tanks back into the well.

- Shell initiated periodic audits (at frac tank hookups) of water supply well plumbing to ensure proper backflow prevention is present.
- Shell instructed water well drillers and well pump installation contractors to only use environmentally friendly silicone-based pipe dope (e.g., Bestolife Eco-Sil: <http://www.bestolife.com/proddetail.asp?p=1000000041&f=l&i=1000000003&c=1000000002>).
- Geomatrix conducted an audit of practices used to install a water supply well at Shell's Jensen 11 #2 well pad to determine if well installation practices are adequate to prevent introduction of PHC during the drilling/installation process.
- Geomatrix collected a water sample from newly-installed Jensen 11 #2 water supply well prior to the well being put into service (i.e., pump installed, hooked up to frac tank). The analytical results indicated that no detectable levels of BTEX, TPH-DRO, or TPH-GRO were present.
- To prevent accidental or intentional introduction of contaminants into water supply wells, Shell added locks to all of its water wells and requires them to be locked when not in use.
- Shell installed totalizer flow meters to track and record groundwater usage from each of its water supply wells.

*Newest
water
well*

RECOMMENDED PATH FORWARD MITIGATION ACTIVITIES

Based on our observations to date and results of previous mitigation measures, Geomatrix recommends Shell implement the following:

- Continue to lock water wells when not in use.
- Continue use of backflow prevention devices on all water well hookups.
- Continue filling frac tanks from top to maintain air break to prevent siphoning.
- Require contractors to use hydrocarbon-free pipe dope.
- Continue to sample for BTEX on an annual basis utilizing updated SAP procedures as they are approved.
- Continue audits at frac tank hookups of the above ground plumbing connected to water supply wells to document proper backflow prevention is present.



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- Require water well drillers and water pump installation contractors to clean equipment and materials prior to well construction or pump installation in a well (recommended for next well to be constructed for Shell).
- Continue periodic audits (e.g., quarterly) of water well drilling and water pump installation to help ensure they are complying with Shell requirements for using environmentally-friendly pipe dope and cleaning equipment prior to use. Also, these audits should help identify other practices that may have the potential to contribute PHC to water in the water supply wells.
- Continue to sample any new water supply well that is installed with the new procedures (mentioned above) for PHC, before and after pump installation. This may help confirm/deny that new construction practices and equipment cleaning are effective. Sampling data will also establish baseline PHC conditions for new wells and provide an indication if PHCs are present in Wasatch Formation groundwater or are introduced during drilling and pump setting activities.
- Maintain a chronological record which thoroughly documents details of and findings from field audits, sampling, and field observations (currently being developed by Shell).

We appreciate the opportunity to serve you on this project. If you have any questions or need additional information, please contact Kevin Van Hook at 713-356-2219.

Sincerely yours,
AMEC Geomatrix, Inc.

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Enclosures

TABLES

Table 1. Summary of Analytical Results for Substance at Warbonnet 12-4 and Unweathered Product

Analyte	Substance at Warbonnet 12-4	Unweathered Product ^a	Units
Benzene	0.22	<0.20	mg/kg
Ethylbenzene	<0.19	0.435	mg/kg
m+p-xylenes	0.47	3.08	mg/kg
o-xylene	0.35	1.14	mg/kg
Toluene	0.19	1.4	mg/kg
TCLP Benzene (calculated)	<0.01	NA	mg/L
TPH-DRO	NA	180,000	mg/kg
TPH-GRO	17	<100,000 ^b	mg/kg
TPH – TX1005 (C6-C12)	NA	<10,000 ^b	mg/kg
(C12-C28)	NA	63,200	mg/kg
(C28-C35)	NA	113,000	mg/kg
(C6-C35)	NA	176,000	mg/kg
Total Purgeable Hydrocarbons	1900	NA	mg/kg

Notes:

a – unweathered product sample obtained from *Copper Supreme Special Blend Plus* pipe dope manufactured by Bestolife

b – high reporting limit resulted from dilution due to matrix interference

TCLP – toxicity characteristic leaching procedure

NA – not analyzed

ND – not detected

mg/kg – milligrams per kilogram

mg/L – milligrams per liter

Table 2
Shell Rocky Mountain Production Water Wells
Groundwater Analytical Summary and Relative Percent Difference for Split Samples
 (all concentrations in mg/L)

Well Name	Well Id	Sample Method	Sample Date	Benzene	Ethylbenzene	m+p-Xylenes	o-Xylene	Xylenes (total)	Toluene	TPH-DRO	TPH-GRO
Boulder 14-32	AMI280	Pump	2/13/2007	<0.0005	<0.0005	<0.0005	<0.0005	---	<0.0005	<1	<0.036 D
		"	2/13/2007*	<0.001	<0.001	<0.002	<0.001	<0.003	<0.001	<0.25	<0.050
Relative Percent Difference											
New Fork Unit 11-24W	AMI026	Pump	2/14/2007	<0.0005	<0.0005	<0.0005	<0.0005		0.0024	<1	<0.036 D
(Riverside 11-24)		"	2/14/2007*	<0.001	<0.001	<0.002	<0.001	<0.003	0.00253	<0.25	<0.050
Relative Percent Difference											
North Pinedale 14-8	AMI188	Boiler	2/12/2007	0.009	0.0013	0.013	0.0033	-	0.048	<1	0.094
		"	2/12/2007*	0.00558	0.00153	0.014	0.00344	0.0177	0.058	0.31	0.209
Relative Percent Difference											
Rainbow 7-31	AMI037	Pump	2/13/2007	11.0%	16.3%	7.4%	4.2%		18.9%		75.9%
		"	2/13/2007*	<0.0005	<0.0005	<0.0005	<0.0005	-	0.0013	<1	<0.036 D
Relative Percent Difference											
Warbonnet 13-14	AMI148	Pump	2/12/2007	<0.0005	<0.0005	<0.0005	<0.0005	-	0.0086	<1	<0.036 D
		"	2/12/2007*	<0.001	<0.001	<0.002	<0.001	<0.003	0.0106	<0.25	<0.050
Relative Percent Difference											
EPA Safe Drinking Water Act Maximum Contaminant Levels				0.005	0.7	10.0	10.0	10.0	1.0	NA	NA

- Notes:
1. Detections indicated in **bold**. EPA MCL exceedances indicated with shading.
 2. '<' indicates analyte concentration is below indicated Reporting Limit.
 3. '-' indicates not analyzed per Scope of Work.
 4. 'D' - reporting limit increased due to sample matrix interference.
 5. 'M' - split sample results.
 6. 'S' - spike recovery outside of advisory limits.

