GENERAL EXPLORATION PERMIT
AKG-31-5100
NOTICE OF INTENT

ATTACHMENT F

BEST MANAGEMENT PRACTICES PLAN

KITCHEN LIGHTS UNIT

COOK INLET, ALASKA

March 2016

Developed for:
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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
APDES	Alaska Pollutant Discharge Elimination System
bbl	barrel
BMP	best management practice
CFR	Code of Federal Regulations
Furie	Furie Operating Alaska LLC
MSD	marine sanitation device
NADF	non-aqueous drilling fluids
NOI	notice of intent
OWS	oil-water separator
Permit	APDES General Permit AKG315100
PM	Preventive maintenance
EPA	United States Environmental Protection Agency
Yost	Randolph Yost jack-up drill rig

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1.0 INTRODUCTION

Furie Operating Alaska, LLC (Furie) is providing a notice of intent (NOI) for coverage under the Alaska Department of Environmental Conservation's (ADEC) Alaska Pollutant Discharge Elimination System (APDES) General Permit AKG315100 (Permit) for oil and gas exploration drilling in state of Alaska coastal waters of the upper Cook Inlet. The purpose of the Permit application is to allow authorized discharges during Furie's exploration drilling activities in coastal waters, as of April 2016.

Drilling will be conducted using the jack-up drill rig Randolph Yost (Yost) during ice-free months. Furie's initial plans for drilling activities in coastal waters include a five-year, five well exploration program. Additional wells may be drilled throughout the Kitchen Lights Unit lease area depending on results and permitting requirements. The Permit allows for discharges from new oil and gas extraction facilities engaged in exploration activities under the Offshore and Coastal Subcategories of the Oil and Gas Extraction Point Source Category found in Chapter 40, Part 435, Subparts A and D of the Code of Federal Regulations (40 CFR 435 [A] and [D]).

1.1 BMP PLAN REQUIREMENTS, DESIGN, AND OBJECTIVES

The Permit requires new exploratory facilities to submit a best management practices (BMP) plan to ADEC for review with, or prior to, submission of an NOI.

This BMP Plan and related program has been designed to prevent or minimize the generation and the potential release of pollutants from the facility to the waters of the United States through normal operations and ancillary activities.

BMP Plan objectives include the following:

- Minimize the number and quantity of pollutants and the toxicity of effluent generated, discharged, or potentially discharged to the extent feasible by managing each waste stream in the most appropriate manner.
- Examine Furie's drilling operations and supporting activities, and each facility component or system (e.g. marine sanitation device, hydraulic systems, fuel tanks) to minimize the opportunities (and potential) for causing a release into Cook Inlet due to equipment failure, improper operation, and natural phenomena such as rain or snowfall.

The plan has been prepared and formatted to meet the requirements of Section 2.11 of the Permit. Furie provides this BMP Plan to ADEC in support of its NOI to use the Permit, pursuant to 40 CFR 435 (A) and (D), and as outlined and prescribed by the Permit.

1.2 FACILITY CONTACTS AND OPERATIONS PLAN

Furie may opt to drill more than five exploration wells; therefore, Furie is requesting authorization as a mobile facility, operating in the upper Cook Inlet area.

Additional information on the Yost rig, facility contacts, and the latitude and longitude of the five exploration wells is presented in the Notice of Intent Information Sheet and the Plan of Operations (Attachment D to the NOI).

Furie will notify ADEC in writing 7 days prior to moving the Yost and will provide latitude and longitude of the next exploration well location.

1.3 PLAN ORGANIZATION

The BMP Plan is organized by components and phases as discussed in the *Guidance Manual for Developing Best Management Practices* (United States Environmental Protection Agency [EPA] 1993) into the following sections:

- Section 1: Introduction
- Section 2: BMP Plan Planning Phase
- Section 3: BMP Plan Development Phase
- Section 4: BMP Evaluation and Re-evaluation Phase

As noted earlier, this plan is subject to modification as the program proceeds, with revisions as necessary.

2.0 BMP PLAN PLANNING PHASE

The planning phase focuses on demonstrating Furie and the Yost contractors' management support for the BMP Plan, and identifying and evaluating areas/activities/operations carried out on the Yost that will be addressed by BMPs. This was achieved by (1) forming a BMP committee for the drilling contractors' operations in Cook Inlet, (2) developing a BMP policy statement, and (3) performing a release identification and evaluation.

2.1 BMP COMMITTEE

Furie committee members and specific responsibilities for the exploratory drilling program are listed and described Table 2-1.

Table 2-1
BMP Committee

Name (Company)	Title	Responsibilities
Bruce Webb or designee (Furie)	Lead Committee Chairperson	• Represent Furie management in implementing BMPs • Conduct meetings and aid in decision-making processes • Assign tasks to appropriate personnel • Provide expertise on compliance issues
L.C. "Tootie" Martin (Furie)	Health, Safety, Security, and Environment (HSSE) Manager	• Communicate BMPs to platform personnel and operator staff • Provide expertise on compliance issues • Conduct inspections/review record keeping with contractor representatives
David Riggs (Advanced Drilling Solutions)	Rig Engineer	• Provide expertise and full understanding of fluids movement throughout the Yost

General BMP Committee Activities and Responsibilities include the following:

- Develop the scope of the BMP Plan
- Make recommendations in support of the BMP Policy Statement
- Review existing spill control plans and drill fluid plans to evaluate existing BMPs
- Conduct assessments to prioritize substances, discharges and areas of concern
- Select appropriate BMPs

- Establish and then implement procedures for recordkeeping and reporting
- Evaluate the effectiveness of the BMP Plan in preventing/mitigating releases
- Periodically review the BMP Plan to evaluate the need to update and/or modify the BMP Plan

2.2 BMP POLICY STATEMENT

Drilling and support operations will endeavor to minimize waste fluids and muds to the extent possible prior to permitted discharge offshore or treated/disposal onshore. This will be achieved by implementing source reduction, recycling/reusing, and practicing good housekeeping measures with inspections whenever possible.

2.3 BMP RELEASE IDENTIFICATION AND EVALUATION

Release identification involves the systematic cataloging of drilling operations and support activities, and assessing these potential releases to determine the impact to human health and the environment. This process resulted in the evaluation of both discharges allowed and potential discharges not allowed under the Permit.

2.3.1 Identified Discharges allowed under the Permit

There are 14 discharges, or outfalls, allowed under the Permit. Those that apply to the Yost are listed below in Table 2-2.

Table 2-2
Identified Discharges (Outfalls) Allowed Under AKG315100
Applicable to the Randolph Yost

Outfall	Waste Composition
Outfall Types Proposed for Typical Discharge	
001 Drilling Fluids and Drill Cuttings	Water-based drill fluids Cuttings above hydrocarbon zones with water-based drill muds
002 Deck Drainage	Fresh water, rain water, seawater, equipment wash down water, and fire control test water. Both equipment wash down water and fire control test water will be collected in the bilge and routed to the oil water separator for deck drainage prior to discharge
003 Domestic Wastewater	Human waste
004 Greywater (included in 003)	Gray water treated and discharged with domestic wastewater
009 Non-contact Cooling Water	Untreated seawater
010 Uncontaminated Ballast Water	Cook Inlet seawater used for preload
012 Excess Cement Slurry	Excess cement
013 Mud, Cuttings, and Cement at the Seafloor	Muds and cuttings above hydrocarbon zones, extra cement
019 Test Fluids	Fluids sent downhole during testing

General BMPs and discharge-specific BMPs have been developed for applicable outfalls, as presented in Section 3.

Table 2-3
Other Potential Discharges (not allowed under *AKG315100*)

Potential Discharge	Notes
Cuttings in Hydrocarbon-bearing Zones	General BMPs and waste-specific BMPs developed and presented in Section 3.
Non-aqueous drill fluids	General BMPs and waste-specific BMPs developed and presented in Section 3.
Used Petroleum, Oil, and Lubricants	General and waste-specific BMPs presented in Section 3.
Trash & Debris Generated During Exploration	General BMPs and waste-specific BMPs developed and presented in Section 3.
Crude Oil from Blowout	General and waste-specific BMPs not presented in Section 3. Covered under the EPA Spill Prevention, Control, and Countermeasure Plan.
Diesel Fuel from a Tank Rupture	General and waste-specific BMPs not presented in Section 3. Covered under the EPA Spill Prevention, Control, and Countermeasure Plan.
Diesel Fuel from a Transfer Failure	General and waste-specific BMPs not presented in Section 3. Covered under the EPA Spill Prevention, Control, and Countermeasure Plan.

3.0 BMP PLAN DEVELOPMENT PHASE

Based on wastes targeted for BMPs, the Furie committee has selected BMPs that are most effective in reducing, controlling or eliminating waste discharges and releases. For this BMP plan, these include general BMPs and facility -specific BMPs.

3.1 GENERAL BMPS

General BMPs for this exploration program consist of six components: good housekeeping, preventive maintenance, inspections, security, employee training, and recordkeeping and reporting. Each component is described below.

3.1.1 Good Housekeeping

Good housekeeping is a program by which the Yost is kept in a clean and orderly fashion to help avoid releases and/or cross contamination of waste types. Good housekeeping on the Yost in support of this BMP Plan will include orderly storage of bags (dry material) and drums (fluids); prompt cleanup of liquids to avoid runoff reaching receiving waters; and expeditious sweeping, vacuuming, or other cleanup of dry materials to prevent them reaching receiving waters via stormwater runoff.

These will be achieved by completing the following steps:

- Designating and labeling appropriate storage areas for every material and every piece of equipment.
- Emphasizing and establishing procedures requiring that materials and equipment be placed in or returned to their designated areas
- Establishing a schedule to check areas to detect release (i.e. inspection) and ensure that releases are mitigated

General housekeeping for drilling and drilling support activities on the Yost also will include the following:

- Ensuring all products stored outside are protected from Cook Inlet weather
- Not storing partial units (open sacks or drums) outside

- Using complete unit amounts of products (sacks, drums, cans), as much as possible in order to minimize inventory of partial units
- Ensuring all hoses are properly secured when transferring fluids and/or cuttings from the Yost to tanks

3.1.2 Preventative Maintenance

Preventive maintenance (PM) focuses on preventing releases or cross-contamination caused by equipment problems. The Yost contractor has an existing PM program that periodically inspects, maintains, and tests equipment and systems to uncover conditions which could cause breakdowns or failures. As part of the BMP Plan, preventive maintenance also will focus on controlling discharges and preventing releases by focusing on the areas and wastes to be of most concern.

Therefore, Furie will review the Yost contractors' program to evaluate if it, at a minimum, includes the following activities:

- Identifying and cataloging equipment, systems and structures to which the PM program should apply, specifically with respect to source reduction and controlling discharges to prevent releases
- Determining and performing appropriate PM activities and maintenance schedules
- Organizing and maintaining complete PM records

3.1.3 Inspections

Regularly scheduled inspections will be used as oversight mechanisms to help ensure selected BMPs are being implemented. Testing and inspection of the pollution prevention equipment and systems on the Yost will be conducted on a scheduled basis as determined by the conditions and circumstances that exist, or as required by other regulations. To meet this requirement, three types of schedules will be followed: daily, monthly, and annually. The BMP committee chairperson will develop the scope of each inspection, assign personnel to conduct each inspection, develop an inspection schedule, provide forms to report inspection results, and determine remedial actions to be taken as a result of inspection findings. A checklist of BMP-related items will be developed for daily and monthly inspections.

Inspections will be in accordance with written procedures developed for the exploration facility. These procedures and a record of the inspections will be signed by the personnel making the inspection.

Qualified employees inspect areas susceptible to leaks, spills and other identified problem areas as noted in Section 3. The focus of BMP Plan inspections will include solid and liquid materials storage, fluid transfers and solid materials handling area, activities with potential to contaminate stormwater runoff, plus disposal sites.

3.1.4 Chemical Additives

The use of chemical additives in fresh or seawater should be avoided or limited the extent possible. If chemical additives are necessary, their use is restricted to the most stringent of the following constraints:

- The maximum concentrations and any other conditions specified in the EPA product registration labeling if the chemical is an EPA registered product.
- The maximum manufacturers recommended concentration.
- The maximum concentration of 500 milligrams per liter.

3.1.5 Security

Security, as a part of the general BMPs program will be designed to avoid releases due to accidental or intentional entry to the Yost that might result from vandalism, theft, or sabotage.

The Yost already has a security plan in place, and this plan will implemented. Generally, access to the Yost will be by helicopter or boat and will be controlled through the control room on the facility as well as at the Nikiski dock. The control room will record personnel present in operating areas. This program provides for security and safety of personnel while moving to and from the exploration facility, and while at the facility.

In addition, the drilling sites are remote, offshore locations with limited access. The drilling supervisor strictly controls any transit and access to the sites. For proprietary and safety reasons, access to the Yost will be restricted to authorized persons and regulatory personnel only.

3.1.6 Employee Training

Furie will develop a program to help instill in employees and understanding of the BMP Plan. This will be integrated into orientation training all onsite personnel will take prior to assignment on the Yost. This orientation training will include:

- Instructing drill crews how to properly handle fluid and products
- Insuring all safety data sheets for chemicals and products are up to date and readily available for workers to access for information
- Informing exploration facility personnel on pollution control laws, rules and regulations
- Receiving regular training in operations and maintenance procedures designed to prevent oil and hazardous substance discharges (Furie and/or contract personnel perform such training)
- Conducting employee briefings to tell them of any recently developed applicable precautionary pollution prevention measures
- Discussing known spills to determine their cause and develop corrective methods that can be used to preclude similar events

Personnel receive training on spill prevention techniques and will be provided regulatory updates and exposed to advanced improvements in spill contingency technology. Contract employees also are regularly indoctrinated to policy on safety and environmental issues.

3.1.7 Recordkeeping and Reporting

As part of a BMP Plan, recordkeeping will supplement records kept as part of the Drilling Fluids Plan. The records required for drilling fluids include a precise chemical inventory for each mud system and contingency additive added downhole or discharged, the total volume of drilling fluids, the maximum concentration of each constituent added to the drilling fluids, and the estimated amount of each constituent discharged to Cook Inlet (kept for 5 years). This information will be used to produce an end of well report per Section 2.2.6.2 of the Permit. Additional records to be kept as part of the BMP program will include background information

gathered as part of the BMP Plan, the BMP Plan itself, BMP inspection records and check lists, PM records non-compliance reports, and employee training materials.

Reporting will include BMP update memorandums, verbal and written notifications by BMP inspectors detailing areas of concern noted during inspections, and correction action report from the BMP committee to the plant manager.

The BMP Committee chairperson will receive and dispense records and information, and also be responsible for record reviews, ensuring corrective actions are identified, and appropriate personnel are notified of the need to make corrections.

Records and reports will be maintained in an organized (subject and date) filing system in the Furie Anchorage office. The daily, monthly, and annual checklists will be completed by exploration facility personnel and maintained for a period of three years. A record of annual inspections on the high level alarms also will be maintained for three years. Copies of the BMP Plan are available to affected employees.

Any deviations from the BMP Plan, and incidents resulting from such, will be recorded and reported to the BMP committee chairperson. A BMP incident report will be generated to document the incident and must include, at a minimum, the following information:

- A description of circumstances leading to the incident,
- Any corrective actions taken, and
- Recommended changes to operations and/or the BMP Plan that will prevent recurrence.

Reporting of noncompliance is accomplished by notification of supervisor by employees and subsequent notification to the field Environmental Coordinator by area supervisors. Noncompliance events must be reported orally to ADEC within 24 hours, and a written report must be submitted within 5 days.

3.1.8 Facility-specific BMPs

Facility-specific BMPs developed for exploration drilling and support operations are presented in Table 3-1. A Daily Rig Environmental Assessment Log for the Randolph Yost is presented in Exhibit 1. A daily checklist for specific equipment and systems on the Yost will be developed when operations commence.

Table 3-1
Exploration Facility-specific BMPs

Discharge No. and/or Type	Outfall Composition	Estimated Amount	Facility-specific BMPs	Notes
001 Drilling Fluids	Water-based drill fluids	5,000 barrels (bbl)/well	Follow Drilling Fluids Plan to minimize toxicity of drilling fluids used. Only those additives listed in the Drilling Fluids Plan and approved by ADEC can be discharged. Perform static sheen test on spent drilling fluids prior to discharge. Perform source reduction by recycle/reuse of drilling fluids after solids control. • Also perform source reduction by using proper drilling techniques. • Store up to 500 bbl in upright storage tanks to ensure less than 500 bbl per hour discharge. • Discharge via shuntline below inlet water surface except during slack tide when discharge will not occur.	Monitor/screen/sample/report per the Permit, Section 2.2 and Table 2. • Track to ensure from above known hydrocarbon zones; observe for oil sheen, and perform static sheen test as required. • Monitor use of NADF by drilling reports
001 Drilling Cuttings	Drilling cuttings coated with water-based drill muds	3,500 bbl/well	Perform source reduction by storing up to 2,000 bbl onboard in mud pits, sand trap, de-silter and trip tanks to ensure less than 500 per hour discharge. • Also perform source reduction by using proper drilling techniques. • Discharge via shuntline below inlet water surface except during slack tide when discharge will not occur. • Once in hydrocarbon zone or using non-aqueous drilling fluids (NADF), no discharge	
Non-aqueous Drilling Fluids	NADF	Not allowed under *the Permit (no discharge)*	Only those additives listed in the Drilling Fluids Plan and approved by ADEC can be discharged. If a mineral oil pill is required, Section 2.2.5 of the Permit outlines strict procedures for toxicity testing, pill recovery, and reporting. Perform source reduction by recycling/reusing drilling fluids after solids control, storing in tanks with visual level indication (manned during drilling)	

Table 3-1
Exploration Facility-specific BMPs (Continued)

Discharge No. and/or Type	Outfall Composition	Estimated Amount	Facility-specific BMPs	Notes
			and transporting for onshore disposal. • Also perform source reduction by using proper drilling techniques. • Ensure all valves possibly leading to a discharge line are tagged/locked out during storage, and all lines, hoses and fittings are in good working order prior to implementing transfer for transport. • Once using NADF, no discharge thereafter *or...* • A 50 bbl buffer of drilling fluid on either side of a NADF pill will be collected and removed from the circulating fluid system and containerized for onshore disposal and the residual mineral oil concentration cannot exceed 2 percent volume/volume (follow procedures in Section 2.2.5.2 of the Permit).	
Drilling Cuttings	Hydrocarbon zone cuttings coated with water-based or NADF drill muds	Not allowed under *the Permit (no discharge)*	Static sheen tests are to be performed on all drilling fluids and cuttings prior to discharge, Fluids and cuttings that exhibit a sheen may not be discharged. Perform source reduction by storing up to up to 2,000 bbl onboard in mud pits, sand trap, de-silter and trip tanks and transporting for onshore disposal. • Also perform source reduction by using proper drilling techniques. • Ensure all valves possibly leading to a discharge line are tagged/locked out during storage, and all lines, hoses and fittings are in good working order prior to implementing transfer for transport. • Once in hydrocarbon zone or using NADF, no discharge.	
002 Deck Drainage	Fresh water, rain water, seawater, equipment wash down water, and fire control test water	125 bbl/day	Perform source reduction by preventing deck drainage from coming into contact with oil by using drip pans and curbing, collection boxes, pipe manifolds, and sumps.	Monitor/screen/sample/report per the Permit, Section 2.3 and Table 3.