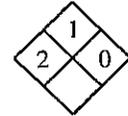
ATTACHMENT 1



MATERIAL SAFETY DATA SHEET

VENDEE AND THIRD PERSONS ASSUME THE RISK OF INJURY PROXIMATELY CAUSED BY THIS PRODUCT IF REASONABLE SAFETY PROCEDURES ARE NOT FOLLOWED AS PROVIDED FOR IN THE DATA SHEET, AND VENDOR SHALL NOT BE LIABLE FOR SUCH INJURY. FURTHERMORE, VENDOR SHALL NOT BE LIABLE FOR INJURY TO VENDEE OR THIRD PERSONS PROXIMATELY CAUSED BY ANY ABNORMAL USE OF THIS PRODUCT EVEN IF REASONABLE SAFETY PROCEDURES ARE FOLLOWED.
 ALL PERSONS USING THIS PRODUCT, ALL PERSONS WORKING IN AN AREA WHERE THIS PRODUCT IS USED, AND ALL PERSONS HANDLING THIS PRODUCT SHOULD BE FAMILIAR WITH THE CONTENTS OF THIS DATA SHEET. POSTING THIS DOCUMENT FOR EMPLOYEE NOTIFICATION IS RECOMMENDED BY THE VENDOR.

N. F. P. A.



1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME Copper Supreme Special Blend Plus	
SYNONYMS Not Applicable	INTENDED USE Industrial
MANUFACTURER'S NAME Bestolife Corporation	TELEPHONE # (214)631-6070
ADDRESS 2777 Stemmons Freeway Suite 1800, Dallas, Texas 75207	TRANSP. EMERGENCY # (800)424-9300
FOR ADDITIONAL INFORMATION CONTACT Bestolife Corporation	DATE May 2007 Reviewed

2. COMPOSITION, INFORMATION ON INGREDIENTS

MATERIAL OR COMPONENT (CAS#)	WEIGHT %	OSHA		ACGIH		Other
		PEL/TWA	Ceiling	TLV/TWA	TLV/STEL	
Petroleum Grease Mixture (CAS# 64742-58-1, 64742-54-7, 64742-62-7, 7620-77-1, 38900-29-7, 64742-16-1, 64741-56-6, 64742-52-5, Mixture)	40-60	5mg/m ³ **	None	5mg/m ³ **	10mg/m ³ **	Not Applicable
Copper (CAS# 7440-50-8)	7-15	0.1mg/m ³ ***	None	0.2mg/m ³ ***	None	Not Applicable
Antimony dialkyldithiocarbamate (CAS# 64742-52-5, Mixture)	1-5	0.5mg/m ³ Sb	None	0.5mg/m ³ Sb	None	Not Applicable
Additives: OSHA- Trade Secret	1-5	None	None	None	None	5mg/m ³ ** manufacturer TLV
Other Non-Hazardous Ingredients						
*Respirable Dust		**Oil Mist, Mineral		***Fume		

3. HAZARDS IDENTIFICATION

Routes of Exposure for Users

- Skin Contact** May cause irritation.
- Skin Absorption** Organic compounds contained herein may be absorbed through the skin.
- Eye Contact** May cause irritation.
- Ingestion** This product may be absorbed by the digestive system. Ingestion can result in both acute and chronic overexposure.
- Inhalation** If the grease base has been removed, i.e. by volatile solvents, heat, etc., the remaining powders and metallics can pose an inhalation hazard resulting in both acute and chronic overexposure as well as lung irritation, lung injury, or other health effects.

Effects of Overexposure	
Acute	Product may cause irritation to the eyes and/or skin. Ingestion of the product may cause gastrointestinal irritation and upset.
Chronic	Prolonged and repeated contact with the product may cause a defatting of the skin, dermatitis, folliculitis and/or oil acne.
Signs and Symptoms of Exposure	Skin or eye irritation; see effects of overexposure described above.
Aggravated Medical Conditions	Chronic forms of kidney, liver, and hematopoietic diseases; preexisting respiratory and cardiovascular disorders may be aggravated by ingestion or inhalation of large doses. Preexisting eye or skin disorders may be aggravated by prolonged contact with this product.
Notes to Physician	The hydrocarbons contained in this product are mild irritants of the eyes and mucous membranes, central nervous system depressants, and primary chemical irritants of the skin. Prolonged or repeated skin contact, especially with poor personal hygiene, may cause skin disorders. For combustion product effects see Hazardous Combustion Products in Section 5. Fire Fighting Measures.
4. FIRST AID MEASURES	
Eyes	Flush with copious amounts of water. Get immediate medical attention.
Skin	Wash thoroughly with soap and water after use. If irritation occurs, get medical attention.
Ingestion	Get immediate medical attention. DO NOT INDUCE VOMITING! Possible aspiration hazard.
Inhalation	Remove from exposure. Get medical attention if experiencing cough, irritation or difficult breathing.
5. FIRE FIGHTING MEASURES	
Flash Point	Minimum 385°F (196°C) Test Method: ASTM D 92, C.O.C.
Flammable Limits in Air (% by volume, estimated)	Lower: Not Available Upper: Not Available
Auto-ignition Temperature	Not Available
Hazardous Combustion Products	Combustion products are highly dependent on the combustion conditions. CO, CO ₂ , CaO, LiO ₂ , fluorides, oxygenates, and unidentified organic compounds may be formed during combustion. High temperatures may produce metal fume, vapor, and/or dust. Combustion products may cause effects of overexposure as noted in Section 3. Hazards Identification. They may also cause headache; dizziness; coma; convulsion; weakness; drowsiness; tachypnea; nausea; paresthesias; dyspnea; asphyxiation; mild to severe eye, skin or respiratory tract irritation; metal fume fever; metallic taste in mouth; cough; pneumonia; pneumoconiosis; ulceration or perforation of the nasal septum; polymer fume fever; cumulative bone damage; excessive salivation; thirst; sweating; stiff spine; calcification of ligaments of ribs and pelvis; lung damage; and/or central nervous system effects. Other unidentified health effects may occur.
Conditions Contributing to Flammability	High temperatures; open flame; combining with strong oxidizer or acid
Extinguishing Media	Dry chemical, water fog, foam, or carbon dioxide may be suitable for extinguishing fires involving this product. Do not spray water directly on burning material. Observe caution when using water or foam as frothing may occur.
Special Fire Fighting Procedures	Use full-body protection and full-face, self-contained breathing apparatus operated in a positive-pressure mode. Use water spray (fog) to cool containers and disperse vapors.
Unusual Fire and Explosion Hazards	Product fume and/or vapor may be irritating or toxic if inhaled. The product, or its dust, can react vigorously with strong oxidizing agents.
Sensitivity to Impact	Not Applicable
Sensitivity to Static Discharge	Not Applicable

6. ACCIDENTAL RELEASE MEASURES

Steps to be Taken if Material is Released or Spilled Clean area with an appropriate cleanser. Keep petroleum products out of streams and waterways. Assure conformity with applicable governmental regulations.

Neutralizing Chemicals Not Applicable

7. HANDLING AND STORAGE

The two major means of metal absorption are inhalation and ingestion. After use, always wash hands before smoking, eating, or drinking. Smoking, eating, and drinking should be confined to uncontaminated areas.

Work clothes and equipment should remain in designated areas. Before reuse, launder contaminated clothing separate from personal clothing.

Avoid skin contact and use personal protection when handling product, waste product, or contaminated equipment. Wash with soap and water after use. Prolonged and repeated contact can cause defatting action of the skin and may cause disorders such as dermatitis, folliculitis, and oil acne.

This product is intended for industrial use only. **KEEP OUT OF REACH OF CHILDREN.**

This product may separate. Stir well before use. The flash point of this product depends on the degree of separation. Store in a cool, dry area where accidental contact with acids is not possible. Keep storage containers closed when not in use. Do not store or handle near high temperature or open flame.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Ventilation Requirements No special requirements under conditions of normal use (air concentrations below PEL/TLV levels).

Specific Personal Protection Equipment

RESPIRATORY None required for normal use. Dry residue may be created by high downhole temperatures; if the residue is removed without a solvent or other means of controlling dust, workers should wear air-purifying respirators.

EYE Vented goggles or safety glasses with side shields should be worn when using this product.

GLOVE Oil-resistant gloves should be worn when handling this product.

OTHER CLOTHING AND EQUIPMENT As appropriate for the industrial environment.

9. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT @ 760 mm Hg	550°F (288°C) Approx. IBP	MELTING POINT	450-500°F (232-260°C) dropping point of grease
SPECIFIC GRAVITY (H ₂ O = 1)	1.2	VAPOR PRESSURE (Reference Temperature)	Not Available
VAPOR DENSITY (Air = 1)	Greater than 1	SOLUBILITY IN H₂O (% by wt.)	Negligible
% VOLATILE BY VOLUME	Not Available	EVAPORATION RATE (Butyl Acetate = 1)	Less than 1
COEFF. WATER/OIL DISTRIBUTION	Not Available	pH	Not Available
FREEZING POINT	Not Available	ODOR THRESHOLD	Not Available
APPEARANCE AND ODOR	Black-copper semisolid, oil/grease odor, noncombustible, nonvolatile under normal use		

10. STABILITY AND REACTIVITY

Conditions Contributing to Instability Not Applicable **Reactivity** Not Applicable

Incompatibility Strong oxidizers or acids combined with this product may liberate hydrogen gas.

Hazardous Decomposition Products Under normal temperatures this product will not decompose.

Conditions Contributing to Hazardous Polymerization Not Applicable

11. TOXICOLOGICAL INFORMATION

Toxicity, Mutagenic, Teratogenic, Synergistic and Sensitization Information

LD₅₀ and LC₅₀ information on the oil and grease is not available. OSHA Trade Secret has an Acute oral LD_{50(oral)} of 7780 mg/kg. Other LD₅₀ and LC₅₀ information is not available. Rare cases of allergic contact dermatitis have been reported in people working with copper dust.

Carcinogenicity

According to the OSHA Hazard Communication Standard, a carcinogenic warning statement is not required.

12. ECOLOGICAL INFORMATION

Not Available

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method

Discard in accordance with local, state, and federal regulations. Empty containers are exempt from RCRA Subtitle C if they contain no more than 2.5 cm of their original contents in the bottom of the container or less than 3% of the original net weight (less than 0.3% by weight for containers over 110 gallons), or if the residue is analyzed and demonstrated to be nonhazardous.

"Empty" Container Warning

"Empty" containers retain residue and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY AND/OR DEATH. "Empty" containers should be completely drained and properly sealed. Recycle or discard plastic liner, pail or drum in accordance with local, state, and federal regulations. "Empty" drums may be sent to a drum reconditioner.

14. TRANSPORT INFORMATION

U.S. Department of Transportation IMDG regulated as a severe Marine Pollutant and an Environmentally Hazardous Substance, Liquid, n.o.s., Class 9, UN3082, Packing Group III due to Copper content.

Canadian Transportation of Dangerous Goods This product is not considered a Hazardous Material for shipping under Canadian Transportation of Dangerous Goods.

15. REGULATORY INFORMATION

Toxic Chemical Release Reporting, EPA Regulation 40 C.F.R. §372 (SARA Section 313)

Reportable chemicals in product: 7-15% copper (CAS #7440-50-8)

Toxic Substances Control Act (TSCA), EPA Regulation 40 C.F.R. §710

The product is a mixture as defined by TSCA. The chemical ingredients in this product are in the Section 8(b) Chemical Substance Inventory (40 C.F.R. §710) and/or are otherwise in compliance with TSCA. In the case of ingredients obtained from other manufacturers, this company relies on the assurance of responsible third parties in providing this statement.