Table 3-1
Exploration Facility-specific BMPs (Continued)

Discharge No. and/or Type	Outfall Composition	Estimated Amount	Facility-specific BMPs	Notes
	Routed through an oil-water separator (OWS) prior to discharge		• Ensure the decks are washed regularly and any sheens observed on the decks resulting from maintenance or operations activities are promptly cleaned up. • Monitor these source reduction systems/ oil collection and containment systems, and remove oil as necessary to prevent overflow. • Inspect drains and chutes on each deck to confirm there is no standing fluid around the drain indicating drainage is not occurring. If drainage is not occurring, notify the Operations Supervisor that maintenance is required. • Treat all collected water by first processing in an OWS system prior to discharge. • Maintain and clean OWS, collect waste oil and transport to shore for proper disposal.	
Fire Control System Test Water	Untreated seawater routed to OWS	2 bbl/ biweekly test (minimum)	Discharge only during fire, blowout or system test. • Discharge into deck drainage through OWS (See BMPs for deck drainage).	
Equipment Wash Down Water`	Wastewater from equipment wash down routed to OWS	50 bbl/day	Perform source reduction by preventing wash water from coming into contact with oil by using drip pans and curbing, collection boxes, pipe manifolds, and sumps. • Use absorbent pads to reduce oil on equipment surfaces. • Maintain equipment to prevent leaks, rust, and other deterioration	

Table 3-1
Exploration Facility-specific BMPs (Continued)

Discharge No. and/or Type	Outfall Composition	Estimated Amount	Facility-specific BMPs	Notes
003 Domestic Wastewater	Human waste	2,500 gal/day	Perform source reduction by treating in marine sanitation device (MSD), storing on board and then transporting to shore and treat/dispose in approved facility. Alternatively, treat and discharge offshore via shuntline below water surface. • Ensure all valves possibly leading to a discharge line are tagged/locked out during storage, and all lines, hoses and fittings are in good working order prior to implementing transfer for transport	Monitor/screen/sample/report per the Permit, Section 2.4 and Table 4.
004 Graywater	Laundry, shower, and gray water	Included in domestic wastewater total	Perform source reduction by treating in MSD, storing on board and then transporting to shore and treat/dispose in approved facility. Alternatively, treat and discharge offshore via shuntline below water surface. • Ensure all valves possibly leading to a discharge line are tagged/locked out during storage, and all lines, hoses and fittings are in good working order prior to implementing transfer for transport. • Avoid disposing of grease, disinfectants, or other chemicals down drains to avoid disrupting operation of the MSD.	Monitor/screen/sample/report per the Permit, Section 2.5 and Table 5.
009 Non-contact Cooling Water	Untreated seawater	42,000 bbl/day	Ensure no chemical additives are mixed with the seawater as the cooling system does not require chemical additives. • Discharge is via a port approximately 10 feet above the bottom of the hull. • Periodically inspect the overboard discharge to ensure only clean water is discharged.	
010 Uncontaminated Ballast Water	Cook Inlet seawater used for preload	27,500 bbls/ preload cycle	Rig to discharge transit water in federal waters prior to entering Cook Inlet. • Cook Inlet seawater to be discharged overboard during preloading	

Table 3-1
Exploration Facility-specific BMPs (Continued)

Discharge No. and/or Type	Outfall Composition	Estimated Amount	Facility-specific BMPs	Notes
012 Excess Cement Slurry	Excess cement	200 bbl/day	Recycle/reuse drilling fluids after solids control. • Discharge via shuntline below water surface.	
013 Muds, Cuttings, Cement at Seafloor	Water-based mud coated cuttings, cement	50 bbl/well	Track to ensure from above hydrocarbon zones, extra cement • Avoid discharge during slack tide.	
019 Test Fluids	Fluids sent downhole during testing with formational water	400 bbl/day	Store on board in tanks with overflow protection (high level alarms and visual level indicators) and then transport to shore for injection if hydrocarbons present. Discharge via shuntline below inlet water surface if no hydrocarbons. • Ensure all valves possibly leading to a discharge line are tagged/locked out during storage, and all lines, hoses and fittings are in good working order prior to implementing disposal or transfer and transport.	Monitor/screen/sample/report per the Permit, Section 2.7 and Table 9.
Trash & debris	Trash & debris during exploration	No Discharge.	Separate by type, store in labeled containers and transport to shore for recycle and/or dispose in approved landfill	
Used petroleum, oil, and lubricants	Used petroleum, oil, and lubricants	No Discharge.	Ensure all used petroleum, oil, and lubricants are stored appropriately in sealed, labeled containers in an appropriate storage location. • Ensure oil-contaminated rags, filters, and other disposable materials are disposed of in appropriate containers dedicated to oily material storage.	

Note:
For definitions, see the Acronyms and Abbreviations section.

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4.0 BMP PLAN EVALUATION AND REEVALUATION PHASE

Operations at Furie's exploration facility will be dynamic and subject to periodic change. As such, the BMP must be modified to reflect facility changes. At a minimum, the BMP plan will be revisited annually to ensure that if fulfills stated objectives and remains applicable.

4.1 ANNUAL EXPLORATION FACILITY EVALUATION

4.1.1 Corrective Action

Based upon the results of inspections, corrective action is initiated if necessary. Significant corrective actions are documented and included in the plan at the next plan amendment.

4.1.2 Record Keeping and Internal Reporting Procedures

The daily, monthly, and annual checklists are completed by platform personnel and maintained for a period of three years. A record of annual inspections on the fuel tank high level alarms is maintained, with a three-year retention. Copies of the BMP Plan are available to affected employees.

Reporting of noncompliance is accomplished by notification of supervisor by employees and subsequent notification to the field Environmental Coordinator by area supervisors.

4.1.3 Best Management Practices Plan Amendments

The BMP Plan will be reviewed annually by the BMP committee and revised if necessary to reflect changes in design, construction, operation, or maintenance which may affect the potential to release pollutants to the waters of the United States or if the plan proves to be ineffective in eliminating or minimizing pollutants from sources impacting water quality.

The plan shall be updated to include new activities or changes in drilling equipment if necessary.

4.2 OTHER RE-EVALUATION

An annual exploration facility allows for new perspectives gained through the implementation of the BMP, as well as the reflection of new directives and emerging technologies, among other factors. However, plan revisions will not be limited to annual evaluating and alteration. In some cases, Furie believes it is appropriate to reevaluate plans based on changing conditions, such as:

- Restructuring of facility management
- Change in drilling equipment
- Additional drilling in the proposed general Permit area
- Significant changes in the drill fluids plan
- New permits and/or new legislation related to BMPs
- Releases to the environment.

This additional plan revaluation may pinpoint areas of the exploration facility not addressed by the plan or activities that may benefit from further development of specific BMPs or revision of the general programs contained in the BMP plan.

In conclusion, Furie believes that, as the BMP plan improves, cost can be further minimized as a result of source reduction (waste generation reduction), less hazardous or toxic materials use, and prevented environmental releases.

5.0 REFERENCES

United States Environmental Protection Agency (EPA). 1993 (October). *Guidance Manual for Developing Best Management Practices.* EPA 833-B-93-004. https://www3.epa.gov/npdes/pubs/owm0274.pdf. Accessed 22 March 2016.

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Exhibit 1

Randolph Yost Daily Rig Environmental Assessment Log

Daily Rig Environmental Assessment Log

Advanced Drilling Solutions, LLC

Randolf Yost

Only persons authorized by the OIM are authorized to complete this form. Records are to be maintained for the duration of the well and filed with end of well paperwork.

Weather Condition(R=Rain, F=Fog, Sn=Snow, Su=Sun, Sl=Sleet, I=Floating Ice) :

Date	Time of Observation	Current Conditions	Forecasted Conditions	Current Flow (Kts & Direction)		Temperature(^{o}F)

Daily Rig Environmental Assessment Log

Rig Floor	ok	Needs Work	Deficiencies	Corrective Actions

Main Deck	ok	Needs Work	Deficiencies	Corrective Actions

Jack Houses	ok	Needs Work	Deficiencies	Corrective Actions

Daily Rig Environmental Assessment Log

Shakers	ok	Needs Work	Deficiencies	Corrective Actions

Cantilever Deck	ok	Needs Work	Deficiencies	Corrective Actions

Machinery Deck	ok	Needs Work	Deficiencies	Corrective Actions

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THE STATE of ALASKA
GOVERNOR BILL WALKER

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DIVISION OF WATER
Wastewater Discharge Authorization Program
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www.dec.alaska.gov

May 3, 2016

DEC File #: 2339.48.056
APDES Permit #: AKG315102

Mr. Bruce Webb
Furie Operating Alaska, LLC
1029 West 3rd Ave, Suite 500
Anchorage, Alaska 99501

Re: Revised Coverage under the Alaska Pollutant Discharge Elimination System (APDES) General Permit AKG315100 – Mobile Oil and Gas Exploration in State Waters in Cook Inlet

Dear Mr. Bruce Webb:

Alaska Department of Environmental Conservation (DEC or Department) received a Notice of Intent (NOI), Drilling Fluids Plan (DFP) and Environmental Monitoring Program (EMP) Study Plan received from Furie Operating Alaska, LLC (Furie) on March 28, 2016. DEC issued authorization **AKG315102 – Furie Operating Alaska, LLC, Kitchen Lights Unit Exploration** on April 4, 2016. This authorization did not include the discharge of domestic wastewater since the domestic wastewater system did not have Department approval on an Engineering Plan Submittal and a waiver to secondary treatment standards. DEC provided approval to operate the Randolph Yost domestic wastewater system and a waiver to secondary treatment standards on April 22, 2016 (tracking #26574). As of the date of this letter, domestic wastewater discharges are authorized as originally requested in the NOI. As noted in the previous authorization letter, the Drilling Fluid Plan and Environmental Monitoring Program Study Plan are approved for the two wells noted in the NOI and Furie is authorized for the following discharges and the associated mixing zones per the general permit:

Discharge	Description
001	Drilling Fluids and Drill Cuttings
002	Deck Drainage
003	Domestic Wastewater
009	Non-Contact Cooling Water
010	Uncontaminated Ballast Water
012	Excess Cement Slurry
013	Mud, Cuttings, and Cement at the Seafloor
019	Test Fluids

Note that adding wells to this authorization may require submittal of a revised NOI, DFP, and EMP Study Plan. You should coordinate with DEC on any modification prior to submitting a written request for modified coverage.

Keep a copy of this letter and the authorization on site along with other documents as required by the permit. See the enclosure and authorization summary for facility and site information. A copy of this APDES authorization has been provided to the DEC Compliance and Enforcement Program (CEP). CEP will provide you with copies of the appropriate discharge monitoring report (DMR), spill report, and violation notification forms in the near future. In the interim, please refer to general permit AKG315100 for specific monitoring requirements, applicable limits, Best Management Practices (BMP) Plan, and Quality Assurance Project Plan (QAPP) requirements. A generic QAPP prepared by DEC is available upon request, or you may prepare your own.

Submittals including DMRs, Annual Reports, EMP Reports, End of Well Reports, BMP and QAPP certifications, and all compliance notifications required by the permit must be sent to the following address:

Department of Environmental Conservation
Division of Water
Compliance and Enforcement Program
555 Cordova Street
Anchorage, AK 99501
Telephone Nationwide (877) 569-4114
(907) 269-4114
Fax (907) 269-4604
Email: dec-wqreporting@alaska.gov

In all communications with the Department, please use the authorization number AKG315102. If reporting to the email address, please indicate if a hardcopy is also being sent to the mail address.

This authorization will expire on midnight Mach 8, 2020. There is a requirement to submit an NOI 90 days before the expiration of General Permit AKG315100 – Mobile Oil and Gas Exploration in State Waters in Cook Inlet for administrative extension, on or before before December 7, 2019. If you have any questions regarding this authorization, please contact Natalie Wagner at 907-269-7956 or Natalie.wagner@alaska.gov.

Sincerely,

Gerry R. Brown

Gerry R. Brown, PE - Manager
Oil and Gas Section

CC: Amber Bennett, CEP, Fairbanks
Monica English, DEC, Soldotna
Natalie Wagner, DEC, Anchorage
Kristina Neptune, Jacobs Engineering, Anchorage

Enclosure: Authorization Summary AKG315102

Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
Authorization Summary

GENERAL PERMIT: AKG315100 - Mobile Oil and Gas Exploration Facilities in State Waters in Cook Inlet
Authorization: AKG315102 - Furie Operating Alaska, LLC, KLU Exploration
DEC File No.: 2339.48.056

This authorization is effective **May 1, 2016**.
This permit and the authorization to discharge shall expire at midnight on **March 8, 2020.**

Responsible Party Information					
Facility Name:	**Randolph Yost**			Phone:	**907-277-3726**
Name of Contact Person, Title:	**Bruce Webb, Senior Vice President**				
Operator:	**Furie Operating Alaska, LLC**				
Facility Mailing Address (Street/Location):	**1029 W. 3rd Ave., Suite 500, Anchorage**	State:	**AK**	Zip:	**99501**
Email Address:	b.webb@furiealaska.com				

Facility Information							
Mobile Facility Type		**Jackup**	Plan Review Approval		Yes	**X**	No
Seasonally Operated ?	**X**	Yes	Approx Start Date:	**April 15**			
		No	Approx End Date:	**October 31**			

Area of Operations (Vicinity Map Provided)[1]				**(Rev 1)**
State Oil and Gas Lease	**ADL**	**389513; 389924; 389929; 389193**	Unit	**Kitchen Lights**
Prohibited Areas[2]	**Trading Bay State Game Refuge (~12 mi), Susitna Flats Game Refuge (~ 25 mi), Reboubt Bay State Critical Habitat Area (~ 30 mi)**			
Range of MLLW Depths in the ADL Lease Block (from NOAA Chart 16663)			**55-90 feet**	**16-28 meters**

Well/Discharge Locations*						**(Rev 1)**
Well Name		**Osprey**	**KLU #4 (re-entry)**			
Well Location	Latitude	**60°52'1.9998" N**	**59°52'17.37"N**			
	Longitud	**-151°52'58.005"W**	**-151°51'55.09"W**			
Legal Description[3]		**T10N, R11W, S24**	**T10N, R10W, S8**			
Alaska State Plane Coordinates[4]:	X					
	Y					
Beginning Date		**Apr-16**	**Jun-16**			
Expected Duration		**Up to 215 Days**	**Up to 215 Days**			
Mean Lower Low Water (MLLW) Depth at Well[5]		**~85 feet (25 meters)**	**~85 feet (25 meters)**			

**To revise discharge and drilling locations, send details to DEC and note the appropriate revision change number.*

Notes:

1 The vacinity map provided by the applicant must define the area of operation.
2 Description and approximate dischage to prohibited area from area of operations.
3 Seward Meridian, (T, R, S): Township (T), Range (R), Section (S).
4 Zone 4, NAD27 (ASP4)
5 Depth of location from NOAA Chart 16663
MLLW: Mean lower low water

NPDES
Inspection Report

Furie Operating Alaska, LLC

Julius R Platform
Randolph Yost Jackup Rig

Cook Inlet, Alaska

June 15, 2016

Prepared by:

Rick Cool
Environmental Protection Agency, Region 10
Office of Compliance and Enforcement
Water and Wetlands Enforcement Unit

(Unless otherwise noted, all details in this inspection report were obtained from conversations with L.C. Tootie Martin, Joe Fleming, Brian Travis and/or from documents related to the two facilities.)

I. Facility Information

Facility Names/Permit Nos:	Julius R Platform (APDES Permit No. AK0053686) Randolph Yost Jackup Rig (APDES Permit No. AKG315102)
Facility Permittee:	Furie Operating Alaska, LLC
Physical Address:	Kitchen Lights Unit, Cook Inlet, Alaska (offshore of Nikiski, Alaska 99635)
Lat/Long:	+60.936722°/ -151.156306°
Mailing Address (AK):	1029 West 3rd Avenue, Suite 500 Anchorage, Alaska 99501
NAICS/SIC Codes:	211111/1311 – Crude Petroleum & Natural Gas
Facility Contacts:	L.C. Tootie Martin, HSE Director 100 Enterprise Avenue League City, Texas 77573 (o) (281) 957-9812; cell: (409) 370-5624 l.martin@furiealaska.com Bruce Webb, Senior Vice President Furie Operating Alaska, LLC 1029 West 3rd Avenue, Suite 500 Anchorage Alaska 99501 (o) (907) 277-3726 b.webb@furiealaska.com
Receiving Water:	Cook Inlet, Alaska (Corsair Block, Kitchen Lights Unit)

II. Inspection Information

Inspection Date:	June 15, 2016
Inspectors:	Rick Cool, Clean Water Act Inspector EPA Region 10, OCE/Water and Wetlands Enforcement Unit (206) 553- 6223 Willow Weimer, Environmental Program Specialist Alaska Department of Environmental Conservation (DEC) (907) 269-6096

Arrival & Departure Times:	Julius R Platform – 7:45 am/4:00 pm Randolph Yost Jackup Rig – 1:00 pm/3:30 pm
Weather:	Clear and sunny
Purpose:	Compliance evaluation inspections under the facilities' Alaska Pollutant Discharge Elimination System (APDES) permits and the Clean Water Act.

III. Permit Information

Furie Operating Alaska, LLC (Furie) is the named permittee for the Julius R Platform (Platform) under APDES Permit No. AK0053686 (herein, Permit). The Permit was originally effective May 18, 2014 and was subsequently modified by DEC. The modification was executed April 22, 2016 and effective May 23, 2016. The modified permit expires on May 17, 2019.

Furie is also the named permittee for the Randolph Yost jackup rig (Rig) under APDES Permit No. AKG315102. This DEC general permit regulates mobile oil and gas exploration facilities in state waters in Cook Inlet. The general permit was effective on March 9, 2015 and expires on March 8, 2020. DEC issued the Rig permit coverage to Furie on April 4, 2016. By letter dated May 3, 2016, DEC revised the Rig permit coverage to include Discharge 003, Domestic Wastewater.

As discussed below, at the time of this June 2016 inspection, the Rig was, in effect, married to the Platform for purposes of conducting development or production drilling activities (i.e., not exploration drilling) at the Platform. In accordance with the Permit, the Rig's discharges of domestic wastewater, deck drainage, non-contact cooling water and uncontaminated ballast water are authorized and regulated by the Permit.

IV. Background

The monopod-designed Platform is a natural gas production facility located in the Corsair Block of the Kitchen Lights Unit approximately 15 miles northwest of Nikiski Bay in the coastal zone of Cook Inlet. See Attachment A of this report for location and vicinity maps of the Platform location. The Platform is permanently fixed to the seabed in waters approximately 35 meters deep. The Platform is designed with a single caisson supporting the Platform's main deck and various skids.

Furie finished installing the Platform and began manned operations by approximately August 2015. The Platform began producing natural gas in approximately November 2015. The Platform sends the natural gas via a gathering subsea pipeline to a shore-based processing facility located near Nikiski. Furie will drill development wells by cantilevering a mobile offshore drilling unit (MODU, e.g. jackup rig) over the fixed Platform. Well tubulars will pass through the caisson to the seafloor.

The Rig is a 1979 Marathon LeTourneau 116C-designed, three-legged jack-up drilling rig under contract to Furie via Shelf Drilling. Furie also intends to use the Rig for exploration drilling for crude oil and natural gas in the Kitchen Lights Unit for a multi-year oil and natural gas drilling program. The Rig has cantilever envelope capability allowing it to cantilever its drill deck/derrick over the Platform for purposes of drilling development and production natural gas wells in available Platform well tubular slots.

On or about May 10, 2016, the Rig was anchored to the seafloor and winched into position next to the Platform for purposes of conducting development and production well drilling. In this joined Rig/Platform configuration and with these development and production well drilling purposes, neither facility is authorized by any APDES permit to discharge drilling fluids and drill cuttings to Cook Inlet. Accordingly, drilling fluids will be recovered and re-used, or as needed, used drilling fluids will re-containerized and shipped to shore for proper storage, re-use and/or disposal. The drill cuttings will also be collected and containerized in drill cuttings containment boxes on the Rig deck and shipped to shore for disposal by an environmental waste disposal company (e.g., NRC or Emerald).