Canadian Workplace Hazardous Materials Information System

This product is considered controlled in Canada and has been placed in WHMIS Subdivision B of Division 2 of Class D due to copper content. This MSDS has been prepared to meet WHMIS and OSHA requirements using the ANSI 16 heading MSDS format.

16. OTHER INFORMATION

Not Applicable

ATTACHMENT 2



LABORATORY ANALYTICAL REPORT

Client: Shell Rocky Mountain Division
Project: Pipe Dope Analysis
Lab ID: C07110766-001
Client Sample ID: 308 WB12-4 PDCMH

Report Date: 12/19/07
Collection Date: 11/04/07 15:40
Date Received: 11/14/07
Matrix: Solid

Analyses	Result	Units	Qualifier	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
Benzene	0.22	mg/kg	D	0.19		SW8021B	11/24/07 20:39 / dkh
Ethylbenzene	ND	mg/kg	D	0.19		SW8021B	11/24/07 20:39 / dkh
m+p-Xylenes	0.47	mg/kg	D	0.37		SW8021B	11/24/07 20:39 / dkh
o-Xylene	0.35	mg/kg	D	0.19		SW8021B	11/24/07 20:39 / dkh
Toluene	0.47	mg/kg	D	0.19		SW8021B	11/24/07 20:39 / dkh
Surr: Trifluorotoluene	87.0	%REC	D	50-115		SW8021B	11/24/07 20:39 / dkh
VOLATILE ORGANIC COMPOUNDS - TOTAL							
Benzene, TCLP equivalent (calc)	ND	mg/L		0.010	0.5	SW1311/8260	11/24/07 16:32 / dkh
Surr: 1,2-Dichlorobenzene-d4	103	%REC		80-120		SW1311/8260	11/24/07 16:32 / dkh
Surr: Dibromofluoromethane	102	%REC		80-120		SW1311/8260	11/24/07 16:32 / dkh
Surr: p-Bromofluorobenzene	100	%REC		80-120		SW1311/8260	11/24/07 16:32 / dkh
Surr: Toluene-d8	101	%REC		80-120		SW1311/8260	11/24/07 16:32 / dkh
ORGANIC CHARACTERISTICS							
Gasoline Range Organics (GRO)	17	mg/kg	D	5		SW8015M as	11/24/07 20:39 / dkh
Total Purgeable Hydrocarbons	1900	mg/kg	D	5		SW8015M as	11/24/07 20:39 / dkh
Surr: Trifluorotoluene	85.0	%REC	D	50-115		SW8015M as	11/24/07 20:39 / dkh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

ANALYTICAL REPORT

JOB NUMBER: 352847

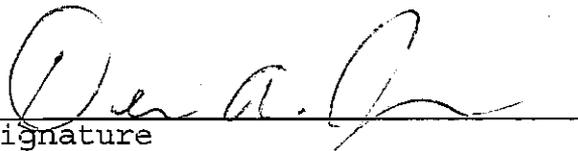
Project ID: PIPE DOPE ANALYSIS

Prepared For:

GeoMatrix Consultants, Inc
1010 Lamar
Suite 540
Houston, Texas 77002

Attention: Kevin VanHook

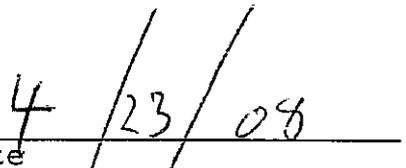
Date: 04/23/2008


Signature

Name: Dean A. Joiner

Title: Project Manager II

E-Mail: Dean.Joiner@testamericainc.com


Date

TestAmerica Laboratories, Inc
6310 Rothway Drive
Houston, TX 77040

PHONE: 713-690-4444

TOTAL NO. OF PAGES 17

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

04/23/2008

Kevin VanHook
GeoMatrix Consultants, Inc
1010 Lamar
Suite 540
Houston, Texas 77002

Reference:

Project : PIPE DOPE ANALYSIS
Project No. : 352847
Date Received : 04/17/2008
TestAmerica Job : 352847

Dear Kevin VanHook:

Enclosed are the analytical results for your project referenced above. The following samples are included in the report.

1. 107 BESTOLIFR COPPER SUPREME SPECIAL

All holding times were met for the tests performed on these samples.

Enclosed, please find the Quality Control Summary. All quality control results for the QC batch that are applicable to the sample(s) are acceptable except as noted in the QC batch reports.

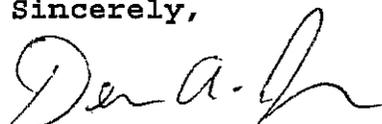
The test results in this report meet all NELAP requirements for TestAmerica Houston's NELAP accredited parameters. Any exceptions to the NELAP requirements will be flagged accordingly and where applicable, included in a case narrative as a part of this report.

If the report is acceptable, please approve the enclosed invoice and forward it for payment.

Thank you for selecting TestAmerica to serve as your analytical laboratory on this project. If you have any questions concerning these results, please feel free to contact me at any time.

We look forward to working with you on future projects.

Sincerely,



Dean A. Joiner
Project Manager

S A M P L E I N F O R M A T I O N

Date: 04/23/2008

Job Number.: 352847
 Customer...: GeoMatrix Consultants, Inc
 Attn.....: Kevin Vanhook

Project Number.....: 99007870
 Customer Project ID....: PIPE DOPE ANALYSIS
 Project Description....: Pipe Dope Analysis

Laboratory Sample ID	Customer Sample ID	Sample Matrix	Date Sampled	Time Sampled	Date Received	Time Received
352847-1	107 BESTOLIFR COPPER SUPREME SPECIAL	Solid	04/16/2008	12:00	04/17/2008	10:03

Job Number: 352847

LABORATORY TEST RESULTS

Date: 04/23/2008

CUSTOMER: GeoMatrix Consultants, Inc

PROJECT: PIPE DOPE ANALYSIS

ATTN: Kevin VanHook

Customer Sample ID: 107 BESTOLIFR COPPER SUPREME SPECIAL
 Date Sampled.....: 04/16/2008
 Time Sampled.....: 12:00
 Sample Matrix.....: Solid

Laboratory Sample ID: 352847-1
 Date Received.....: 04/17/2008
 Time Received.....: 10:03

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	FLAGS	REPORTING LIMIT	UNITS	DATE	TECH
SW-846 8015B	Total Volatile Petroleum Hydrocarbons TVPH as GRD, Solid	ND	0	100000	ug/Kg	04/17/08	mht
SW846 8015	Extraction (Waste Dilution) 8015 Diesel Waste Dilution, Solid	Complete				04/18/08	mra
TNRCC TX-1005	TNRCC 1005 Extraction (Ultrasonic) TNRCC 1005 Extraction, Solid	Complete				04/18/08	lvp
TNRCC 1005	Direct Analytical TPH Method TX 1005 Petroleum Hydrocarbons C6 - C12, Solid	ND		10000	mg/Kg	04/21/08	kp
	Petroleum Hydrocarbons C12 - C28, Solid	63200		10000	mg/Kg	04/21/08	kp
	Petroleum Hydrocarbons C28 - C35, Solid	113000		10000	mg/Kg	04/21/08	kp
	Petroleum Hydrocarbons C6 - C35, Solid	176000		10000	mg/Kg	04/21/08	kp
SW-846 8015B	Total Extractable Petroleum Hydrocarbons TEPH - as Diesel, Solid	180000		830	mg/Kg	04/22/08	jps
SW-846 8260B	Volatile Organics						
	Benzene, Solid	ND		20	ug/Kg	04/17/08	zfl
	Ethylbenzene, Solid	43.5		20	ug/Kg	04/17/08	zfl
	Toluene, Solid	140		20	ug/Kg	04/17/08	zfl
	Xylenes (total), Solid	421		75	ug/Kg	04/17/08	zfl
	m,p-Xylene, Solid	308		50	ug/Kg	04/17/08	zfl
	o-Xylene, Solid	114		20	ug/Kg	04/17/08	zfl

QUALITY CONTROL RESULTS

Job Number.: 352847

Report Date.: 04/23/2008

CUSTOMER: GeoMatrix Consultants, Inc

PROJECT: PIPE DOPE ANALYSIS

ATTN: Kevin VanHook

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time
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Test Method.....: SW-846 8015B

Units.....: ug/L

Analyst...: mht

Method Description.: Total Volatile Petroleum Hydrocarbons

Batch(s)...: 197577

LCS	Laboratory Control Sample	BXS041408F	197577-1		04/17/2008	1216
Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits F
TVPH as GRO, Soil	216.836		250.000000		86.7	49-151

MB	Method Blank		197577-1		04/17/2008	1240
Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits F
TVPH as GRO, Soil	ND					

SB	Spiked Blank	BX091307A			04/17/2008	1701
Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits F
TVPH as GRO, Soil	235.674		250.000000	ND	94	49.0-151.0

SBD	Spiked Blank Duplicate	BX091307A			04/17/2008	1725
Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits F
TVPH as GRO, Soil	224.696	235.674	250.000000	ND	89.9 4.8	49-151 20

Test Method.....: TNRCC 1005

Units.....: mg/L

Analyst...: kp

Method Description.: Direct Analytical TPH Method TX 1005

Batch(s)...: 197670

LCD	Laboratory Control Sample Duplicate	GCL032708	197555		04/21/2008	1052
Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits F
Petroleum Hydrocarbons C6 - C12, Soil	217.100	203.810	250.000000	ND	86.8 6.3	75-125 20
Petroleum Hydrocarbons C12 - C28, Soil	208.562	206.331	250.000000	ND	83.4 1.1	75-125 20
Petroleum Hydrocarbons C6 - C35, Soil	425.662	410.140	500.000000	ND	85.1 3.7	75-125 20

LCS	Laboratory Control Sample	GCL032708	197555		04/21/2008	1019
Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits F
Petroleum Hydrocarbons C6 - C12, Soil	203.810		250.000000	ND	81.5	75-125
Petroleum Hydrocarbons C12 - C28, Soil	206.331		250.000000	ND	82.5	75-125
Petroleum Hydrocarbons C6 - C35, Soil	410.140		500.000000	ND	82.0	75-125

Job Number.: 352847

QUALITY CONTROL RESULTS

Report Date.: 04/23/2008

CUSTOMER: GeoMatrix Consultants, Inc

PROJECT: PIPE DOPE ANALYSIS

ATTN:

QC Type	Description	Reag. Code	Lab ID	Dilution Factor	Date	Time
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Test Method.....: SW-846 8260B

Units.....: ug/L

Analyst...: zfl

Method Description.: Volatile Organics

Batch(s)...: 197600

LCS	Laboratory Control Sample	VS041608H			04/17/2008	1307
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Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits	F
Benzene, Soil	45.7035		50.00	ND	91.4	68-121	
Ethylbenzene, Soil	48.2352		50.00	ND	96.5	66-130	
Toluene, Soil	47.4827		50.00	ND	95.0	66-127	
Xylenes (total), Soil	149.717		150.	ND	99.8	37-160	
m,p-Xylene, Soil	99.3294		100.0	ND	99.3	68-160	
o-Xylene, Soil	50.3879		50.00	ND	100.8	66-160	

MB	Method Blank	VS041608C			04/17/2008	1533
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Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits	F
Benzene, Soil	ND						
Ethylbenzene, Soil	ND						
Toluene, Soil	ND						
Xylenes (total), Soil	ND						
m,p-Xylene, Soil	ND						
o-Xylene, Soil	ND						

MS	Matrix Spike	VS041608E	352663-1		04/17/2008	1651
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Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits	F
Benzene, Soil	48.7393		50.00	ND	97	65-135	
Ethylbenzene, Soil	49.0151		50.00	ND	98	60-140	
Toluene, Soil	51.1687		50.00	ND	102	64-135	
Xylenes (total), Soil	152.816		150.0	ND	102	60-140	
m,p-Xylene, Soil	101.212		100.0	ND	101	60-140	
o-Xylene, Soil	51.6043		50.00	ND	103	60-140	