Additionally, the joined Rig/Platform configuration has the following authorized discharge outfalls under Permit No. AK0053686:

001A: Platform domestic wastewater
001B: Rig domestic wastewater
002A: Platform deck drainage
002G: Rig deck drainage
005: Rig non-contact cooling water
006: Rig uncontaminated ballast water

In accordance with the Permit, Section 1.1.2, the Rig's outfall discharges identified above are authorized under the Permit only while the Rig is conducting development or production drilling activities at the Platform.

In April 2016, the DEC approved the Platform's advanced domestic wastewater system which consists of a redFox sewage treatment unit Model RF-2000-M (unit). This unit uses an aerobic biological treatment process to treat domestic wastewater (combined gray and black water) generated on the Platform. The DEC's approval letter indicates the effluent is disinfected using a chlorine contact chamber then de-chlorinated before final discharge.

In April 2016, the DEC also approved the Rig's advanced domestic wastewater treatment system which consists of an Omnipure Model 5538 unit. This unit uses an electrocoagulation process to treat the Rig's commingled gray and black water for a maximum population of 60 persons. The DEC's approval letter indicates the effluent is disinfected through a seawater electrolytic process then de-chlorinated prior to final discharge.

According to DEC's final fact sheet for the Permit, the Permit effluent limitations' compliance point for the Platform's domestic discharge (Outfall 001A) and the Rig's domestic discharge (Outfall 001B) will be prior to the location where the discharges are combined to be discharged from a single discharge port.

According to DEC's final fact sheet for the Permit, the Rig's deck drainage will include fire test water and equipment wash water and that this commingled drainage will be held in an interim holding tank before being treated by an oil water separator (OWS) prior to discharge to the receiving water via Permit's Outfall 002G. The Permit, Section 1.2.2, Table 3, note c, also requires the Platform's Outfall 002A, deck drainage, must be treated using an OWS prior to discharge.

The Rig uses seawater for non-contact, once-through cooling of various Rig machinery (e.g., power generators, drawwork brakes, etc.) and discharges it via the Permit, Outfall 005. The Rig's best management practices (BMP) plan (March 2016) indicates this cooling system does not require chemical additives so none will be used. The BMP Plan estimates untreated cooling seawater discharges of up to 42,000 barrels per day, via a port that is approximately 10 feet above the bottom of the Rig hull.

Finally, the Rig's uncontaminated ballast water is unaltered seawater that is taken into the Rig's hull during pre-loading as part of the deployment and anchoring operations of the Rig's three legs. This ballast water is not mixed with any other wastes onboard and there are no chemical additives. The DEC fact sheet indicates that upwards of 1.2 million gallons (28,500 barrels) of seawater is transferred for each positioning attempt of the Rig at a well location. The uncontaminated ballast water is discharged via the Permit, Outfall 006.

V. Inspection Chronology

This was an announced inspection. I initially contacted Mr. Martin, Furie's HSE director, on about May 17, 2016 via phonecall and follow-up email to coordinate the inspection logistics. We arrived at the Rediske helipad on Porter Drive, Nikiski, at about 7:30-7:45 am for a scheduled 8:00 am flight. We arrived at the Rig helipad at approximately 8:45 am and began the opening conference in Rig offices at 9:30 am. We conducted the Rig inspection first, then the Platform inspection in the early afternoon and completed the inspection process by about 4:00 pm.

Mr. Martin and Joe Fleming, Jabobs Environmental, accompanied us during the Rig and Platform inspections. We were not denied access to either facility and we were allowed to inspect all areas that we requested to inspect.

VI. Inspections & File Reviews

We started the discussion with an overview of current Rig and Platform operations. The Rig and Platform were finally married on about May 6, with the Rig's cantilever system moved over the Platform on about May 10.

There was no Rig drilling occurring on the day of the inspection (Wednesday) but the conductor pipe, starter head and diverter pipe systems had been installed in preparation for drilling Well KLU A-2. Furie was still in the process of installing drill cuttings collection, auger and vacuum systems on the Rig and the blowout preventer was going to be inspected by AOGCC on Thursday. Furie was anticipating that the development well would be spud late the coming weekend and anticipated that it would take approximately 35 days to complete the development well KLU A-2.

The Platform has been operating in manned conditions since about August 2015. The Platform typically has four staff persons on board, two production operators and two service hands that operate on day/night shifts. Current natural gas production is occurring from the Platform's Well KLU-3.

The Rig arrived in Homer, Alaska (Kachemak Bay) on about March 10 and had been moored in Homer until about May 5 when it was towed by a tug to the Platform and anchored into position.

The Platform operators are responsible for conducting Permit-required sampling, inspections, etc. Jacob Engineering (or a/k/a Jacob Environmental) provides all of the Rig Permit-required sampling, inspections, etc. and in addition, is responsible for discharge monitoring report preparation for both facilities.

In regard to Rig drilling, the Permit does not authorize the discharge of drilling muds and drill cuttings for development and production well drilling. At the time of the inspection, Furie was in the process of installing the drill cuttings collection system and they described that process and equipment to the inspectors which included the use of deck-located 25-barrel cutting collection boxes (and spares) that could be moved by Rig crane to support vessels for transport back to shore for disposal.

We discussed the drilling fluids' barite receipt process and sampling process in light of the fact that Furie intended to use the Rig for exploration drilling in 2016 and future years. Furie gets barite supplies by both bag and bulk delivery. The EPA inspector noted that barite sample results (e.g., manufacturer's certifications, actual Rig sampling and results, etc.) for mercury and cadmium should be obtained and retained for all separate barite supply lots, regardless of how the barite is delivered and stored.

We also discussed Furie's static sheen test methods, equipment, etc. in anticipation of having to do Outfall 001 sampling during exploration drilling under their Rig permit coverage, AKG315102. We checked and observed their static sheen test equipment and purchased kit-provided procedures. Subsequent to this inspection, Furie also submitted a copy of their static sheen test report form for both facilities. Attachment D of this inspection report is a copy of the Furie-supplied static sheen test report form for both facilities.

In terms of Rig housekeeping, the Rig's drill floor is underlain with a containment pan that diverts drill floor runoff back to the Rig's mud system. Precipitation that might fall near the drill floor collects in a trench drain and is treated with the stormwater.

We discussed each of the Rig's other permitted current discharges under the Permit. The Rig's oil water separator (OWS) used for deck drainage treatment was off-line at the time of the inspection, undergoing maintenance and repair so at the time of the inspection, all deck drainage was being collected on board awaiting OWS operations. During regular OWS operations, the deck drainage is diverted to preload tanks then treated via the OWS before final discharge.

The Rig's black and gray water are both being conveyed to the deck-side Omnipure unit. The unit was just started in May, 2016 and some of the initial samples were not in compliance with the Rig's AKG315102 requirements. Furie's initial evaluation was that the low salinity was causing the bookcell and reactor to not run as expected and that the system might be affected by high solids loading. Furie was adding saltwater to keep the voltage down across the elements. A brine injector pump was on order in an effort to resolve the salinity situation. Furie uses a Hach test kit for chlorine and we observed this test equipment.

Furie indicated that weekly sampling of the Ominpure unit's domestic wastewater discharge was now instituted to comply with the Permit, Section 1.2.1, Table 2, note a, requiring weekly sampling for BOD_5 and TSS of the domestic wastewater discharge when the Rig is connected to the Platform.

Furie also confirmed that no chemicals are added to the non-contact cooling water discharge. We did not discuss the uncontaminated ballast water discharge because it was not a current discharge (and only occurred when the Rig set its legs on about May 6) but I reviewed Furie's May 2016 discharge monitoring report for this discharge and did not observe any anomalies.

Daily visual walk-around observations are made and recorded in the observer's log or note book of the Rig for BMP Plan housekeeping elements and discharge observation purposes and then the log or note book data is entered into computer template checklists. Daily checks include of OWS operations and Ominpure operations (including chlorinator and dechlorinator).

A document review was done on board the Rig, including observations of the presence of the Permit, DEC's discharge authorization letter, drilling fluids plan, BMP Plan (March 2016 edition), DMRs and supporting documentation and visual observation checklist records. No BMP Plan training records existed as of this inspection date.

After the document review, we did a walk-around inspection of the Rig that included observations of the drilling fluids/cuttings "no-discharge" containerization system (e.g., shale shakers, centrifuge, auger and muds vacuum system, cutting boxes, etc.), sub-drill floor fluids containment, handling and conveyance system, static sheen test equipment (kit availability), Omnipure system and sampling points, and visual observation points.

After the Rig walk-around inspection and lunch, we proceeded to the Platform for an operational overview of the Platform's recent operations (e.g. staffing, start-up, etc.) and about O&M and inspection/sampling procedures related to its Permit-authorized discharges, the redFox domestic wastewater treatment unit and the deck drainage-related CPI separator.

The Crosby-hired operator described the redFox unit's operation and the various daily inspection and observations that are made, and the disinfection O&M and sampling procedures. Given the low number of staff people on board and resulting low domestic flows, staff occasionally feed fertilizer to the redFox unit to feed the aerobic biological treatment sub-unit. Daily redFox observations, measurements, sampling and O&M tasks are kept by operators in a hand-written daily log book (a sample copy of which was provided for review). July 2016 excerpts of the daily log book entries are included in the compact disk that is Attachment E of this inspection report.

The operator described the daily Platform equipment observations that are made and the use of a BMP Plan-devised checklist. These daily observations include reviews of equipment pollution containment pans, the redFox unit and the coalescing plate interceptor (CPI) separator that is used to treat deck drainage. The CPI provides gravity separation of free oils and solids. The floating oil is collected in the CPI's oil skimming bucket, pumped to the vent scrubber.

In connection with the CPI separator operation and deck drainage discharges, we asked whether the Platform had static sheet test equipment and procedures in order to comply with the Permit, Section 1.2.2, Table 3, note b's requirements for such a test if certain specified ice conditions exist. Furie indicated that no such equipment and procedures existed on the Platform but the HSE director committed to getting the equipment and having the Jacobs Engineering staff conduct operating training on test procedures and test results documentation. The Platform's daily BMP Plan-based equipment checklist already identified the need for preparations to run the static sheen test.

A document review was done on board the Platform, including observations of the presence of the Permit, BMP Plan (March 2016 edition), QAPP (May 2016 edition), sampling records, DMRs and supporting documentation and visual observation and BMP Plan-based checklist records. No BMP Plan training records were located on the Platform on this inspection date.

After the document review, we did a walk-around inspection of the Platform that included observations of the Platform's production level, redFox unit, CPI separator and observation points.

VII. Closing Conference and Areas of Concern

During the closing conference, we discussed the following issues, observations, areas of concern and recommendations.

In regard to the Platform, we noted that the Permit requires continuous monitoring of the domestic wastewater discharge (not estimated) and our observation during the walk-around that the redFox flow meter was offline and in need of some maintenance. In addition, we noted that the Platform's BMP Plan (March 2016), Sections 3.4 and 3.5, Table 3-2, provides that employee BMP training and attendance records are to be maintained onsite for ready availability to regulatory agencies upon request. We recommended that Furie create and retain Rig-based BMP training records and attendance when such BMP Plan training is provided and completed.

In regard to the Platform, we discussed and highlighted that the Permit, Section 1.2.2, Table 3, note b, requires the use of the static sheen test on deck drainage discharges during certain ice conditions. We understood from this inspection and other platform inspections prior to June 15, that there have not been significant ice conditions surrounding Cook Inlet platforms, including this Platform, during winter months in the last couple of years. An area of concern was that the Platform and its staff did not currently have onboard the Platform the static sheen test equipment, test procedures or test record forms to carry out these Permit requirements. Furie staff assured us that a test kit, test kit procedures, test record forms and training would be obtained in a timely manner via Jacobs staff and that training on the static sheen test procedures would be provided to the Platform staff.

In regard to Rig and Platform procedures and records, we discussed the staff's daily visual observations under the Permit and the use of staff notebooks or log books. As background, the Permit, Appendix A, Part 1.11.2, provides in part that the permittee must retain all monitoring information records for at least three years, and Part 1.11.3 identifies what records of monitoring information must include (e.g., exact place and time of monitoring, name of person performing monitoring, etc.). When the Rig is operating under its Permit No. AKG315102 coverage, there are the same or similar monitoring record requirements as noted above under the DEC Permit No. AKG315100, Appendix A, Parts 1.11.2 and 1.11.3. For additional context, we understood that Rig and Platform operators made the daily visual observations for the pollutant parameters required by the Permit for floating solids, foam, garbage and oil sheen as they are applicable to particular discharges (e.g. domestic, deck drainage, etc).

We discussed areas of concern regarding the Permit's visual observation recordkeeping content and record retention requirements and about Furie's record retention schedule for the original monitoring records created by operators in log books and notebooks before that information is entered into electronic template checklists, spreadsheets and DMRs. We recommended that Furie review its monitoring records creation and retention procedures in light of the various procedures and devices being used onboard its facilities, staff recording preferences and possibilities for staff changes and consequently changed practices.

In addition, we raised as an area of concern that electronic daily/weekly checklists used to summarize the operators' actual visual observations should reflect the entire suite of Permit parameters that are required to be visually observed. As an example and in addition to visible sheen observations, the Rig's electronic daily environmental compliance summary assessment checklist should include recorded observations for the Permit's domestic

wastewater and combined outfall discharge related to floating solids, foam and garbage.

Similarly, we noted that the Platform's summary daily electronic visual observation records for domestic wastewater discharges should record the other non-sheen pollutant parameters like floating solids, foam and garbage. The Platform's BMP Plan (March 2016), Appendix C, includes a daily environmental compliance checklist that includes these three domestic wastewater pollutant parameters; however, Furie subsequently produced a completed electronic weekly environmental compliance record (with daily entries) for May 9-15, 2016 that included sheen but not the parameters for floating solids, foam and garbage. We recommended that Furie review its monitoring record creation, transfer, retention and record content procedures and checklists to ensure Permit-required parameters were being properly observed and recorded. This recommendation was made with the purpose to ensure the Furie records accurately reflect their staff person's in-field visual observations practices and results as required by the Permit.

At the conclusion of the closing conference, we discussed the logistics of getting representative example copies of some Rig and Platform documents (e.g., daily checklists) that were identified and discussed during the inspections. We thanked Furie and Jacobs staff for their time and cooperation in all phases of the inspection process and logistics. We concluded the inspection and were escorted to the Rig helipad for the flight back to the Rediske airfield.

VIII. Report Attachments

The following items are attached to this report:

A. Location and Vicinity Maps
B. Inspection Attendance Roster
C. Summary Photo Array & Photo Log
D. Rig & Platform Static Sheen Test Report Form
E. Compact Disk & Table of Contents

Report Completion Date: 12/12/17

Lead Inspector Signature:

ATTACHMENT E

Compact Disk & Table of Contents

Julius R BMP Plan (March 2016)
Julius R 2016 BMP Annual Review & Certification Statement
Julius R O&M redFox/Omnipure Plan (February 2016)
Julius R Quality Assurance Project Plan (May 2016)
Julius R BMP Weekly Environmental Compliance Checklist (May 15, 2016)
Julius R Weekly Environmental Compliance Record (May 9-15, 2016)
Julius R BMP Plan Daily Equipment Checklist (May 15, 2016)
Julius R redFox daily log book entries (July 8-19, 2016)
Julius R Static Sheen Test Kit instruction manual
Julius R Static Sheen Test Report Form

Randolph Yost BMP Plan (March 2016)
Randolph Yost Drilling Fluids Plan (March 2016)
Randolph Yost Daily Env. Compliance Assessment Checklist (June 24, 2016)
Randolph Yost BMP Plan Daily Compliance Checklist (June 24, 2016)
Randolph Yost Static Sheen Test Kit instruction manual
Randolph Yost Static Sheen Test Report Form

Photos & Photo Log (file folder)

DRAFT 6.22.16

Furie – Inspection Document Requests

Overview. The purpose of this document is to catalog the remaining document requests from the June 15 Randolph Yost MODU and Julius R Platform inspections.

Julius R Platform

1. November & December 2015 and January 2016: Signed DMRs, Lab Sheets, Chains of Custody for each month.
2. RedFox MSD [if existing]
   - MSD/BTU Field Test Forms [O&M Manual]
   - Daily Observations Checklists [Table 2-2, O&M Manual]
   - Equipment Maintenance Schedule records [Table 2-3, O&M Manual]
   - Daily Flow Meter readings records [QAPP, P. 5-1]
3. Static Sheen Test SOP & Testing records/forms
4. Weekly Jacobs Environmental Compliance Record – one completed week example
5. BMP Plan Daily BMP Checklist(s) – one completed day example
6. BMP Plan – Weekly Compliance Checklist(s) – one completed week example

Randolph Yost MODU

1. Notice Of Intent Cover Letter in re BMP Plan [GP Part 2.11.2]
2. Drilling Fluids Plan
3. Environmental Monitoring Program Study Plan
4. Jacobs Daily 3-page BMP Checklist – one completed daily example
5. May 2015 – Signed DMR, Lab Sheets, Chain of Custody

6. Omnipure MSD [if existing]
   - Daily Observations Checklists
   - Daily Flow Meter readings records
7. Static Sheen Test SOP & Testing records/forms
8. Daily Rig Environmental Assessment Record – one completed daily example

FURIE
Operating Alaska LLC
Furie Operating Alaska, LLC
1029 West 3rd Ave., Suite 500
Anchorage, Alaska 99501

Permit # AKG315100
March 25, 2016

Alaska Department of Environmental Conservation
Division of Water – Waste Water Discharge, Oil & Gas Section
555 Cordova St
Anchorage, AK 99501 USA

Subject: Notice of Intent (NOI), APDES General Permit AKG315100, Furie Operating Alaska, LLC, Cook Inlet Exploratory Drilling Program

Dear Natalie Wagner and Gerry Brown,

Furie Operating Alaska, LLC (Furie) is providing a notice of intent (NOI) for coverage under APDES General Permit AKG315100 regarding authorized discharges related to oil and gas exploration drilling to be conducted in state of Alaska coastal waters of the upper Cook Inlet. Drilling will be conducted by the Randolph Yost jack-up drill rig.

The purpose of the permit application is to allow Furie to conduct drilling activities in coastal waters, starting with a five-year exploration period that is scheduled to begin in April 2016. The initial drilling program will consist of five (5) wells in the Kitchen Lights Unit (KLU) lease block. Depending on results, additional wells may be drilled.

Furie hereby submits this NOI to satisfy the requirements of 40 CFR Part 435 (a) and (d). Completion of the NOI information is being provided by Furie as prescribed by General Permit AKG315100. This includes preparing and submitting the following documentation:

- NOI Information Sheet
- Initial Site Assessment
- Line Drawings and Flow Balances
- Environmental Monitoring Plan
- Plan of Operations
- Biological Evaluation
- Biological Assessment
- Drilling Fluids Plan
- Best Management Practices Plan
- Wastewater Engineering Plan Submittal Letter

A Quality Assurance Project Plan has been developed and will be implemented within 90 days of discharging; this document is available upon request. The Drilling Fluids Plan is currently missing toxicity information for one drilling fluid additive and has not received a final review by the drilling fluids contractor. A revised version of the Drilling Fluids Plan will be provided to ADEC for review and approval prior to discharging drilling fluids or cuttings.