MSD	Matrix Spike Duplicate	VS041608E	352663-1		04/17/2008	1717
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Parameter/Test Description	QC Result	QC Result	True Value	Orig. Value	Calc. Result	* Limits	F
Benzene, Soil	45.9243	48.7393	50.00	ND	92	65-135	
Ethylbenzene, Soil	46.5454	49.0151	50.00	ND	5.9	30.0	
Toluene, Soil	47.3944	51.1687	50.00	ND	93	60-140	
Xylenes (total), Soil	142.876	152.816	150.0	ND	5.2	30.0	
m,p-Xylene, Soil	95.2068	101.212	100.0	ND	95	64-135	
o-Xylene, Soil	47.6690	51.6043	50.00	ND	7.7	30.0	
					6.7	60-140	
					95	60-140	
					6.1	30.0	
					95	60-140	
					7.9	30.0	

Job Number.: 352847

SURROGATE RECOVERIES REPORT

Report Date.: 04/23/2008

CUSTOMER: GeoMatrix Consultants, Inc

PROJECT: PIPE DOPE ANALYSIS

ATTN: Kevin VanHook

Method.....: Total Extractable Petroleum Hydrocarbons
Batch(s).....: 197798

Method Code...: 8015D
Test Matrix...: Water

Prep Batch....: 197590
Equipment Code: EXTGC01

Lab ID	DT	Sample ID	Date	OTERPH
197590--21	LCD		04/22/2008	112
197590--21	LCS		04/22/2008	110
197590--21	MB		04/22/2008	102

Test	Test Description	Limits
OTERPH	o-Terphenyl	60 - 140

Method.....: Total Extractable Petroleum Hydrocarbons
Batch(s).....: 197798

Method Code...: 8015D
Test Matrix...: Solid

Prep Batch....: 197590
Equipment Code: EXTGC01

Lab ID	DT	Sample ID	Date	OTERPH
352847-	1	107 BESTOLIFR COPPER SUPREME SPECIAL	04/22/2008	5 d

Test	Test Description	Limits
OTERPH	o-Terphenyl	60 - 140

SURROGATE RECOVERIES REPORT

Job Number.: 352847

Report Date.: 04/23/2008

CUSTOMER: 483648

PROJECT: PIPE DOPE ANALYSIS

ATTN: Kevin VanHook

Method.....: Total Volatile Petroleum Hydrocarbons
Batch(s).....: 197577

Method Code...: 8015G
Test Matrix...: Soil

Prep Batch....:
Equipment Code: BTEX07

Lab ID	DT	Sample ID	Date	ATFT	BFB
SB			04/17/2008	97.2	93.3
SBD			04/17/2008	95.0	92.7
197577- 1	LCS		04/17/2008	111.7	115.0
197577- 1	MB		04/17/2008	94.2	92.4

Test	Test Description	Limits
ATFT	a,a,a-Trifluorotoluene	50 - 150
BFB	BFB (Surrogate)	50 - 150

Method.....: Total Volatile Petroleum Hydrocarbons
Batch(s).....: 197577

Method Code...: 8015G
Test Matrix...: Solid

Prep Batch....:
Equipment Code: BTEX07

Lab ID	DT	Sample ID	Date	ATFT	BFB
352847- 1		107 BESTOLIFR COPPER SUPREME SPECIAL	04/17/2008	130.8	125.9

Test	Test Description	Limits
ATFT	a,a,a-Trifluorotoluene	50 - 150
BFB	BFB (Surrogate)	50 - 150

SURROGATE RECOVERIES REPORT

Job Number.: 352847

Report Date.: 04/23/2008

CUSTOMER: 483648

PROJECT: PIPE DOPE ANALYSIS

ATTN: Kevin VanHook

Method.....: Volatile Organics
Batch(s).....: 197600

Method Code...: 8260
Test Matrix...: Soil

Prep Batch....:
Equipment Code: GCMSVOA05

Lab ID	DT	Sample ID	Date	12DCED	BRFLBE	DBRFLM	TOLD8
LCS			04/17/2008	91.4	97.2	100.3	95.0
MB			04/17/2008	78.8	108.9	79.2	90.5
352663-	1 MS	GB-1 0-30 ¹	04/17/2008	76.0	108.1	80.1	92.3
352663-	1 MSD	GB-1 0-30 ¹	04/17/2008	72.6	104.2	85.3	86.9

Test	Test Description	Limits
12DCED	1,2-Dichloroethane-d4	61 - 130
BRFLBE	4-Bromofluorobenzene	57 - 140
DBRFLM	Dibromofluoromethane	68 - 130
TOLD8	Toluene-d8	50 - 130

Method.....: Volatile Organics
Batch(s).....: 197600

Method Code...: 8260
Test Matrix...: Solid

Prep Batch....:
Equipment Code: GCMSVOA05

Lab ID	DT	Sample ID	Date	12DCED	BRFLBE	DBRFLM	TOLD8
352847-	1	107 BESTOLIFR COPPER SUPREME SPECIAL	04/17/2008	82.4	156.8A	79.1	94.8

Test	Test Description	Limits
12DCED	1,2-Dichloroethane-d4	61 - 130
BRFLBE	4-Bromofluorobenzene	57 - 140
DBRFLM	Dibromofluoromethane	68 - 130
TOLD8	Toluene-d8	50 - 130

Job Number.: 352847

SURROGATE RECOVERIES REPORT

Report Date.: 04/23/2008

CUSTOMER: 483648

PROJECT: PIPE DOPE ANALYSIS

ATTN: Kevin VanHook

Method.....: Direct Analytical TPH Method TX 1005
Batch(s).....: 197670

Method Code...: TX1005
Test Matrix...: Soil

Prep Batch....: 197555
Equipment Code: EXTGC12

Lab ID	DT	Sample ID	Date	OTERPH
352880-	3 MS	VB-25619 MUD+WATER	04/18/2008	117.2
352880-	3 MSD	VB-25619 MUD+WATER	04/18/2008	132.3K
197555--	21 LCD		04/21/2008	104.9
197555--	21 LCS		04/21/2008	105.4
197555--	21 MB		04/21/2008	117.1