An engineering plan review for the marine sanitation device onboard the Randolph Yost was submitted to the Alaska Department of Environmental Conservation, Division of Water- Wastewater Discharge Authorization Program on 19 February 2016. Additional information was requested by the Division and was provided on 22 February 2016 and 22 March 2016. An approval to operate the marine sanitation device has not been granted. A

waiver from minimum treatment requirements for domestic wastewater will be submitted shortly. Domestic wastewater and gray water will be containerized until approval for operation and discharge has been received.

We would also like to note that deck drainage will include a comingled outfall that includes bilge water and fire control test water. The bilge water will be comprised primarily of equipment wash down water. These sources will be combined and routed through the oil-water separator, to be discharged as a single outfall (Outfall 002, Deck Drainage). Further discussions of deck drainage and/or Outfall 002 refer to this combined outfall.

If you have questions, please contact me at (907) 229-8398.

Best Regards,

Bruce Webb
Senior Vice President
Furie Operating Alaska, LLC

Cc: Kristina Neptun, Jacobs Engineering

Attachments:
Notice of Intent Information Sheet
Initial Site Assessment and Site Map (NOI Attachment A)
Line Drawings and Flow Balances (NOI Attachment B)
Environmental Monitoring Plan (NOI Attachment C)
Other Environmental Reports (Plan of Operations and Biological Assessment) (NOI Attachment D)
Drilling Fluids Plan (NOI Attachment E)
Best Management Practices Plan (NOI Attachment F)
Wastewater Engineering Plan Submittal Letter (Attachment G)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

JUL - 6 2016

OFFICE OF
COMPLIANCE AND ENFORCEMENT

Reply To: OCE-101

Certified Mail Return Receipt Requested

Ms. Misty Osborn
Furie Operating Alaska, LLC
100 Enterprise Avenue
League City, Texas 77573

Re: Reimbursement Payment – EPA Cook Inlet Inspections
Invoice No. 2016-0601

Dear Ms. Osborn:

Enclosed please find Cashier's Check No. 0697801551 for $584.83 made to the order of Furie Operating Alaska, LLC (Furie).

This payment is reimbursement for helicopter travel and meal costs incurred by me as a U.S. Environmental Protection Agency (EPA) inspector on the June 15, 2016 NPDES inspections of Furie's Julius R Platform and the Randolph Yost mobile oil drilling unit.

For your information, I am also enclosing a copy of Furie's Invoice No. 2016-0601 (dated June 30, 2016) regarding the EPA inspector incurred costs.

I appreciate your assistance and that of Tootie Martin, Furie's HSE Director, in preparing the invoice and completing this cost reimbursement process.

If you have any questions about this letter, please contact me at (206) 553-6223.

Sincerely,

Rick Cool

Rick Cool
Water and Wetlands Enforcement Unit

Enclosures

Cashier's check
Copy of Furie Invoice

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0006978
Office AU #

11-24
1210(8)

CASHIER'S CHECK

0697801551

Remitter: RICHARD P COOL
Operator I.D.: wash2041

July 01, 2016

PAY TO THE ORDER OF ***FURIE OPERATING ALASKA, LLC***

Five hundred eighty-four dollars and 83 cents

$584.83

Payee Address:
Memo: YOST/JULIUS R INSPECTIONS

VOID IF OVER US $ 584.83

WELLS FARGO BANK, N.A.
1215 4TH AVE
SEATTLE, WA 98161
FOR INQUIRIES CALL (480) 394-3122

Richard Levy
CONTROLLER

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⑈0697801551⑈ ⑆121000248⑆4861 512929⑈

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FURIE OPERATING ALSAKA, LLC

INVOICE

100 Enterprise Avenue
League City, TX 77573
281-957-9812

SOLD TO:

EPA – Richard Cool
cool.richard@epa.gov

INVOICE NUMBER	2016-0601
INVOICE DATE	June 30, 2016
OUR ORDER NO.	
YOUR ORDER NO.	
TERMS	Net 30

QUANTITY	DESCRIPTION	UNIT PRICE	AMOUNT
1	Round trip Helicopter flight to and from Randolph Yost	558.33	558.33
1	Lunch time meal aboard the Randolph Yost	26.50	26.50
		SUBTOTAL	584.83
		TAX	0.00
		FREIGHT	0.00
		PAY THIS AMOUNT	$584.83

DIRECT ALL INQUIRIES TO:
name: Misty Osborn
phone: 281-957-9812
email: m.osborn@furiepetroleum.com

MAKE ALL CHECKS PAYABLE TO:
Furie Operating Alaska, LLC
100 Enterprise Ave.
League City, TX 77573

THANK YOU FOR YOUR BUSINESS!

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

DEC 16 2017

OFFICE OF
COMPLIANCE AND ENFORCEMENT

Reply To: OCE-101

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

WARNING

Mr. Bruce Webb
Senior Vice President
Furie Operating Alaska, LLC
1029 West 3rd Avenue, Suite 500
Anchorage, Alaska 99501

Re: Julius R Platform and Randolph Yost Jackup Rig
APDES Permit No. AK0053686

Dear Mr. Webb:

On June 15, 2016, the U.S. Environmental Protection Agency (EPA), conducted a Clean Water Act inspection of your company's Julius R Platform and Randolph Yost jackup rig in the Kitchen Lights Unit, Cook Inlet, Alaska. The purpose of the inspections was to determine compliance with the requirements of the APDES Permit No. AK0053686 (Permit) and the Clean Water Act (CWA). The purpose of this warning letter is to notify you of the areas of concern identified during the CWA inspections that were discussed with your Platform and rig representatives during the inspection closing conference, and to notify you of Permit effluent limitation violations that occurred during your development well drilling campaign.

On behalf of EPA, I would like to express my appreciation for Furie's time and cooperation during the inspection process and for organizing the logistics, and for Furie's post-inspection cooperation and communications with EPA regarding the areas of concern. A copy of the inspection report (without attachments) is enclosed for your information and reference.

During the inspections' closing conference, the EPA inspector identified and discussed with Furie personnel three areas of concern summarized here as follows: (1) the lack of static sheen test equipment and procedures on the Platform at the time of the inspection: (2) original record retention of visual observation monitoring when such data is transferred to and entered into electronic checklists; and (3) documentation of visual observations that are being conducted for all required pollutant parameters, including, when applicable, records for observations for foam, floating solids and garbage. Additional details and explanations of these three areas of concern can be found in Section VII of the enclosed inspection report.

The EPA inspector understood that operators were making the required visual observations but that certain operational monitoring records appeared to summarize the observations as a lack of oily sheen

only, instead of clearly documenting that the observations were made for and covered all required parameters. Also, during post-inspection, Furie obtained the static sheen test equipment kit and test report forms for the Platform and notified EPA of the completion of that follow-up task.

The EPA also conducted an administrative review of EPA's integrated compliance information system (ICIS) which contains entries from Furie's discharge monitoring reports (DMRs) required under the Permit. During the inspection, Furie personnel apprised the inspectors that it was trouble-shooting operational treatment issues on the Randolph Yost rig's Omnipure domestic wastewater treatment system which were resulting in some initial sampling results exceeding Permit effluent limitations. At that time, the ongoing evaluations were focused on the effects of low salinity on the bookcell operations, and possibility of high solids loading. This trouble-shooting was ongoing, and we understood an additional brine pump had been ordered to help deal with the salinity issues.

The Permit, Part 1.2.1, Table 2, identifies various effluent limitations for domestic wastewater discharges from the Platform's Outfall 001A and the Randolph Yost rig's Outfall 001B when the rig is subject to the Permit requirements. The Furie-submitted DMRs, as reviewed in ICIS, demonstrate that some effluent limitations for Outfalls 001A and 001B were violated. Attachment A is enclosed with this letter and it summarizes the effluent limitation violations for the domestic wastewater discharges from Outfalls 001A and 001B identified during the ICIS review. The November-December 2015 and January 2016 effluent violations are related to the Platform's Outfall 001A and the June-October 2016 effluent violations are related to the Randolph Yost rig's Outfall 001B.

Although our goal is to ensure facilities comply fully with applicable CWA requirements and their APDES permits, the ultimate responsibility rests with the permittee. As such, I want to strongly encourage you to continue your efforts to maintain full knowledge of the Permit requirements, and other appropriate statutes, and to respond appropriately to ensure compliance. Notwithstanding your response to this letter if any, EPA retains all rights to pursue enforcement actions to address these effluent limitation violations and any other violations.

If you have any questions concerning this matter, please do not hesitate to contact Rick Cool of my staff at (206) 553-6223. Thank you again for your cooperation.

Sincerely,

Jeff KenKnight, Manager
Water and Wetlands Enforcement Unit

Enclosures
1. Inspection Report
2. Violation Summary (Attachment A)

cc w/enc: Mr. L.C. Tootie Martin
Furie Operating Alaska, LLC

NPDES
Inspection Report

Furie Operating Alaska, LLC

Julius R Platform
Randolph Yost Jackup Rig

Cook Inlet, Alaska

June 15, 2016

Prepared by:

Rick Cool
Environmental Protection Agency, Region 10
Office of Compliance and Enforcement
Water and Wetlands Enforcement Unit

(Unless otherwise noted, all details in this inspection report were obtained from conversations with L.C. Tootie Martin, Joe Fleming, Brian Travis and/or from documents related to the two facilities.)

I. Facility Information

Facility Names/Permit Nos:	Julius R Platform (APDES Permit No. AK0053686) Randolph Yost Jackup Rig (APDES Permit No. AKG315102)
Facility Permittee:	Furie Operating Alaska, LLC
Physical Address:	Kitchen Lights Unit, Cook Inlet, Alaska (offshore of Nikiski, Alaska 99635)
Lat/Long:	+60.936722°/ -151.156306°
Mailing Address (AK):	1029 West 3rd Avenue, Suite 500 Anchorage, Alaska 99501
NAICS/SIC Codes:	211111/1311 – Crude Petroleum & Natural Gas
Facility Contacts:	L.C. Tootie Martin, HSE Director 100 Enterprise Avenue League City, Texas 77573 (o) (281) 957-9812; cell: (409) 370-5624 l.martin@furiealaska.com Bruce Webb, Senior Vice President Furie Operating Alaska, LLC 1029 West 3rd Avenue, Suite 500 Anchorage Alaska 99501 (o) (907) 277-3726 b.webb@furiealaska.com
Receiving Water:	Cook Inlet, Alaska (Corsair Block, Kitchen Lights Unit)

II. Inspection Information

Inspection Date:	June 15, 2016
Inspectors:	Rick Cool, Clean Water Act Inspector EPA Region 10, OCE/Water and Wetlands Enforcement Unit (206) 553- 6223 Willow Weimer, Environmental Program Specialist Alaska Department of Environmental Conservation (DEC) (907) 269-6096

Arrival & Departure Times:	Julius R Platform – 7:45 am/4:00 pm Randolph Yost Jackup Rig – 1:00 pm/3:30 pm
Weather:	Clear and sunny
Purpose:	Compliance evaluation inspections under the facilities' Alaska Pollutant Discharge Elimination System (APDES) permits and the Clean Water Act.

III. Permit Information

Furie Operating Alaska, LLC (Furie) is the named permittee for the Julius R Platform (Platform) under APDES Permit No. AK0053686 (herein, Permit). The Permit was originally effective May 18, 2014 and was subsequently modified by DEC. The modification was executed April 22, 2016 and effective May 23, 2016. The modified permit expires on May 17, 2019.

Furie is also the named permittee for the Randolph Yost jackup rig (Rig) under APDES Permit No. AKG315102. This DEC general permit regulates mobile oil and gas exploration facilities in state waters in Cook Inlet. The general permit was effective on March 9, 2015 and expires on March 8, 2020. DEC issued the Rig permit coverage to Furie on April 4, 2016. By letter dated May 3, 2016, DEC revised the Rig permit coverage to include Discharge 003, Domestic Wastewater.

As discussed below, at the time of this June 2016 inspection, the Rig was, in effect, married to the Platform for purposes of conducting development or production drilling activities (i.e., not exploration drilling) at the Platform. In accordance with the Permit, the Rig's discharges of domestic wastewater, deck drainage, non-contact cooling water and uncontaminated ballast water are authorized and regulated by the Permit.

IV. Background

The monopod-designed Platform is a natural gas production facility located in the Corsair Block of the Kitchen Lights Unit approximately 15 miles northwest of Nikiski Bay in the coastal zone of Cook Inlet. See Attachment A of this report for location and vicinity maps of the Platform location. The Platform is permanently fixed to the seabed in waters approximately 35 meters deep. The Platform is designed with a single caisson supporting the Platform's main deck and various skids.

Furie finished installing the Platform and began manned operations by approximately August 2015. The Platform began producing natural gas in approximately November 2015. The Platform sends the natural gas via a gathering subsea pipeline to a shore-based processing facility located near Nikiski. Furie will drill development wells by cantilevering a mobile offshore drilling unit (MODU, e.g. jackup rig) over the fixed Platform. Well tubulars will pass through the caisson to the seafloor.

The Rig is a 1979 Marathon LeTourneau 116C-designed, three-legged jack-up drilling rig under contract to Furie via Shelf Drilling. Furie also intends to use the Rig for exploration drilling for crude oil and natural gas in the Kitchen Lights Unit for a multi-year oil and natural gas drilling program. The Rig has cantilever envelope capability allowing it to cantilever its drill deck/derrick over the Platform for purposes of drilling development and production natural gas wells in available Platform well tubular slots.

On or about May 10, 2016, the Rig was anchored to the seafloor and winched into position next to the Platform for purposes of conducting development and production well drilling. In this joined Rig/Platform configuration and with these development and production well drilling purposes, neither facility is authorized by any APDES permit to discharge drilling fluids and drill cuttings to Cook Inlet. Accordingly, drilling fluids will be recovered and re-used, or as needed, used drilling fluids will re-containerized and shipped to shore for proper storage, re-use and/or disposal. The drill cuttings will also be collected and containerized in drill cuttings containment boxes on the Rig deck and shipped to shore for disposal by an environmental waste disposal company (e.g., NRC or Emerald).

Additionally, the joined Rig/Platform configuration has the following authorized discharge outfalls under Permit No. AK0053686:

001A: Platform domestic wastewater
001B: Rig domestic wastewater
002A: Platform deck drainage
002G: Rig deck drainage
005: Rig non-contact cooling water
006: Rig uncontaminated ballast water

In accordance with the Permit, Section 1.1.2, the Rig's outfall discharges identified above are authorized under the Permit only while the Rig is conducting development or production drilling activities at the Platform.

In April 2016, the DEC approved the Platform's advanced domestic wastewater system which consists of a redFox sewage treatment unit Model RF-2000-M (unit). This unit uses an aerobic biological treatment process to treat domestic wastewater (combined gray and black water) generated on the Platform. The DEC's approval letter indicates the effluent is disinfected using a chlorine contact chamber then de-chlorinated before final discharge.

In April 2016, the DEC also approved the Rig's advanced domestic wastewater treatment system which consists of an Omnipure Model 5538 unit. This unit uses an electrocoagulation process to treat the Rig's commingled gray and black water for a maximum population of 60 persons. The DEC's approval letter indicates the effluent is disinfected through a seawater electrolytic process then de-chlorinated prior to final discharge.

According to DEC's final fact sheet for the Permit, the Permit effluent limitations' compliance point for the Platform's domestic discharge (Outfall 001A) and the Rig's domestic discharge (Outfall 001B) will be prior to the location where the discharges are combined to be discharged from a single discharge port.

According to DEC's final fact sheet for the Permit, the Rig's deck drainage will include fire test water and equipment wash water and that this commingled drainage will be held in an interim holding tank before being treated by an oil water separator (OWS) prior to discharge to the receiving water via Permit's Outfall 002G. The Permit, Section 1.2.2, Table 3, note c, also requires the Platform's Outfall 002A, deck drainage, must be treated using an OWS prior to discharge.

The Rig uses seawater for non-contact, once-through cooling of various Rig machinery (e.g., power generators, drawwork brakes, etc.) and discharges it via the Permit, Outfall 005. The Rig's best management practices (BMP) plan (March 2016) indicates this cooling system does not require chemical additives so none will be used. The BMP Plan estimates untreated cooling seawater discharges of up to 42,000 barrels per day, via a port that is approximately 10 feet above the bottom of the Rig hull.

Finally, the Rig's uncontaminated ballast water is unaltered seawater that is taken into the Rig's hull during pre-loading as part of the deployment and anchoring operations of the Rig's three legs. This ballast water is not mixed with any other wastes onboard and there are no chemical additives. The DEC fact sheet indicates that upwards of 1.2 million gallons (28,500 barrels) of seawater is transferred for each positioning attempt of the Rig at a well location. The uncontaminated ballast water is discharged via the Permit, Outfall 006.

V. Inspection Chronology

This was an announced inspection. I initially contacted Mr. Martin, Furie's HSE director, on about May 17, 2016 via phonecall and follow-up email to coordinate the inspection logistics. We arrived at the Rediske helipad on Porter Drive, Nikiski, at about 7:30-7:45 am for a scheduled 8:00 am flight. We arrived at the Rig helipad at approximately 8:45 am and began the opening conference in Rig offices at 9:30 am. We conducted the Rig inspection first, then the Platform inspection in the early afternoon and completed the inspection process by about 4:00 pm.

Mr. Martin and Joe Fleming, Jabobs Environmental, accompanied us during the Rig and Platform inspections. We were not denied access to either facility and we were allowed to inspect all areas that we requested to inspect.

VI. Inspections & File Reviews

We started the discussion with an overview of current Rig and Platform operations. The Rig and Platform were finally married on about May 6, with the Rig's cantilever system moved over the Platform on about May 10.

There was no Rig drilling occurring on the day of the inspection (Wednesday) but the conductor pipe, starter head and diverter pipe systems had been installed in preparation for drilling Well KLU A-2. Furie was still in the process of installing drill cuttings collection, auger and vacuum systems on the Rig and the blowout preventer was going to be inspected by AOGCC on Thursday. Furie was anticipating that the development well would be spud late the coming weekend and anticipated that it would take approximately 35 days to complete the development well KLU A-2.

The Platform has been operating in manned conditions since about August 2015. The Platform typically has four staff persons on board, two production operators and two service hands that operate on day/night shifts. Current natural gas production is occurring from the Platform's Well KLU-3.

The Rig arrived in Homer, Alaska (Kachemak Bay) on about March 10 and had been moored in Homer until about May 5 when it was towed by a tug to the Platform and anchored into position.

The Platform operators are responsible for conducting Permit-required sampling, inspections, etc. Jacob Engineering (or a/k/a Jacob Environmental) provides all of the Rig Permit-required sampling, inspections, etc. and in addition, is responsible for discharge monitoring report preparation for both facilities.

In regard to Rig drilling, the Permit does not authorize the discharge of drilling muds and drill cuttings for development and production well drilling. At the time of the inspection, Furie was in the process of installing the drill cuttings collection system and they described that process and equipment to the inspectors which included the use of deck-located 25-barrel cutting collection boxes (and spares) that could be moved by Rig crane to support vessels for transport back to shore for disposal.

We discussed the drilling fluids' barite receipt process and sampling process in light of the fact that Furie intended to use the Rig for exploration drilling in 2016 and future years. Furie gets barite supplies by both bag and bulk delivery. The EPA inspector noted that barite sample results (e.g., manufacturer's certifications, actual Rig sampling and results, etc.) for mercury and cadmium should be obtained and retained for all separate barite supply lots, regardless of how the barite is delivered and stored.

We also discussed Furie's static sheen test methods, equipment, etc. in anticipation of having to do Outfall 001 sampling during exploration drilling under their Rig permit coverage, AKG315102. We checked and observed their static sheen test equipment and purchased kit-provided procedures. Subsequent to this inspection, Furie also submitted a copy of their static sheen test report form for both facilities. Attachment D of this inspection report is a copy of the Furie-supplied static sheen test report form for both facilities.