Test	Test Description	Limits
OTERPH	o-Terphenyl	70 - 130

Method.....: Direct Analytical TPH Method TX 1005
Batch(s).....: 197670

Method Code...: TX1005
Test Matrix...: Solid

Prep Batch....: 197555
Equipment Code: EXTGC12

Lab ID	DT	Sample ID	Date	OTERPH
352847-	1	107 BESTOLIFR COPPER SUPREME SPECIAL	04/21/2008	136.0d

Test	Test Description	Limits
OTERPH	o-Terphenyl	70 - 130

QUALITY ASSURANCE METHODS

REFERENCES AND NOTES

Report Date: 04/23/2008

REPORT COMMENTS

- 1) All pages of this report are integral parts of the analytical data. Therefore, this report should be reproduced only in its entirety.
- 2) Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.
- 3) According to 40CFR Part 136.3, pH, Chlorine Residual, and Dissolved Oxygen analyses are to be performed immediately after aqueous sample collection. When these parameters are not indicated as field, (e.g. pH Field) they were not analyzed immediately, but as soon as possible on laboratory receipt.
- 4) For all USACE projects, the QC limits are based on "mean +/- 2 sigma", which are the warning limits.

General Information:

- Cresylic Acid is the combination of o,m and p-Cresol. The combination is reported as the final result.
- m-Cresol (3-Methylphenol) and p-Cresol (4-methylphenol) co-elute. The result of the two is reported as either m&p-cresol or as 4-methylphenol (p-cresol).
- m-Xylene and p-Xylene co-elute. The result of the two is reported as m,p-Xylene.
- N-Nitrosodiphenylamine decomposes in the gas chromatograph inlet forming dipheylamine and, consequently, may be detected as diphenylamine.
- Methylene Chloride and Acetone are recognized potential laboratory contaminants. Its presence in the sample up to five times the amount reported in the blank may be attributed to laboratory contamination.
- Trimethylsilyl(Diazomethane) is used to esterify acid herbicides in Method SW-846 8151A.
- For Inorganic analyses, duplicate QC limits are determined as follows: If the sample result is less than or equal to 5 times the reporting limit, the RPD limit is equal to the reporting limit. If the sample result is greater than 5 times the reporting limit, the RPD limit is the method defined RPD.
- For TRRP reports, the header on the column RL is equivalent to a MQL/PQL.
- Results for LCS and MS/MSD recoveries listed in the report are reported as ug/L on-column values which are not corrected for variables such as sample volumes or weights extracted, final volume of extracts and dilutions. To correct QC on-column recoveries to reflect actual spiking volumes for soils, multiply the values reported for Diesel Range Organics and Semivolatiles by 33.3 and Gasoline Range Organics by 20. The 8260 and 1006 results will not require correction. The only corection required for water analysis is for method 1006 where the reported concentraiton must be multiplied by 0.1.
- Due to limitation of the reporting software, results for the Method blank in the Semivolatile fraction are reported as "0". Which indicates there was no compound detected at the reporting limit for the compound revealed.
- The dilution factor listed on the report represents only the analytical dilutions necessary for the target compounds to be within the calibration range of the instrument. It does not include any preparation factors, dry weight or any other adjustment.

Explanation of Qualifiers:

- U - This qualifier indicates that the analyte was analyzed but not detected.
- J - (Organics only) This qualifier indicates that the analyte is an estimated value between the RL and the MDL.
- B - (Inorganics only) This Qualifier indicates that the analyte is an estimated value between the RL and the MDL.
- N - (Organics only) This flag indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds (TICs), where the identification is based on a mass spectral library search. It is applied to all TIC results. For generic characterization of a TIC, such as "chlorinated hydrocarbon", the "N" flag is not used.

Explanation of General QC Outliers:

- A - Matrix interference present in sample.
- a - MS/MSD analyses yielded comparable poor recoveries, indicating a possible matrix interference. Method performance is demonstrated by acceptable LCS recoveries.
- b - Target analyte was found in the method blank.
- M - QC sample analysis yielded recoveries outside QC acceptance criteria. This sample was reanalyzed.
- L - LCS analysis yielded high recoveries, indicating a potential high bias. No target analytes were

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- observed above the RL in the associated samples.
- G - Marginal outlier within 1% of acceptance criteria.
 - r - RPD value is outside method acceptance criteria.
 - C - Poor RPD values observed due to the non-homogenous nature of the sample.
 - O - Sample required dilution due to matrix interference.
 - D - Sample reported from a dilution.
 - d - Spike and/or surrogate diluted.
 - E - The reported concentration exceeds the instrument calibration.
 - F - The analyte is outside QC limits and was not detected in any associated samples in the analytical batch.
 - H - Continuing Calibration Verification (CCV) standard is not associated with the samples reported.
 - q - See the subcontract final report for qualifier explanation.
 - W - The MS/MSD recoveries are outside QC acceptance criteria because the amount spiked is much less than the amount found in the sample.
 - K - High recovery will not affect the quality of reported results.
 - Z - See case narrative.

Explanation of Organic QC Outliers:

- e - Method blank analysis yielded phthalate concentrations above the RL. Phthalates are recognized potential laboratory contaminants. Its presence in the sample up to five times the amount reported in the blank may be attributed to laboratory contamination.
- S - Sample reanalyzed/reextracted due to poor surrogate recovery. Reanalysis confirmed original analysis indicating a possible matrix interference.
- T - Sample analysis yielded poor surrogate recovery.
- R - The RPD between the two GC columns is greater than 40% and no anomalies are present. The higher result is reported as per EPA Method 8000B.
- I - The RPD between the two GC columns is greater than 40% and anomalies are present. The lower of the two results has been reported.
- X - Gaseous compound. In-house QC limits are advisory.
- Y - Ketone compounds have poor purge efficiency. In-house QC limits are advisory.
- f - Surrogate not associated with reported analytes.