In terms of Rig housekeeping, the Rig's drill floor is underlain with a containment pan that diverts drill floor runoff back to the Rig's mud system. Precipitation that might fall near the drill floor collects in a trench drain and is treated with the stormwater.

We discussed each of the Rig's other permitted current discharges under the Permit. The Rig's oil water separator (OWS) used for deck drainage treatment was off-line at the time of the inspection, undergoing maintenance and repair so at the time of the inspection, all deck drainage was being collected on board awaiting OWS operations. During regular OWS operations, the deck drainage is diverted to preload tanks then treated via the OWS before final discharge.

The Rig's black and gray water are both being conveyed to the deck-side Omnipure unit. The unit was just started in May, 2016 and some of the initial samples were not in compliance with the Rig's AKG315102 requirements. Furie's initial evaluation was that the low salinity was causing the bookcell and reactor to not run as expected and that the system might be affected by high solids loading. Furie was adding saltwater to keep the voltage down across the elements. A brine injector pump was on order in an effort to resolve the salinity situation. Furie uses a Hach test kit for chlorine and we observed this test equipment.

Furie indicated that weekly sampling of the Ominpure unit's domestic wastewater discharge was now instituted to comply with the Permit, Section 1.2.1, Table 2, note a, requiring weekly sampling for BOD_5 and TSS of the domestic wastewater discharge when the Rig is connected to the Platform.

Furie also confirmed that no chemicals are added to the non-contact cooling water discharge. We did not discuss the uncontaminated ballast water discharge because it was not a current discharge (and only occurred when the Rig set its legs on about May 6) but I reviewed Furie's May 2016 discharge monitoring report for this discharge and did not observe any anomalies.

Daily visual walk-around observations are made and recorded in the observer's log or note book of the Rig for BMP Plan housekeeping elements and discharge observation purposes and then the log or note book data is entered into computer template checklists. Daily checks include of OWS operations and Ominpure operations (including chlorinator and dechlorinator).

A document review was done on board the Rig, including observations of the presence of the Permit, DEC's discharge authorization letter, drilling fluids plan, BMP Plan (March 2016 edition), DMRs and supporting documentation and visual observation checklist records. No BMP Plan training records existed as of this inspection date.

After the document review, we did a walk-around inspection of the Rig that included observations of the drilling fluids/cuttings "no-discharge" containerization system (e.g., shale shakers, centrifuge, auger and muds vacuum system, cutting boxes, etc.), sub-drill floor fluids containment, handling and conveyance system, static sheen test equipment (kit availability), Omnipure system and sampling points, and visual observation points.

After the Rig walk-around inspection and lunch, we proceeded to the Platform for an operational overview of the Platform's recent operations (e.g. staffing, start-up, etc.) and about O&M and inspection/sampling procedures related to its Permit-authorized discharges, the redFox domestic wastewater treatment unit and the deck drainage-related CPI separator.

The Crosby-hired operator described the redFox unit's operation and the various daily inspection and observations that are made, and the disinfection O&M and sampling procedures. Given the low number of staff people on board and resulting low domestic flows, staff occasionally feed fertilizer to the redFox unit to feed the aerobic biological treatment sub-unit. Daily redFox observations, measurements, sampling and O&M tasks are kept by operators in a hand-written daily log book (a sample copy of which was provided for review). July 2016 excerpts of the daily log book entries are included in the compact disk that is Attachment E of this inspection report.

The operator described the daily Platform equipment observations that are made and the use of a BMP Plan-devised checklist. These daily observations include reviews of equipment pollution containment pans, the redFox unit and the coalescing plate interceptor (CPI) separator that is used to treat deck drainage. The CPI provides gravity separation of free oils and solids. The floating oil is collected in the CPI's oil skimming bucket, pumped to the vent scrubber.

In connection with the CPI separator operation and deck drainage discharges, we asked whether the Platform had static sheet test equipment and procedures in order to comply with the Permit, Section 1.2.2, Table 3, note b's requirements for such a test if certain specified ice conditions exist. Furie indicated that no such equipment and procedures existed on the Platform but the HSE director committed to getting the equipment and having the Jacobs Engineering staff conduct operating training on test procedures and test results documentation. The Platform's daily BMP Plan-based equipment checklist already identified the need for preparations to run the static sheen test.

A document review was done on board the Platform, including observations of the presence of the Permit, BMP Plan (March 2016 edition), QAPP (May 2016 edition), sampling records, DMRs and supporting documentation and visual observation and BMP Plan-based checklist records. No BMP Plan training records were located on the Platform on this inspection date.

After the document review, we did a walk-around inspection of the Platform that included observations of the Platform's production level, redFox unit, CPI separator and observation points.

VII. Closing Conference and Areas of Concern

During the closing conference, we discussed the following issues, observations, areas of concern and recommendations.

In regard to the Platform, we noted that the Permit requires continuous monitoring of the domestic wastewater discharge (not estimated) and our observation during the walk-around that the redFox flow meter was offline and in need of some maintenance. In addition, we noted that the Platform's BMP Plan (March 2016), Sections 3.4 and 3.5, Table 3-2, provides that employee BMP training and attendance records are to be maintained onsite for ready availability to regulatory agencies upon request. We recommended that Furie create and retain Rig-based BMP training records and attendance when such BMP Plan training is provided and completed.

In regard to the Platform, we discussed and highlighted that the Permit, Section 1.2.2, Table 3, note b, requires the use of the static sheen test on deck drainage discharges during certain ice conditions. We understood from this inspection and other platform inspections prior to June 15, that there have not been significant ice conditions surrounding Cook Inlet platforms, including this Platform, during winter months in the last couple of years. An area of concern was that the Platform and its staff did not currently have onboard the Platform the static sheen test equipment, test procedures or test record forms to carry out these Permit requirements. Furie staff assured us that a test kit, test kit procedures, test record forms and training would be obtained in a timely manner via Jacobs staff and that training on the static sheen test procedures would be provided to the Platform staff.

In regard to Rig and Platform procedures and records, we discussed the staff's daily visual observations under the Permit and the use of staff notebooks or log books. As background, the Permit, Appendix A, Part 1.11.2, provides in part that the permittee must retain all monitoring information records for at least three years, and Part 1.11.3 identifies what records of monitoring information must include (e.g., exact place and time of monitoring, name of person performing monitoring, etc.). When the Rig is operating under its Permit No. AKG315102 coverage, there are the same or similar monitoring record requirements as noted above under the DEC Permit No. AKG315100, Appendix A, Parts 1.11.2 and 1.11.3. For additional context, we understood that Rig and Platform operators made the daily visual observations for the pollutant parameters required by the Permit for floating solids, foam, garbage and oil sheen as they are applicable to particular discharges (e.g. domestic, deck drainage, etc).

We discussed areas of concern regarding the Permit's visual observation recordkeeping content and record retention requirements and about Furie's record retention schedule for the original monitoring records created by operators in log books and notebooks before that information is entered into electronic template checklists, spreadsheets and DMRs. We recommended that Furie review its monitoring records creation and retention procedures in light of the various procedures and devices being used onboard its facilities, staff recording preferences and possibilities for staff changes and consequently changed practices.

In addition, we raised as an area of concern that electronic daily/weekly checklists used to summarize the operators' actual visual observations should reflect the entire suite of Permit parameters that are required to be visually observed. As an example and in addition to visible sheen observations, the Rig's electronic daily environmental compliance summary assessment checklist should include recorded observations for the Permit's domestic

wastewater and combined outfall discharge related to floating solids, foam and garbage.

Similarly, we noted that the Platform's summary daily electronic visual observation records for domestic wastewater discharges should record the other non-sheen pollutant parameters like floating solids, foam and garbage. The Platform's BMP Plan (March 2016), Appendix C, includes a daily environmental compliance checklist that includes these three domestic wastewater pollutant parameters; however, Furie subsequently produced a completed electronic weekly environmental compliance record (with daily entries) for May 9-15, 2016 that included sheen but not the parameters for floating solids, foam and garbage. We recommended that Furie review its monitoring record creation, transfer, retention and record content procedures and checklists to ensure Permit-required parameters were being properly observed and recorded. This recommendation was made with the purpose to ensure the Furie records accurately reflect their staff person's in-field visual observations practices and results as required by the Permit.

At the conclusion of the closing conference, we discussed the logistics of getting representative example copies of some Rig and Platform documents (e.g., daily checklists) that were identified and discussed during the inspections. We thanked Furie and Jacobs staff for their time and cooperation in all phases of the inspection process and logistics. We concluded the inspection and were escorted to the Rig helipad for the flight back to the Rediske airfield.

VIII. Report Attachments

The following items are attached to this report:

A. Location and Vicinity Maps
B. Inspection Attendance Roster
C. Summary Photo Array & Photo Log
D. Rig & Platform Static Sheen Test Report Form
E. Compact Disk & Table of Contents

Report Completion Date: 12/12/17

Lead Inspector Signature:

ATTACHMENT E

Compact Disk & Table of Contents

Julius R BMP Plan (March 2016)
Julius R 2016 BMP Annual Review & Certification Statement
Julius R O&M redFox/Omnipure Plan (February 2016)
Julius R Quality Assurance Project Plan (May 2016)
Julius R BMP Weekly Environmental Compliance Checklist (May 15, 2016)
Julius R Weekly Environmental Compliance Record (May 9-15, 2016)
Julius R BMP Plan Daily Equipment Checklist (May 15, 2016)
Julius R redFox daily log book entries (July 8-19, 2016)
Julius R Static Sheen Test Kit instruction manual
Julius R Static Sheen Test Report Form

Randolph Yost BMP Plan (March 2016)
Randolph Yost Drilling Fluids Plan (March 2016)
Randolph Yost Daily Env. Compliance Assessment Checklist (June 24, 2016)
Randolph Yost BMP Plan Daily Compliance Checklist (June 24, 2016)
Randolph Yost Static Sheen Test Kit instruction manual
Randolph Yost Static Sheen Test Report Form

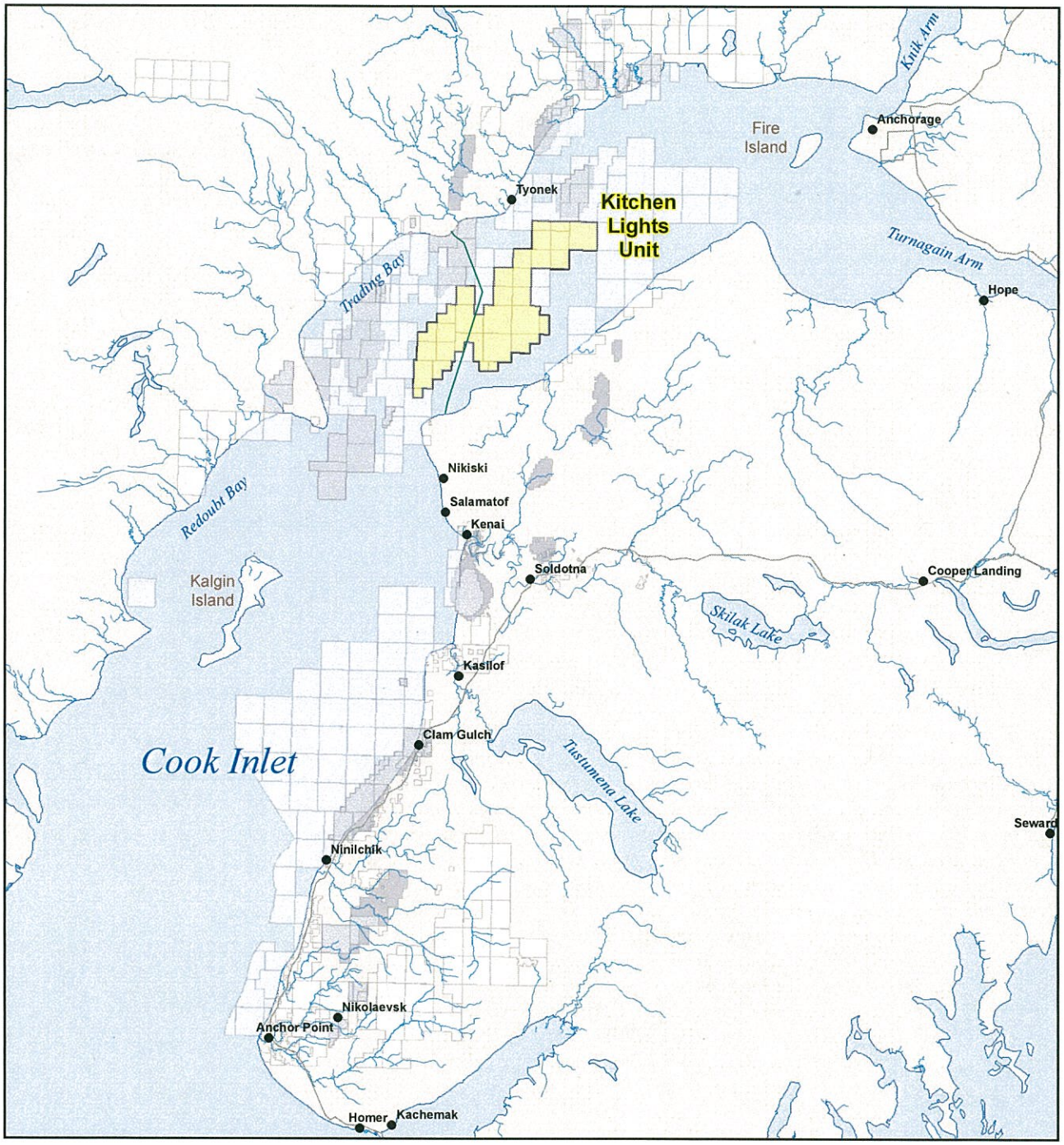
Photos & Photo Log (file folder)

Attachment A: Furie Operating Alaska, LLC
APDES Permit No. AK0053686
Effluent Limitation Violation Summary

Month	Pollutant	Value Reported in DMR	Effluent Limitation	Limit Type
November 2015	BOD, 5-day, 20 deg. C	62.9 mg/L	60 mg/L	DAILY MX
November 2015	Solids, total suspended	62 mg/L	60 mg/L	DAILY MX
December 2015	Solids, total suspended	68 mg/L	60 mg/L	DAILY MX
January 2016	Solids, total suspended	68 mg/L	60 mg/L	DAILY MX
June 2016	BOD, 5-day, 20 deg. C	70.125 mg/L	30 mg/L	MO AVG
June 2016	BOD, 5-day, 20 deg. C	136 mg/L	60 mg/L	DAILY MX
June 2016	Chlorine, total residual	3.4 mg/L	1 mg/L	DAILY MX
June 2016	Solids, total suspended	108.6 mg/L	30 mg/L	MO AVG
June 2016	Solids, total suspended	202 mg/L	60 mg/L	DAILY MX
July 2016	BOD, 5-day, 20 deg. C	178.8 mg/L	30 mg/L	MO AVG
July 2016	BOD, 5-day, 20 deg. C	244 mg/L	60 mg/L	DAILY MX
July 2016	Chlorine, total residual	3.4 mg/L	1 mg/L	DAILY MX
July 2016	Solids, total suspended	122.825 mg/L	30 mg/L	MO AVG
July 2016	Solids, total suspended	180 mg/L	60 mg/L	DAILY MX
August 2016	BOD, 5-day, 20 deg. C	174.4 mg/L	30 mg/L	MO AVG
August 2016	BOD, 5-day, 20 deg. C	337 mg/L	60 mg/L	DAILY MX
August 2016	Chlorine, total residual	3.4 mg/L	1 mg/L	DAILY MX
August 2016	Solids, total suspended	129.2 mg/L	30 mg/L	MO AVG
August 2016	Solids, total suspended	186 mg/L	60 mg/L	DAILY MX
September 2016	BOD, 5-day, 20 deg. C	325.25 mg/L	30 mg/L	MO AVG
September 2016	BOD, 5-day, 20 deg. C	402 mg/L	60 mg/L	DAILY MX
September 2016	Chlorine, total residual	3.4 mg/L	1 mg/L	DAILY MX
September 2016	Solids, total suspended	239.75 mg/L	30 mg/L	MO AVG
September 2016	Solids, total suspended	340 mg/L	60 mg/L	DAILY MX
October 2016	BOD, 5-day, 20 deg. C	277 mg/L	30 mg/L	MO AVG
October 2016	BOD, 5-day, 20 deg. C	373 mg/L	60 mg/L	DAILY MX
October 2016	Chlorine, total residual	3.4 mg/L	1 mg/L	DAILY MX
October 2016	Solids, total suspended	341.725 mg/L	30 mg/L	MO AVG
October 2016	Solids, total suspended	720 mg/L	60 mg/L	DAILY MX

ATTACHMENT A

Location and Vicinity Maps



Cook Inlet Gas Gathering System (CIGGS)

Active Leases

Unit Boundary

Kitchen Lights Unit

All Locations Are Approximate

0 5 10 15 20

Miles

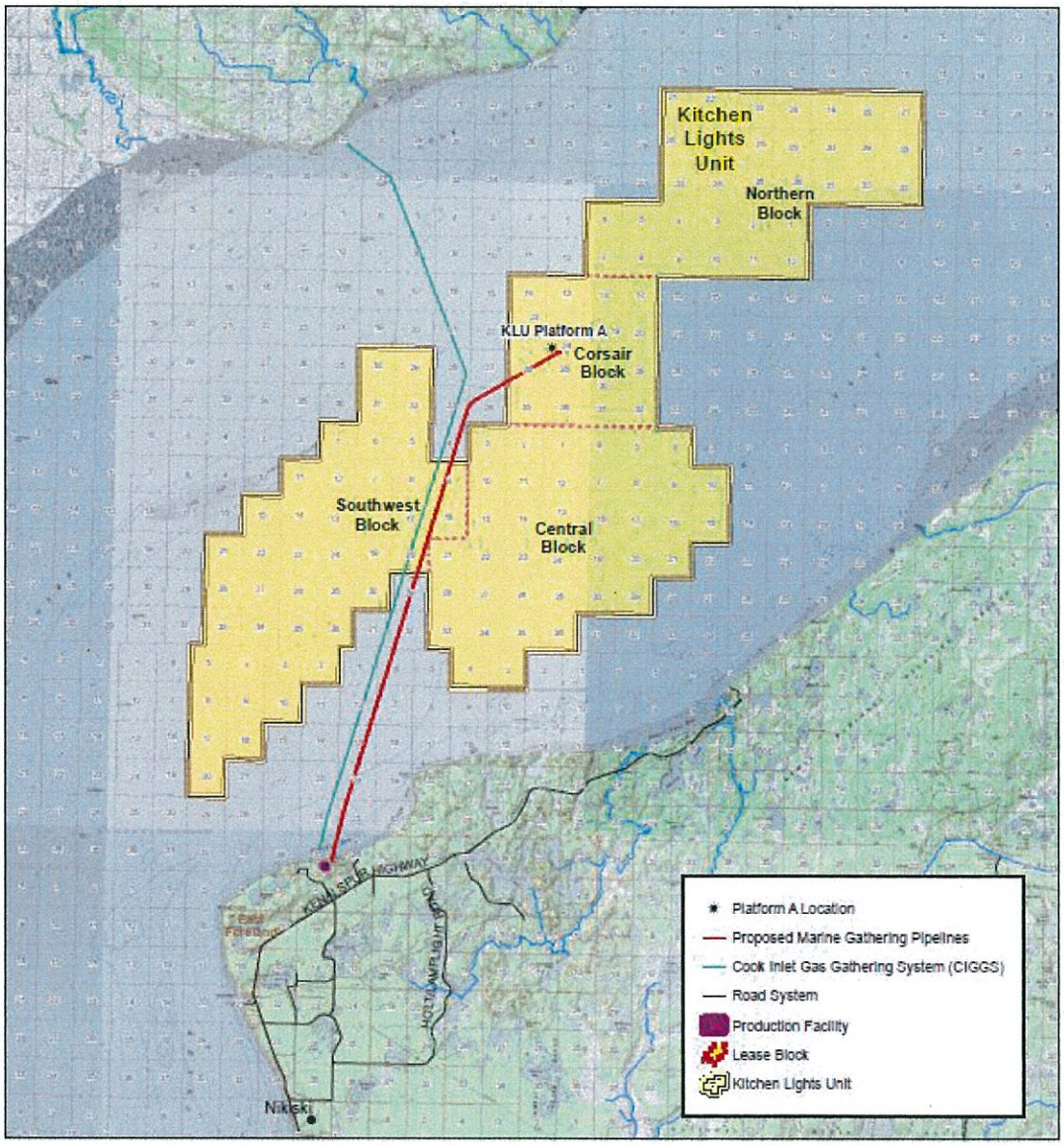
NAD 1983 StatePlane Alaska 4, Feet

N

FURIE OPERATING ALASKA
LOCATION AND VICINITY MAP
2016 EXPLORATION PLAN OF OPERATIONS
COOK INLET, ALASKA

JACOBS	DATE:	PROJECT MANAGER:	FIGURE NO:
	16 DEC 2015	K. NEPTUN	2-1

P:\Furie\2016_PlanOfOperations\MXD\FigA-1_KLU_VicinityMap.mxd beatycj



Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

All Locations Are Approximate

0 1 2 3 4 5 Miles

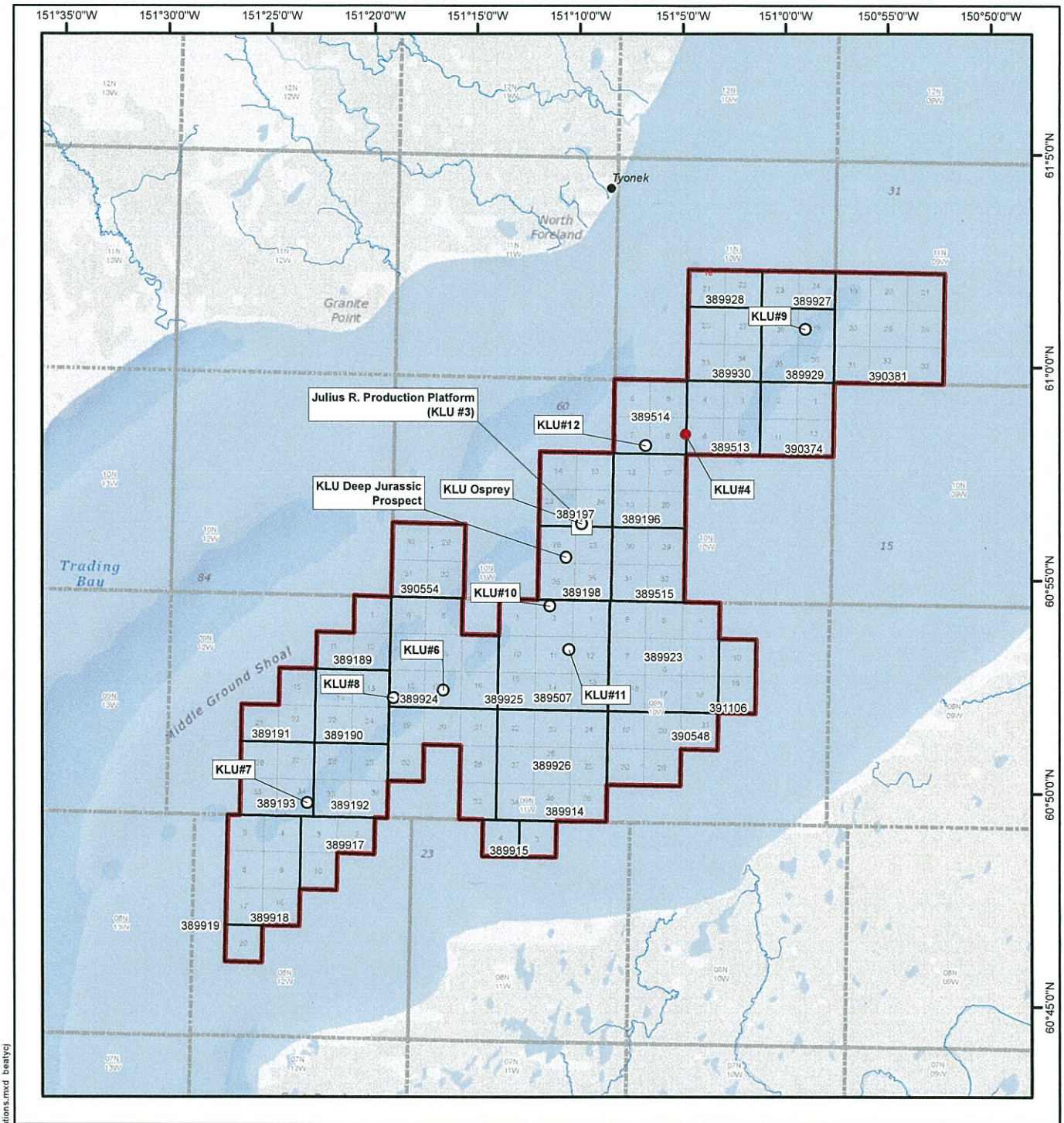
0 2 4 6 8 10 Kilometers

NAD 1983 StatePlane Alaska 4, Feet

N

FURIE OPERATING ALASKA
KITCHEN LIGHTS UNIT LEASE BLOCKS
COOK INLET, ALASKA

JACOBS	DATE: 29 APR 2014	PROJECT MANAGER: T. HEIKKILA	FIGURE NO: 1



- Existing Well Location
- Proposed Well Location
- Platform
- KLU Boundary
- KLU Alaska Division of Lands (ADL) Lease Tract
- PLSS Section
- PLSS Township

Note: All proposed well locations are on state waters over state submerged lands.

All Locations Are Approximate

0 2 4 6 8
Miles

NAD 1983 StatePlane Alaska 4, Feet

N

FURIE OPERATING ALASKA
PROPOSED EXPLORATION WELL LOCATIONS
2016 EXPLORATION PLAN OF OPERATIONS

COOK INLET, ALASKA

JACOBS	DATE: 22 JAN 2016	PROJECT MANAGER: K. NEPTUN	FIGURE NO: A-2

P:\Furie\2016_PlanOfOperations\MXD\FigA-2_ProposedWellLocations.mxd beatycj

ATTACHMENT B

Inspection Attendance Roster

YOST / JULIUS R 6/15/16

NAME	COMPANY / POSITION
RICK COOL	EPA / Inspector
Willow Weimer	ADEC / Inspector
L.C. MARTIN	FURIE / HSE DIR.
Joe Fleming	Jacobs / Environmental
Clay Clary	Furie / Company Rep
Joey Beasley	Advanced Drilling Solutions
Brian Travis / [illegible]	OIM Crosby / Lead
JULIUS R	120 PM

ATTACHMENT C

Summary Photo Array & Photo Log

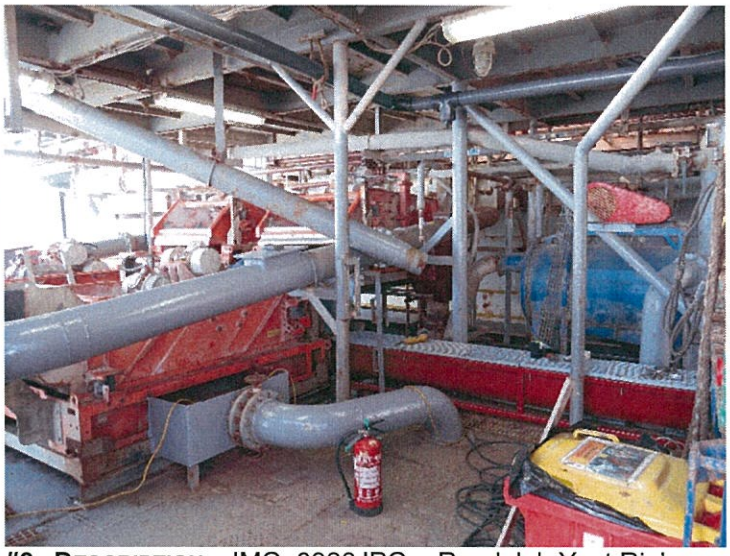
(Photographs were taken by Willow Weimer on June 15, 2016)

June 15, 2016 **Permit # AK0053686**

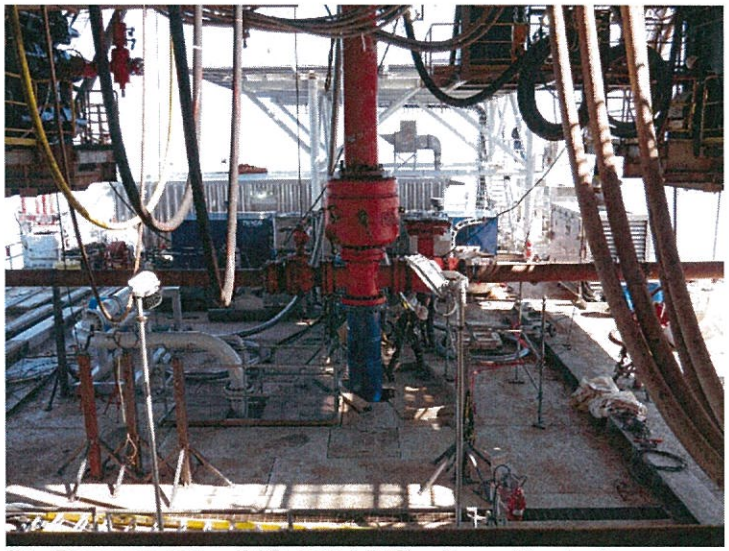
Furie Operating Alaska, LLC

#1. DESCRIPTION: IMG_0913JPG – Randolph Yost Rig's on-deck Omnipure Unit (bookcell and control panel).

#2. DESCRIPTION: IMG_0918JPG – Randolph Yost Rig's deck with drill cuttings collection boxes and to right, the on-deck Omnipure Unit.



#3. DESCRIPTION: IMG_0926JPG – Randolph Yost Rig's shale shaker/drill cuttings collection auger system.



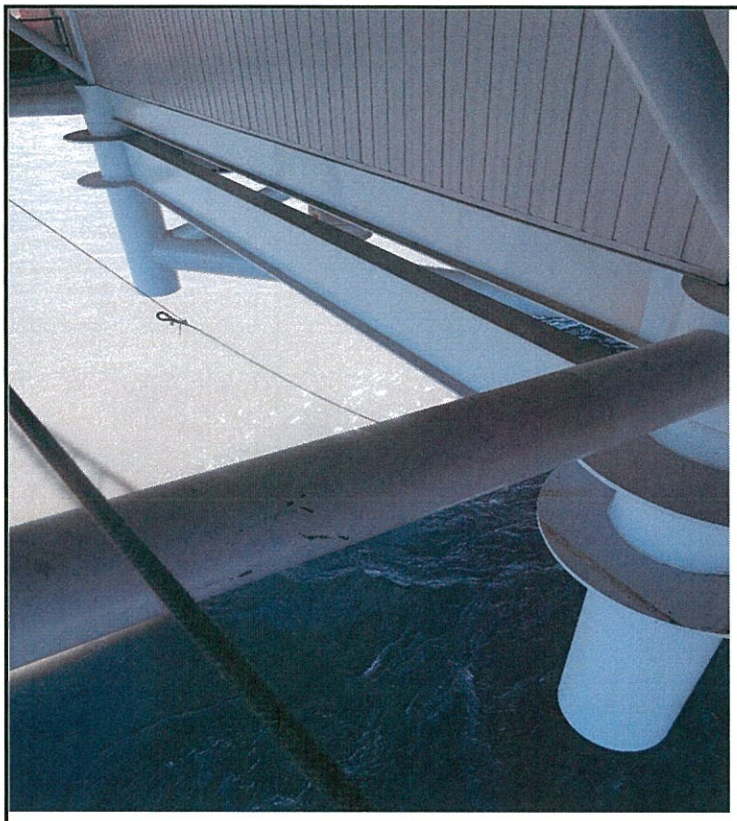
#4. DESCRIPTION: IMG_0934JPG - From Rig, looking over the Julius R Platform's roof area under the Rig's cantilever deck system at the conductor pipe with starter head and diverter pipes.

#5. DESCRIPTION: IMG_0936JPG - Julius R Platform's production deck and redFox Unit.

#6. DESCRIPTION: IMG_0940JPG – Julius R Platform's CPI separator.

June 15, 2016 Permit # AK0053686

Furie Operating Alaska, LLC



#7. DESCRIPTION: IMG_0942JPG – Julius R Platform's observation point.

#8. DESCRIPTION: IMG_0906JPG – Randolph Yost Rig's non-contact cooling water discharge and observation point.

Julius R Platform & Randolph Yost Jackup Rig

June 15, 2016 Photo Log

(Photographs were taken by Willow Weimer on June 15, 2016)

IMG_0893JPG: Rig leg
IMG_0894JPG: Rig leg
IMG_0895JPG: Rig leg
IMG_0896JPG: DEC job book cover
IMG_0897JPG: Rig anchoring diagram
IMG_0898JPG: Hach chlorine test reagent package
IMG_0899JPG: Hach chlorine test equipment
IMG_0900JPG: DEC's May 1, 2016 Rig authorization letter
IMG_0901JPG: Static sheen test kit instruction manual
IMG_0902JPG: Static sheen test kit instruction manual
IMG_0903JPG: Static sheen test kit instruction manual
IMG_0904JPG: Static sheen test kit instruction manual
IMG_0905JPG: Static sheen test kit instruction manual
IMG_0906JPG: Non-contact cooling water observation point
IMG_0907JPG: Non-contact cooling water observation point background
IMG_0908JPG: Sample point for Outfall 001B pre-dechlorination
IMG_0909JPG: Sample point for Outfall 001B pre-dechlorination
IMG_0910JPG: Rig's Omnipure unit on deck
IMG_0911JPG: Rig's Omnipure unit on deck
IMG_0912JPG: Rig's Omnipure unit on deck (bookcell)
IMG_0913JPG: Rig's Omnipure unit on deck (bookcell)
IMG_0914JPG: Rig's Omnipure unit on deck
IMG_0915JPG: Rig's Omnipure unit on deck
IMG_0916JPG: Omnipure dechlorination unit
IMG_0917JPG: Omnipure dechlorination unit
IMG_0918JPG: Drill cutting collection boxes
IMG_0919JPG: Drill cutting collection boxes
IMG_0920JPG: Solids centrifuge
IMG_0921JPG: Rig leg
IMG_0922JPG: Rig leg
IMG_0923JPG: Omnipure post-dechlorination sampling point
IMG_0924JPG: Omnipure post-dechlorination sampling point
IMG_0925JPG: Rig's shale shaker – auger system
IMG_0926JPG: Rig's shale shaker – auger system
IMG_0927JPG: Rig's drill cuttings auger system
IMG_0928JPG: Rig's drill cuttings auger system
IMG_0929JPG: Vacuum-equipped cuttings collection box
IMG_0930JPG: Drill cuttings and muds centrifuge
IMG_0931JPG: Vacuum system control room

IMG_0932JPG: Rig skim tank under drill floor/cantilever deck
IMG_0933JPG: Top of Platform, under Rig cantilever deck – conductor pipe/starter head/diverter pipes
IMG_0934JPG: Top of Platform, under Rig cantilever deck – conductor pipe/starter head/diverter pipes
IMG_0935JPG: [photo does not exist]
IMG_0936JPG: Platform's redFox unit
IMG_0937JPG: Platform's redFox unit inlet chlorine sample valve
IMG_0938JPG: Platform's redFox unit
IMG_0939JPG: Platform's redFox unit discharge valve sample point
IMG_0940JPG: CPI separator
IMG_0941JPG: Platform's visual observation point
IMG_0942JPG: Platform's visual observation point
IMG_0943JPG: Stacked drilling pipe
IMG_0944JPG: Stacked drilling pipe

ATTACHMENT D

Rig & Platform Static Sheen Test Report Form

Static Sheen Test Report Form

Certificate of Analysis

Operator:		**OCS-G Number:**	
Rig Name:		**Area and Block:**	(Surface Location)
Permit Number:		**Method Reference:**	40 CFR Subpart A, Appendix 1 to Subpart A

Sample ID Number				
Date of Sampling and Analysis				
Type of Sample				
Time of Sampling				
Location of Sample				
Sample Collector				
Test Location				
Analyst				
Time Test Initiated				
Observations	Time	Pass / Fail	Time	Pass / Fail
1				
2				
3				
4				
5				
6				
Results of Analysis	Pass / Fail		Pass / Fail	

Comments:

Analyst Signature:	Date:

Cool, Richard

From: Leslie Martin <l.martin@furiealaska.com>
Sent: Thursday, July 21, 2016 12:13 PM
To: Cool, Richard
Subject: Randolph Yost requested documents
Attachments: Yost APDES NOI AttC-Environmental Monitoring Plan.pdf; YOST Cover letter Furie NOI AKG315100.pdf; Yost Daily Environmental Compliance Report 06-24-2016.pdf; Yost Drilling Fluids Plan-compiled.pdf; Yost Lab Report and CoC 1162534_May2016 PreliminaryLab.pdf; Yost SST Test Procedure.pdf; Yost Static Sheen Test Report Form.pdf; YostFurie AKG315102 Signed DMR May2016.pdf; YostFurie Daily BMP Rig Compliance Checklist - 06-24-2016.pdf

I think all of the Yost docs will go in one email. You should get 9 PDF's, Let's see.