Explanation of Inorganic QC Outliers:

- Q - Method blank analysis yielded target analytes above the RL. Associated sample results are greater than 10 times the concentrations observed in the method blank.
- V - The RPD control limit for sample results less than 5 times the RL is +/- the RL value. Sample and duplicate results are within method acceptance criteria.
- e - Serial dilution failed due to matrix interference.
- g - Sample result quantitated by Method of Standard Additions (MSA) due to the analytical spike recovery being below 85 percent. The correlation coefficient for the MSA is greater than or equal to 0.995.
- s - BOD/cBOD seed value is not within method acceptance criteria. Due to the nature of the test method, the sample cannot be reanalyzed.
- l - BOD/cBOD LCS value is not within method acceptance criteria. Due to the nature of the test method, sample cannot be reanalyzed.
- N - Spiked sample recovery is not within control limits.
- n - Sample result quantitated by Method of Standard Additions (MSA) due to the analytical spike recovery being below 85 percent. The correlation coefficient for the MSA is less than 0.995.
- * - Duplicate analysis is not within control limits.

Abbreviations:

- Batch - Designation given to identify a specific extraction, digestion, preparation, or analysis set.
- CCV - Continuing Calibration Verification
- CRA - Low level standard check - GFAA, Mercury
- CRI - Low level standard check - ICP
- Dil Fac - Dilution Factor - Secondary dilution analysis

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DLFac - Detection Limit Factor
 DU - Duplicate
 EB - Extraction Blank (TCLP, SPLP, etc.)
 ICAL - Initial Calibration
 ICB - Initial Calibration Blank
 ICV - Initial Calibration Verification
 ISA - Interference Check Sample A - ICP
 ISB - Interference Check Sample B - ICP
 LCD - Laboratory Control Duplicate
 LCS - Laboratory Control Sample
 MB - Method Blank
 MD - Method Duplicate
 MDL - Method Detection Limit
 MQL - Method Quantitation Limit (TRRP)
 MS - Matrix Spike
 MSD - Matrix Spike Duplicate
 ND - Not Detected
 PB - Preparation Blank
 PREPF - Preparation Factor
 RL - Reporting Limit
 RPD - Relative Percent Difference
 RRF - Relative Response Factor
 RT - Retention Time
 SQL - Sample Quantitation Limit (TRRP)
 TIC - Tentatively Identified Compound

Method References:

- (1) EPA 600/4-79-020 Methods for the Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-94-111 Methods for the Determination of METals in Environmental Samples, Supplement I, May 1994.
- (3) EPA SW846 Test Methods for Evaluating Solid Waste, Third Edition, September 1986; Update I July 1992; Update II, September 1994, Update IIA August 1993; Update IIB, January 1995; Update III, December 1996, Update IVA January 1998, Update IVB November 2000.
- (4) Standard Methods for the Examination of Water and Wastewater, 16th Edition (1985), 17th Edition (1989), 18th Edition (1992), 19th Edition (1995), 20th Edition (1998).
- (5) HACH Water Analysis Handbook 3rd Edition (1997).
- (6) Federal Register, July 1, 1990 (40 CFR Part 136 Appendix A).
- (7) Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, 2nd Edition, January 1997.
- (9) Diagnosis and Improvement of Saline and Alkali Soils, Agriculture Handbook No. 60, United States Department of Agriculture, 1954.

Job Number: 352847

LABORATORY CHRONICLE

Date: 04/23/2008

CUSTOMER: GeoMatrix Consultants, Inc

PROJECT: PIPE DOPE ANALYSIS

ATTN: Kevin VanHook

Lab ID: 352847-1	Client ID: 107 BESTOLIFR COPPER SUPREME S	Date Recvd: 04/17/2008	Sample Date: 04/16/2008						
METHOD	DESCRIPTION	RUN#	BATCH#	PREP BT	#(S)	DATE/TIME ANALYZED		DILUTION	
TNRCC 1005	Direct Analytical TPH Method TX 1005	1	197670	197555		04/21/2008	1019	200.00	
SWB46 8015	Extraction (Waste Dilution) 8015 Diesel	1	197590			04/18/2008	1400		
TNRCC TX-1005	TNRCC 1005 Extraction (Ultrasonic)	1	197555			04/18/2008	0830		
SW-846 8015B	Total Extractable Petroleum Hydrocarbons	1	197798	197590		04/22/2008	1248	10	
SW-846 8015B	Total Volatile Petroleum Hydrocarbons	1	197577			04/17/2008	1558	100.00	
SW-846 8260B	Volatile Organics	1	197600			04/17/2008	2318	5.00000	

rpjsckl

Job Sample Receipt Checklist Report

V2

Job Number.: 352847 Location.: 57216 Check List Number.: 1 Description.:
 Customer Job ID.....: Job Check List Date.:
 Project Number.: 99007870 Project Description.: Pipe Dope Analysis
 Customer.....: GeoMatrix Consultants, Inc Contact.: Kevin VanHook

Date of the Report...: 04/17/2008
 Project Manager.....: daj1

Questions ?	(Y/N)	Comments
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Chain of Custody Received?.....	Y	
...If "yes", completed properly?.....	Y	
Custody seal on shipping container?.....	N	
...If "yes", custody seal intact?.....		
Custody seals on sample containers?.....	N	
...If "yes", custody seal intact?.....		
Samples chilled?.....	Y	
Temperature of cooler acceptable? (<=6 Deg C).	Y	3.1
...If "no", is sample an air matrix?(no temp req.)		
Thermometer ID.....	Y	491
Samples received intact (good condition)?.....	Y	
Volatile samples acceptable? (no headspace).....		
Correct containers used?.....	Y	
Adequate sample volume provided?.....	Y	
Samples preserved correctly?.....	Y	
Samples received within holding-time?.....	Y	
Agreement between COC and sample labels?.....	Y	
Radioactivity at or below background levels?.....	Y	
Additional.....		
Comments.....		
Sample Custodian Signature/Date.....	Y	TFC

R
 4/17/08

ATTACHMENT 3