L.C. "Tootie" Martin
Furie Operating Alaska, LLC
Director of HS&E
l.martin@furiealaska.com
Off: 281-957-9812
Cell: 409-370-5624

RANDOLPH YOST

NCEP 2011b **DMR Review Range:** Apr 1, 2016 to Nov 30, 2017 **Violation Code:** E90 **Last Resfresh Date** Dec 9, 2017

Facility Information

FRS Facility UIN	110067194663
NPDES ID	AKG315102
Permit Name	FURIE OPERATING ALASKA, LL
Major/Minor	Minor
Permit SIC Desc	Oil And Gas Exploration Services
Water Body Name	COOK INLET
TMDL ID	

Number and Months of Violations

63	1

Facility Location

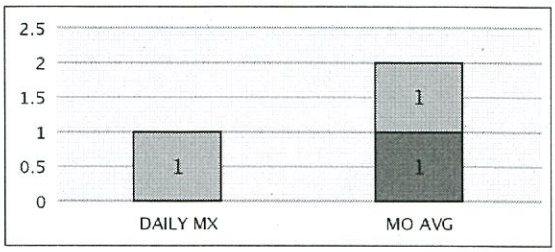
LAT	60.972222
LONG	-151.073611

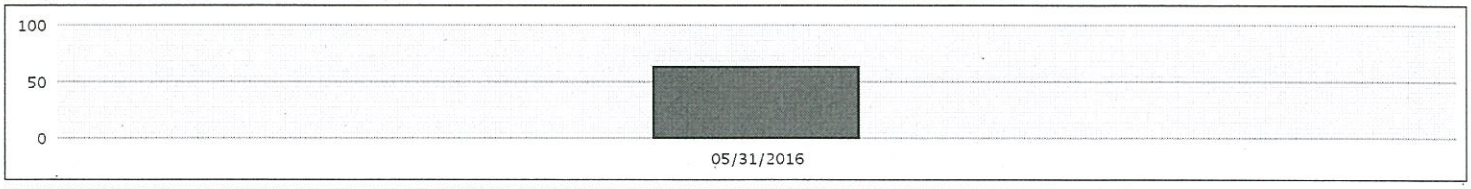
Permit Information

Original Issue Date	2/6/15
Issue Date	2/6/15
Effective Date	4/4/16
Expiration Date	3/8/20
Permit Status	EFF

Last Formal Enforcement Action

EA Identifier	
Final Order Issued	
EA Type Desc	





Month	Outfall	Parameter Code and Name	DMR Value	Permit Limit	% Exceed	Limit Type	#V	Due/Rec'd		#DL
MAY 2016	003 A	00310 BOD, 5-day, 20 deg. C	57 mg/L	30 mg/L	90	MO AVG	31	6/15	6/15	
MAY 2016	003 A	00530 Solids, total suspended	107 mg/L	51 mg/L	110	MO AVG	31	6/15	6/15	
MAY 2016	003 A	00530 Solids, total suspended	107 mg/L	67 mg/L	60	DAILY MX	1	6/15	6/15	

Month	Pollutant	Value Reported in DMR	Effluent Limitation	Limit Type
May 2016	BOD, 5-day, 20 deg. C	57 mg/L	30 mg/L	MO AVG
May 2016	Solids, total suspended	107 mg/L	51 mg/L	MO AVG
May 2016	Solids, total suspended	107 mg/L	67 mg/L	DAILY MX

KANDOLPH YOST

NCEP 2011b DMR Review Range: Jan 1, 2012 to Mar 31, 2017 Violation Code: E90 Last Resfresh Date May 8, 2017

Facility Information

FRS Facility UIN	110067194663
NPDES ID	AKG315102
Permit Name	FURIE OPERATING ALASKA, LL
Major/Minor	Minor
Permit SIC Desc	Oil And Gas Exploration Services
Water Body Name	COOK INLET
TMDL ID	

Facility Location

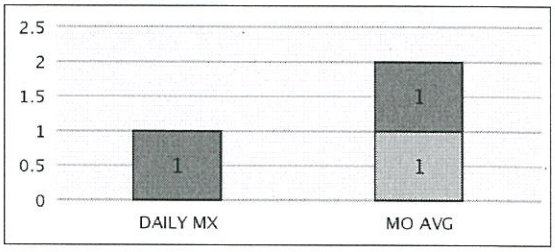
LAT	60.972222
LONG	-151.073611

Permit Information

Original Issue Date	2/6/15
Issue Date	2/6/15
Effective Date	4/4/16
Expiration Date	3/8/20
Permit Status	EFF

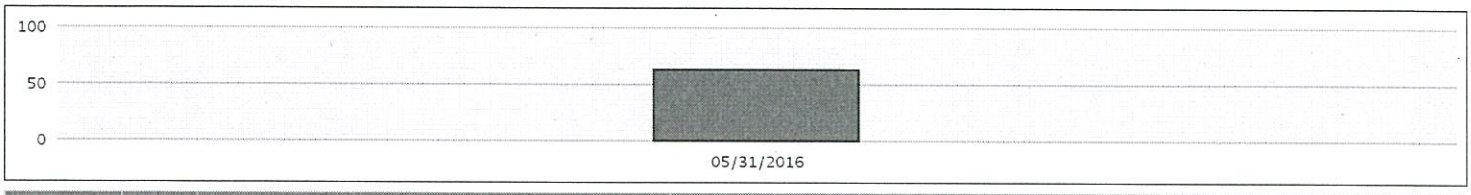
Last Formal Enforcement Action

EA Identifier	
Final Order Issued	
EA Type Desc	



Number and Months of Violations

63	1



Month	Outfall	Parameter Code and Name	DMR Value	Permit Limit	% Exceed	Limit Type	#V	Due/Rec'd		#DL
MAY 2016	003 A	00310 BOD, 5-day, 20 deg. C	57 mg/L	30 mg/L	90	MO AVG	31	6/15	6/15	
MAY 2016	003 A	00530 Solids, total suspended	107 mg/L	51 mg/L	110	MO AVG	31	6/15	6/15	
MAY 2016	003 A	00530 Solids, total suspended	107 mg/L	67 mg/L	60	DAILY MX	1	6/15	6/15	

Month	Pollutant	Value Reported in DMR	Effluent Limitation	Limit Type
May 2016	BOD, 5-day, 20 deg. C	57 mg/L	30 mg/L	MO AVG
May 2016	Solids, total suspended	107 mg/L	51 mg/L	MO AVG
May 2016	Solids, total suspended	107 mg/L	67 mg/L	DAILY MX

ECHO Enforcement and Compliance History Online

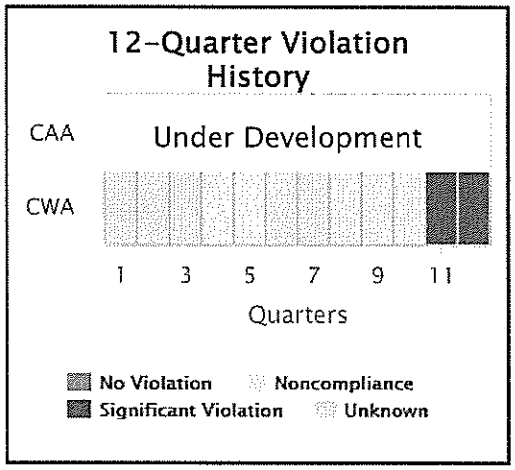
Detailed Facility Report

Facility Summary

KITCHEN LIGHTS UNIT

15 MILES NW OF NIKISKI BAY, NIKISKI, AK 99611

FRS (Facility Registry Service) ID: 110067194663
EPA Region: 10
Latitude: 60.936722
Longitude: -151.156306
Locational Data Source: NPDES
Industry: Oil and Gas Extraction; Support Activities for Mining
Indian Country: N



Enforcement and Compliance Summary

Statute	Insp (5 Years)	Date of Last Inspection	Compliance Status	Qtrs in NC (Non-Compliance) (of 12)	Qtrs in Significant Violation	Informal Enforcement Actions (5 years)	Formal Enforcement Actions (5 years)	Penalties from Formal Enforcement Actions (5 years)	EPA Cases (5 years)	Penalties from EPA Cases (5 years)
CAA	2	08/26/2016	Viol w/In 1 yr	1	0	2	--	--	--	--
CWA	4	06/15/2016	Significant Violation	7	2	--	--	--	--	--

Related Reports **Regulatory Information** **Other Regulatory Reports**

CWA Pollutant Loading Report
CWA Effluent Charts

Clean Air Act (CAA): Operating Synthetic Minor (AK0000000212200112), Operating Synthetic Minor (AK0000000212290003)
Clean Water Act (CWA): Minor, Permit Effective (AK0053686), Minor, Permit Admin Continued (AKG315022), Minor, Permit Effective (AKG315102)
Resource Conservation and Recovery Act (RCRA): No Information
Safe Drinking Water Act (SDWA): No Information

Air Emissions Inventory (EIS): No Information
Greenhouse Gas Emissions (eGGRT): No Information
Toxic Releases (TRI): No Information

Facility/System Characteristics

Facility/System Characteristics

System	Statute	Identifier	Universe	Status	Areas	Permit Expiration Date	Indian Country	Latitude	Longitude
FRS		110067194663					N	60.936722	-151.156306
AIR	CAA	AK0000000212200112	Synthetic Minor Emissions	Operating	CAAFESOP		N		
AIR	CAA	AK0000000212290003	Synthetic Minor Emissions	Operating	CAASIP		N		
ICP	CWA	AK0053686	Minor: NPDES Individual Permit	Effective		05/17/2019	N	60.936667	-151.156111
ICP	CWA	AKG315022	Minor: General Permit Covered Facility	Admin Continued		06/30/2012	N	60.867347	-151.305497
ICP	CWA	AKG315102	Minor: General Permit Covered Facility	Effective		03/08/2020	N	60.972222	-151.073611

Facility Address

System	Statute	Identifier	Facility Name	Facility Address
FRS		110067194663	KITCHEN LIGHTS UNIT	15 MILES NW OF NIKISKI BAY, NIKISKI, AK 99611
AIR	CAA	AK0000000212200112	FURIE OPERATING ALASKA, LLC / KITCHEN LIGHTS UNIT, ONSHORE PRODUCTION	4 MILES NORTH OF NINILCHIK, ALASKA, AK 99639
AIR	CAA	AK0000000212290003	FURIE OPERATING ALASKA, LLC / KITCHEN LIGHTS UNIT EXPLORATION	UPPER COOK INLET, KENAI, AK 99501
ICP	CWA	AK0053686	KITCHEN LIGHTS UNIT GAS PROD-PLATFORM A	15 MILES NW OF NIKISKI BAY, NIKISKI, AK 99635
ICP	CWA	AKG315022	FURIE OPERATING ALASKA LLC - SPARTAN 151	COOK INLET, NOT APPLICABLE, AK 00000
ICP	CWA	AKG315102	FURIE KITCHEN LIGHTS UNIT EXPLORATION -RANDOLPH YOST	JACK UP MOBILE FACILITY, COOK INLET, AK 99501

Facility SIC (Standard Industrial Classification) Codes

System	Identifier	SIC Code	SIC Desc
ICP	AK0053686	1311	Crude Petroleum And Natural Gas
ICP	AKG315022	1311	Crude Petroleum And Natural Gas
ICP	AKG315102	1381	Drilling Oil And Gas Wells
ICP	AKG315102	1382	Oil And Gas Exploration Services

Facility NAICS (North American Industry Classification System) Codes

System	Identifier	NAICS Code	NAICS Description
AIR	AK0000000212200112	211111	Crude Petroleum And Natural Gas Extraction
AIR	AK0000000212290003	213112	Support Activities For Oil And Gas Operations
ICP	AK0053686	211111	Crude Petroleum And Natural Gas Extraction
ICP	AK0053686	213111	Drilling Oil And Gas Wells
ICP	AK0053686	213112	Support Activities For Oil And Gas Operations
ICP	AK0053686	486910	Pipeline Transportation of Refined Petroleum Products

Statute	Source ID	Current SNC (Significant Non-compliance)/HPV (High Priority Violation)	Description	Current As Of	Qtrs in NC (Non-Compliance) (of 12)
CWA	AKG315022	No		12/31/2016	2
CWA	AKG315102	No		12/31/2016	3

Three Year Compliance Status by Quarter

Statute	Program/Pollutant/Violation Type				QTR 1	QTR 2	QTR 3	QTR 4	QTR 5	QTR 6	QTR 7	QTR 8	QTR 9	QTR 10	QTR 11	QTR 12
CAA (Source ID: AK0000000212200112)					07/01-09/30/14	10/01-12/31/14	01/01-03/31/15	04/01-06/30/15	07/01-09/30/15	10/01-12/31/15	01/01-03/31/16	04/01-06/30/16	07/01-09/30/16	10/01-12/31/16	01/01-03/31/17	04/01-06/30/17
	Facility-Level Status				**No Viol**	**No Viol**										
	HPV History															
	Violation Type	**Agency**	**Programs**	**Pollutants**												
Historic Violations																
CAA (Source ID: AK0000000212290003)					07/01-09/30/14	10/01-12/31/14	01/01-03/31/15	04/01-06/30/15	07/01-09/30/15	10/01-12/31/15	01/01-03/31/16	04/01-06/30/16	07/01-09/30/16	10/01-12/31/16	01/01-03/31/17	04/01-06/30/17
	Facility-Level Status				**No Viol**	**No Viol**							**Viol**			
	HPV History															
	Violation Type	**Agency**	**Programs**	**Pollutants**												
CAA	FRV	AK	CAASIP										07/25/2016			
Historic Violations																

Statute	Program/Pollutant/Violation Type			QTR 1	QTR 2	QTR 3	QTR 4	QTR 5	QTR 6	QTR 7	QTR 8	QTR 9	QTR 10	QTR 11
CWA (Source ID: AK0053686)				01/01-03/31/14	04/01-06/30/14	07/01-09/30/14	10/01-12/31/14	01/01-03/31/15	04/01-06/30/15	07/01-09/30/15	10/01-12/31/15	01/01-03/31/16	04/01-06/30/16	07/01-09/30/16
	Facility-Level Status			**No Viol**	**No Viol**	**No Viol**	**No Viol**	**No Viol**	**No Viol**	**No Viol**	**In Viol**	**In Viol**	**In Viol**	**SNC/Cat 1**
	SNC (Significant Non-compliance)/RNC (Reportable Non-Compliance) History						C (Manual)	C (Manual)	C (Manual)		V (NonRNCV)	V (NonRNCV)	V (NonRNCV)	E(EffViol)
	Pollutant	**Disch Point**	**Freq**											
CWA	BOD, 5-day, 20 deg. C	001	Mthly										**134%**	**984%**
CWA	BOD, 5-day, 20 deg. C	001	NMth								5%		127%	570%
CWA	Chlorine, total residual	001	NMth										**240%**	**240%**
CWA	Solids, total suspended	001	Mthly										**262%**	**699%**
CWA	Solids, total suspended	001	NMth								13%	13%	237%	467%
CWA (Source ID: AKG315022)				01/01-03/31/14	04/01-06/30/14	07/01-09/30/14	10/01-12/31/14	01/01-03/31/15	04/01-06/30/15	07/01-09/30/15	10/01-12/31/15	01/01-03/31/16	04/01-06/30/16	07/01-09/30/16
	Facility-Level Status			**Unk**	**Unk**	**Unk**	**In Viol**	**In Viol**	**Unk**	**Unk**	**Unk**	**Unk**	**Unk**	**Unk**
	SNC (Significant Non-compliance)/RNC (Reportable Non-Compliance) History			W (N/A)	W (N/A)	W (N/A)	N (RptViol)	N (RptViol)	W(N/A)	W (N/A)	W(N/A)	W(N/A)	W(N/A)	W(N/A)
CWA (Source ID: AKG315102)				01/01-03/31/14	04/01-06/30/14	07/01-09/30/14	10/01-12/31/14	01/01-03/31/15	04/01-06/30/15	07/01-09/30/15	10/01-12/31/15	01/01-03/31/16	04/01-06/30/16	07/01-09/30/16
	Facility-Level Status			**No Viol**	**No Viol**	**No Viol**	**No Viol**	**No Viol**	**No Viol**	**No Viol**	**No Viol**	**No Viol**	**In Viol**	**In Viol**
	SNC (Significant Non-compliance)/RNC (Reportable Non-Compliance) History												V (NonRNCV)	V (NonRNCV)
	Pollutant	**Disch Point**	**Freq**											
CWA	BOD, 5-day, 20 deg. C	003	Mthly										90%	

System	Identifier	NAICS Code	NAICS Description
ICP	AKG315022	211111	Crude Petroleum And Natural Gas Extraction

Facility Tribe Information

Reservation Name	Tribe Name	EPA Tribal ID	Distance to Tribe (miles)
Tyonek	Native Village of Tyonek	100000537	9.12
Salamatof	Village of Salamatoff	100000523	24.83

Enforcement and Compliance

Compliance Monitoring History (5 years)

Statute	Source ID	System	Inspection Type	Lead Agency	Date	Finding
CAA	AK0000000212200112	AIR	FCE Off-Site	State	08/26/2016	
CAA	*AK0000000212200112*	*AIR*	*PCE Off-Site*	*State*	*08/05/2016*	
CAA	*AK0000000212200112*	*AIR*	*PCE Off-Site*	*State*	*12/29/2015*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*03/13/2017*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*09/07/2016*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*08/18/2016*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*07/25/2016*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*03/14/2016*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*12/29/2015*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*04/29/2015*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*12/23/2014*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*04/04/2014*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*12/23/2013*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*12/09/2013*	
CAA	AK0000000212290003	AIR	FCE Off-Site	State	02/20/2013	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*02/01/2013*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*09/07/2012*	
CAA	*AK0000000212290003*	*AIR*	*PCE Off-Site*	*State*	*09/06/2012*	
CWA	AK0053686	ICP	Evaluation	EPA	06/15/2016	
CWA	AKG315022	ICP	Evaluation	EPA	09/17/2013	
CWA	AKG315022	ICP	Evaluation	EPA	09/08/2012	
CWA	AKG315102	ICP	Evaluation	EPA	06/15/2016	

Entries in italics are not considered inspections in official counts.

Compliance Summary Data

Statute	Source ID	Current SNC (Significant Non-compliance)/HPV (High Priority Violation)	Description	Current As Of	Qtrs in NC (Non-Compliance) (of 12)
CAA	AK0000000212200112	No		05/06/2017	0
CAA	AK0000000212290003	No		05/06/2017	1
CWA	AK0053686	Yes		12/31/2016	5

Statute	Program/Pollutant/Violation Type			QTR 1	QTR 2	QTR 3	QTR 4	QTR 5	QTR 6	QTR 7	QTR 8	QTR 9	QTR 10	QTR 11
CWA	Solids, total suspended	003	Mthly										110%	
CWA	Solids, total suspended	003	NMth										60%	

Informal Enforcement Actions (5 Years)

Statute	System	Source ID	Type of Action	Lead Agency	Date
CAA	AIR	AK0000000212200112	Warning Letter	State	09/08/2016
CAA	AIR	AK0000000212290003	Warning Letter	State	08/08/2016

Formal Enforcement Actions (5 Years)

Statute	Source ID	Type of Action	Lead Agency	Date	Penalty	Penalty Description
No data records returned						

ICIS (Integrated Compliance Information System) Case History (5 years)

Primary Law/Section	Case No.	Case Type	Lead Agency	Case Name	Issued/Filed Date	Settlement Date	Federal Penalty	State/Local Penalty	SEP (Supplemental Environmental Project) Cost	Comp Action Cost
No data records returned										

Environmental Conditions

Water Quality

Permit ID	Combined Sewer System?	Number of CSO (Combined Sewer Overflow) Outfalls	12-Digit WBD (Watershed Boundary Dataset) HUC (RAD (Reach Address Database))	WBD (Watershed Boundary Dataset) Subwatershed Name (RAD (Reach Address Database))	State Waterbody Name (ICIS (Integrated Compliance Information System))	Impaired Waters	Impaired Class	Causes of Impairment(s) by Group(s)	Watershed with ESA (Endangered Species Act)-listed Aquatic Species?
AKG315022					COOK INLET	No			No
AK0053686					COOK INLET	No			No
AKG315102					COOK INLET	No			No

Waterbody Designated Uses

Reach Code	Waterbody Name	Exceptional Use	Recreational Use	Aquatic Life Use	Shellfish Use	Beach Closure Within Last Year	Beach Closure Within Last Two Years
		No	No	No	No	No	No
		No	No	No	No	No	No
		No	No	No	No	No	No

Air Quality

Non-Attainment Area?	Pollutant(s)
No	Ozone
No	Lead

Non-Attainment Area?	Pollutant(s)
Yes	Particulate Matter
No	Sulfur Dioxide

Pollutants

Toxics Release Inventory History of Reported Chemicals Released in Pounds per Year at Site

TRI Facility ID	Year	Total Air Emissions	Surface Water Discharges	Off-Site Transfers to POTWs (Publicly Owned Treatment Works)	Underground Injections	Releases to Land	Total On-site Releases	Total Off-site Releases
No data records returned								

Toxics Release Inventory Total Releases and Transfers in Pounds by Chemical and Year

Chemical Name
No data records returned

Demographic Profile

Demographic Profile of Surrounding Area (3 Miles)

This section provides demographic information regarding the community surrounding the facility. ECHO compliance data alone are not sufficient to determine whether violations at a particular facility had negative impacts on public health or the environment. Statistics are based upon the 2010 US Census and American Community Survey data, and are accurate to the extent that the facility latitude and longitude listed below are correct. The latitude and longitude are obtained from the EPA Locational Reference Table (LRT) when available.

Radius of Area:	3	Land Area	0%	Households in Area:	0
Center Latitude:	60.936722	Water Area:	100%	Housing Units in Area:	0
Center Longitude:	-151.156306	Population Density:	0/sq.mi.	Households on Public Assistance:	0
Total Persons:	0	Percent Minority:		Persons Below Poverty Level:	0

Race Breakdown	Persons (%)	Age Breakdown	Persons (%)
White:		Child 5 years and younger:	
African-American:		Minors 17 years and younger:	
Hispanic-Origin:		Adults 18 years and older:	#
Asian/Pacific Islander:		Seniors 65 years and older:	
American Indian:			
Other/Multiracial:			

Education Level (Persons 25 & older)	Persons (%)	Income Breakdown	Households (%)
Less than 9th Grade:		Less than $15,000:	
9th through 12th Grade:		$15,000 - $25,000:	
High School Diploma:		$25,000 - $50,000:	
Some College/2-yr:		$50,000 - $75,000:	
B.S./B.A. or More:		Greater than $75,000:	

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Permit issuing with P2W
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Vol. 21, No. 11 Week of March 13, 2016
Providing coverage of Alaska and northern Canada's oil and gas industry

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Currently the Kitchen Lights field is producing from a single well, the KLU No. 3 well. Furie has previously said that it plans to complete a second development well this year and a further well in 2017, with the intent of having four production wells completed by the end of the 2018 drilling season. A schedule of events outlined in the new unit plan of operations shows a slightly different development drilling sequence, with two wells planned for 2016 and two for the period April 2017 to October 2018.

Exploration wells

In terms of exploration wells, Furie's plan says that the company will re-enter the KLU No. 4 well in the northern block of the unit at some time between mid-May this year and the end of October 2017, to drill through to a depth of 17,858 feet to test the Tyonek and Hemlock formations of the Tertiary rock sequence, and to penetrate deeper Jurassic rocks of Mesozoic age. Geologists have long speculated that there may be oil in the deep Mesozoic sequence.

The active gas field is in the Corsair block, to the north of the central block of the unit. During this year's drilling season, Furie plans to drill two additional exploration wells: the KLU No. 9 well in the extreme north of the unit, and the KLU No. 12 well, a mile or so southwest of the KLU No. 4 well. The KLU Nos. 9 and 12 wells should each reach depths of some 17,000 feet in the Hemlock formation, Furie's plan says.

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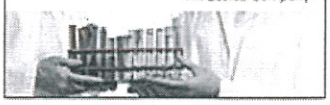

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Furie's plan of operations says that the rig will attempt to continue drilling until the end of October, depending on ice conditions, and will demobilize to Homer for overwintering.

Tax credits

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- ALAN BAILEY

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Cool, Richard

From: Cool, Richard
Sent: Tuesday, May 17, 2016 2:52 PM
To: l.smith@furiealaska.com
Subject: FW: EPA NPDES Inspections - Julius R Platform & Randolph Yost rig

Hi Leslie:

Thank you for taking my call. Attached below is the email I sent to Mr. Webb last Friday. I realize he is extremely busy thus my call as a follow-up.

Despite Mr. Brown's suggestion to talk to Mr. Webb directly, I would appreciate it if you might talk to Mr. Webb, if applicable, to see if there is a preferred contact for inspection discussions or please pass my email on to an appropriate contact.

In past years I worked with Randy O'Neil, HSE manager, but I don't know if Randy is still with Furie and if so, in that position.

Thank you for your help. I will contact you on Wednesday to see if a preferred contact has been identified.

Rick Cool
Water and Wetlands Enforcement Unit
U.S. EPA Region 10
1200 Sixth Avenue, M/S OCE-101
Seattle, WA 98101

Phone: (206) 553-6223
Fax: (206) 553-4743

From: Cool, Richard
Sent: Friday, May 13, 2016 11:45 AM
To: 'b.webb@furiealaska.com' <b.webb@furiealaska.com>
Subject: FW: EPA NPDES Inspections - Julius R Platform & Randolph Yost rig

Hello Mr. Webb:

By way of re-introduction, I am sending you this email regarding EPA's proposal to conduct NPDES general permit inspections of the Julius R Platform, and possibly the Randolph Yost rig (if it is not at the platform) during the week of June 13-17.

I talked to Gerry Brown, DEC, earlier today and he recommended I contact you directly and that maybe you would then designated your preferred point-of-contact for me to do follow-up regarding scheduling, logistics, etc.

On these planned inspections, I will be accompanied by Willow Weimer, an inspector with the DEC APDES compliance and enforcement program.

I would appreciate it if you could respond to this email, or alternatively call me, and please let me know if I should work directly with you, or in the alternative, you could provide me the name and contact information of your preferred point of contact.

Thanks in advance for your anticipated cooperation.

Rick Cool
Water and Wetlands Enforcement Unit
U.S. EPA Region 10
1200 Sixth Avenue, M/S OCE-101
Seattle, WA 98101

Phone: (206) 553-6223
Fax: (206) 553-4743

Cool, Richard

From: Cool, Richard
Sent: Wednesday, June 22, 2016 12:58 PM
To: Leslie Martin
Cc: Weimer, Willow A (DEC)
Subject: EPA Inspection Document Request Follow-up
Attachments: Furie Inspection Doc Requests 6.22.16.docx

Hi Tootie:

Per last Wednesday's discussion, I generated the attached documentation request summary in hopes that it accurately reflects our discussion and your notes on what documentation EPA would like to get to supplement the inspections.

I would appreciate it if you could forward this list to Joe Fleming as I do not currently have his email address, assuming that is OK with you.

I vetted this summary with Willow too. If you have any questions about any of the entries, need for clarification, etc., please let me know. I am in the office this week until Friday noon and all next week too.

Maybe we can do a short call after you and Joe digest this summary and get a feel for when you might be able to make the submissions.

Thanks again for your help.

Rick Cool
Water and Wetlands Enforcement Unit
U.S. EPA Region 10
1200 Sixth Avenue, M/S OCE-101
Seattle, WA 98101

Phone: (206) 553-6223
Fax: (206) 553-4743

Randolph Yost

300 Foot Jack-Up Drilling Unit

General Description

Design ..... Marathon LeTourneau 116-C
Year Built 1979
Hull Dimensions ..... 243 ft. x 200 ft. x 26 ft.
Spud Can Diameter ..... 46 ft.
Legs (3) ..... 410 ft. long square
Quarters Capacity ..... 118 persons
Maximum Water Depth ..... 300 ft.
Cantilever Envelope ..... 45 ft. by 24 ft.
Maximum Variable Load (drilling) ..... Approx. 4,800kips*

**depending on water depth and geographical location*

Drilling Equipment

Derrick Pyramid 160 ft. x 30 ft. x 30 ft., with a static hook load capacity of 1,000,000 lbs. with twelve (12) lines

Drawworks Oilwell E-3000, 1,600 HP driven by two (2) EMD D-79-MB DC motors, and outfitted with a Baylor 7838 auxiliary electric brake

Rotary Table Oilwell A37, 37-1/2 in. opening driven by an independent 800 HP DC motor with two speed gear box

Top Drive Varco TDS-4S, 650 short tons, 1,150 HP motor, maximum continuous drilling torque 50,900 ft.lbs., outfitted with a Varco PH-85 pipe handler

Mud Pumps Two (2) Oilwell A-1700PT, 1,600 HP triplex pumps each driven by two (2) EMD D-79-MB 800 HP DC motors, rated to 5,000 psi working pressure

Solids Control Four (4) MI Swaco Mongoose Pro linear motion shale shakers; one (1) Brandt King Cobra 24/3 desander with 3 x 12 in. cones; one (1) Brandt King Cobra 24/3 desilter with 24 x 4 in. cones.

Storage Capacities

Liquid Mud	1,692 bbls
Drill Water	10,814 bbls
Base Oil	702 bbls
Potable Water	1,283 bbls
Bulk Mud	4,000 cu.ft.
Bulk Cement	4,000 cu.ft.

Power Equipment

Main Power Three (3) EMD 16-645-E8 diesel engines rated 1,950 HP at 900 rpm, driving three (3) EMD A20-N6 2,100 kW 600 volt AC generators

Power Dist. Four (4) Ross Hill SCR units 1,800 amps 750 V DC.

Well Control Equipment

Diverter Hydril MSP 29-1/2 in. diverter rated 500 psi with two (2) 12 in. discharge lines and Demco ball valves

BOP Stack One (1) Cameron 13-5/8 in. 10,000 psi WP Type U double ram preventer; one (1) Cameron 13-5/8 in. 10,000 psi WP Type U single ram preventer; one (1) Hydril GK 13-5/8 in. 5,000 psi WP annular preventer

BOP Handling Two (2) Beebe Hercu-Link BOP hoist system 27 short tons each

Cranes

Four (4) Marathon LeTourneau PCM-120 cranes, 100 ft. booms, rated for 50 short tons at 24 ft. radius.

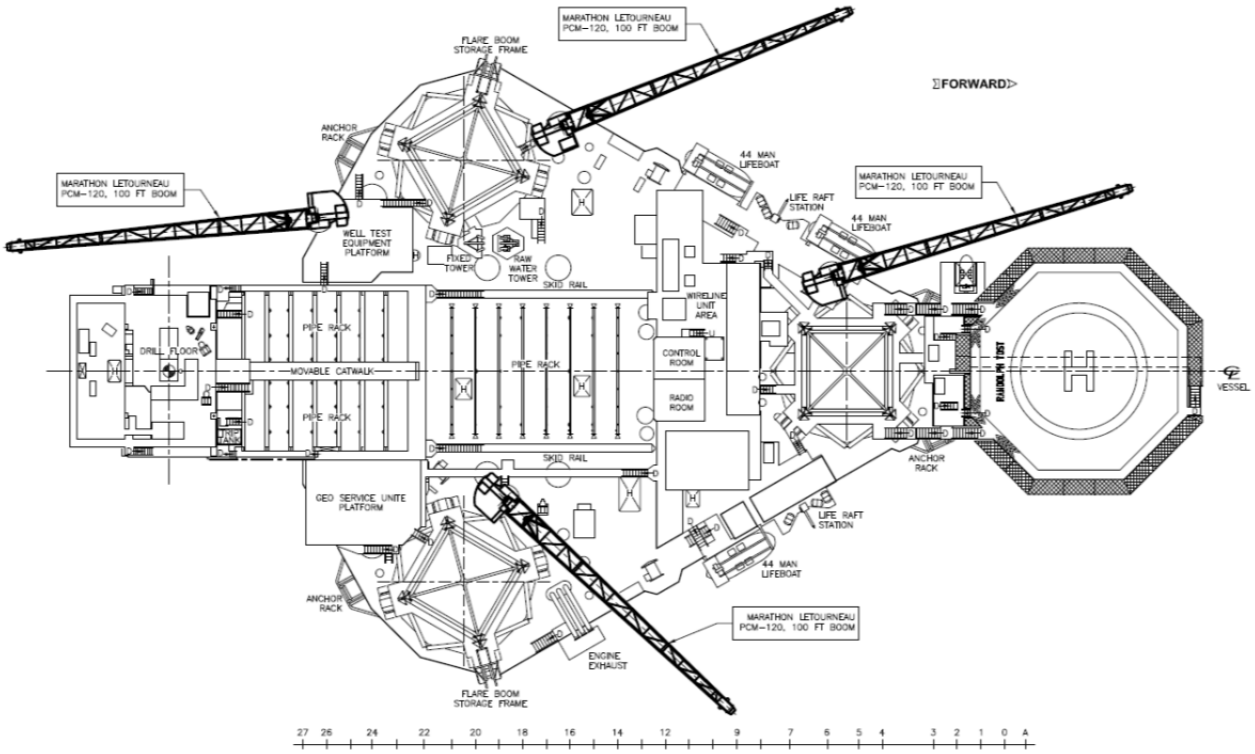
Special Features

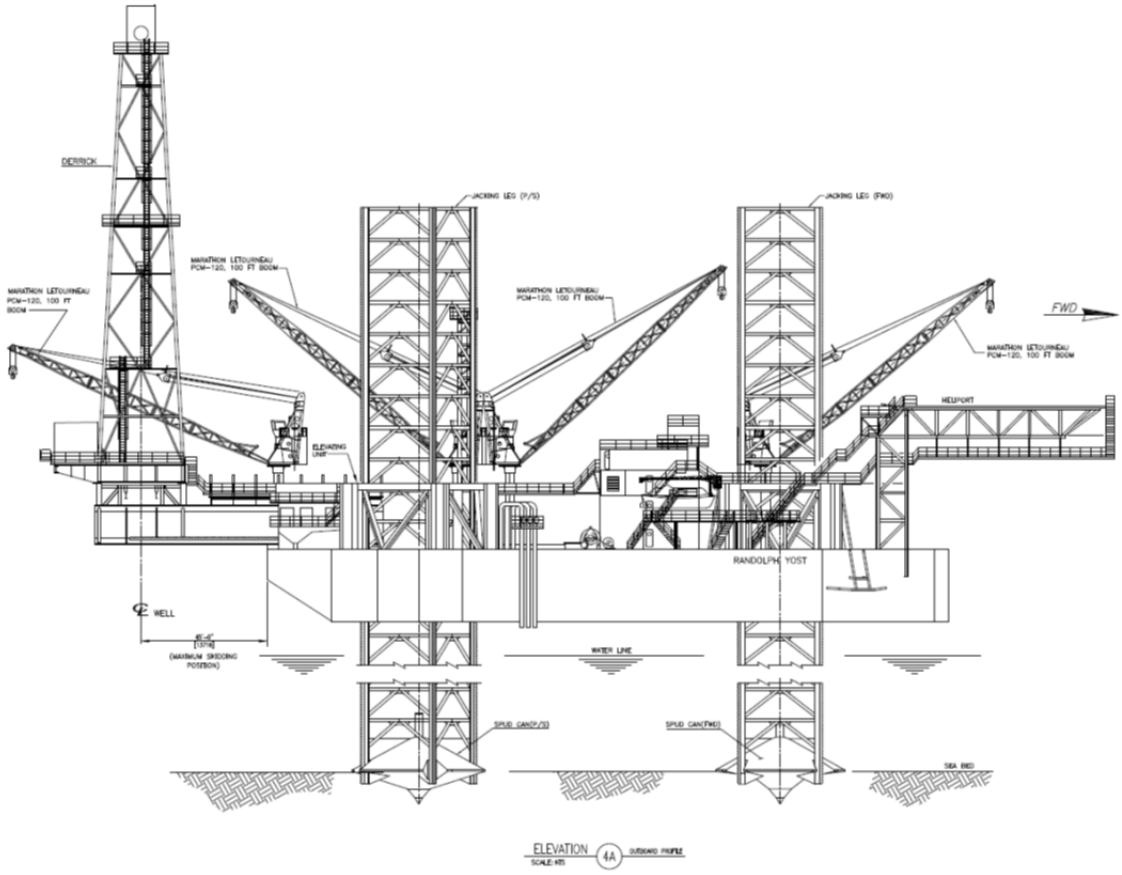
A coring moonpool with 15" inside diameter and an annulus flooding system to deliver 1,200 GPM of seawater are available.

Conductor Tensioning System rated to 100 kips is available.

SHELF DRILLING

These specifications are intended for general reference purposes only, as actual equipment and specifications may vary based upon subsequent changes, the contract situation and customer needs. All equipment shall be operated and maintained at all times, in compliance with Shelf Drilling policies and procedures, and within its stated operational limits or continuous rated capacity, in order to assure maximum operational efficiency.





Randolph Yost

R-Apr-2015

These specifications are intended for general reference purposes only, as actual equipment and specifications may vary based upon subsequent changes, the contract situation and customer needs. All equipment shall be operated and maintained at all times, in compliance with Shelf Drilling policies and procedures, and within its stated operational limits or continuous rated capacity, in order to assure maximum operational efficiency.

GENERAL EXPLORATION PERMIT
AKG-31-5100
NOTICE OF INTENT

ATTACHMENT C

ENVIRONMENTAL MONITORING PLAN

KITCHEN LIGHTS UNIT
COOK INLET, ALASKA

March 2016

Developed for:
Furie Operating Alaska, LLC
1029 W. 3rd Ave Suite 500
Anchorage, Alaska 99501

Prepared by:
Jacobs Engineering Group Inc.
4300 B Street, Suite 600
Anchorage, Alaska 99503

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ANOVA	analysis of variance
As	arsenic
Ba	barium
BTEX	benzene, toluene, ethylbenzene, xylenes
Cd	cadmium
CFR	Code of Federal Regulations
Cr	chromium
CTD	conductivity-temperature-depth
Cu	copper
EMP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
Furie	Furie Operating Alaska LLC
GPS	global positioning system
Hg	mercury
KLU	Kitchen Lights Unit
m/s	meter(s) per second
NOAA	National Oceanic and Atmospheric Administration
NOI	*Notice of Intent / Application to Discharge Under: General Permit AKG315100 – Mobile Oil and Gas Exploration Facilities in State Waters in Cook Inlet*
NTU	nephelometric turbidity units
OWS	oil-water separator
PAH	polycyclic aromatic hydrocarbons
Pb	lead
Permit	Alaska Pollutant Discharge Elimination System General Permit No. AKG-31-5100
ppt	parts per thousand
PSU	practical salinity units
QAPP	Quality Assurance Project Plan
SD	standard deviation
TAH	Total aromatic hydrocarbons
TAqH	Total aqueous hydrocarbons
µg/g	micrograms per gram
µg/L	micrograms per liter
VOA	volatile organic analysis
Zn	zinc

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1.0 INTRODUCTION

This Environmental Monitoring Plan (EMP) has been prepared to describe technical specifications of the environmental monitoring study and related sampling activities to meet the requirements of the Alaska Pollutant Discharge Elimination System General Permit No. AKG-31-5100 (Permit), Section 2.2.7. Furie Operating Alaska LLC (Furie) provides this EMP to the Alaska Department of Environmental Conservation (ADEC) for use under the Permit, pursuant to Chapter 40, Part 435, Subparts A and D of the Code of Federal Regulations (40 CFR 435 [A] and [D]), and as outlined and prescribed by the Permit.

Furie has drilled five exploration wells; completed one production well; proposes to re-enter, deepen, and evaluate the Kitchen Lights Unit (KLU) No. 4 well drilled in 2013; and proposes up to nine new exploration wells in the KLU lease block in Cook Inlet, Alaska. Furie anticipates drilling two exploration wells each year; therefore, Furie is requesting permit coverage as a mobile facility (see the *Notice of Intent / Application to Discharge Under: General Permit AKG315100 – Mobile Oil and Gas Exploration Facilities in State Waters in Cook Inlet* [NOI]) for project description). Drilling will be performed by the jack-up drill rig Randolph Yost. Additional information on the Randolph Yost, facility contacts, and the latitude and longitude of the first five exploration wells and discharge locations are provided on the NOI Application to Discharge.

1.1 PLAN MODIFICATIONS

The EMP may be modified if ADEC determines that the modification is appropriate. Modifications may include changes in sample locations, quantity, timing, and analyses performed. ADEC may grant a written exemption to some or all of the EMP requirements if Furie can satisfactorily demonstrate that the discharges do not have significant effects on the receiving water quality.

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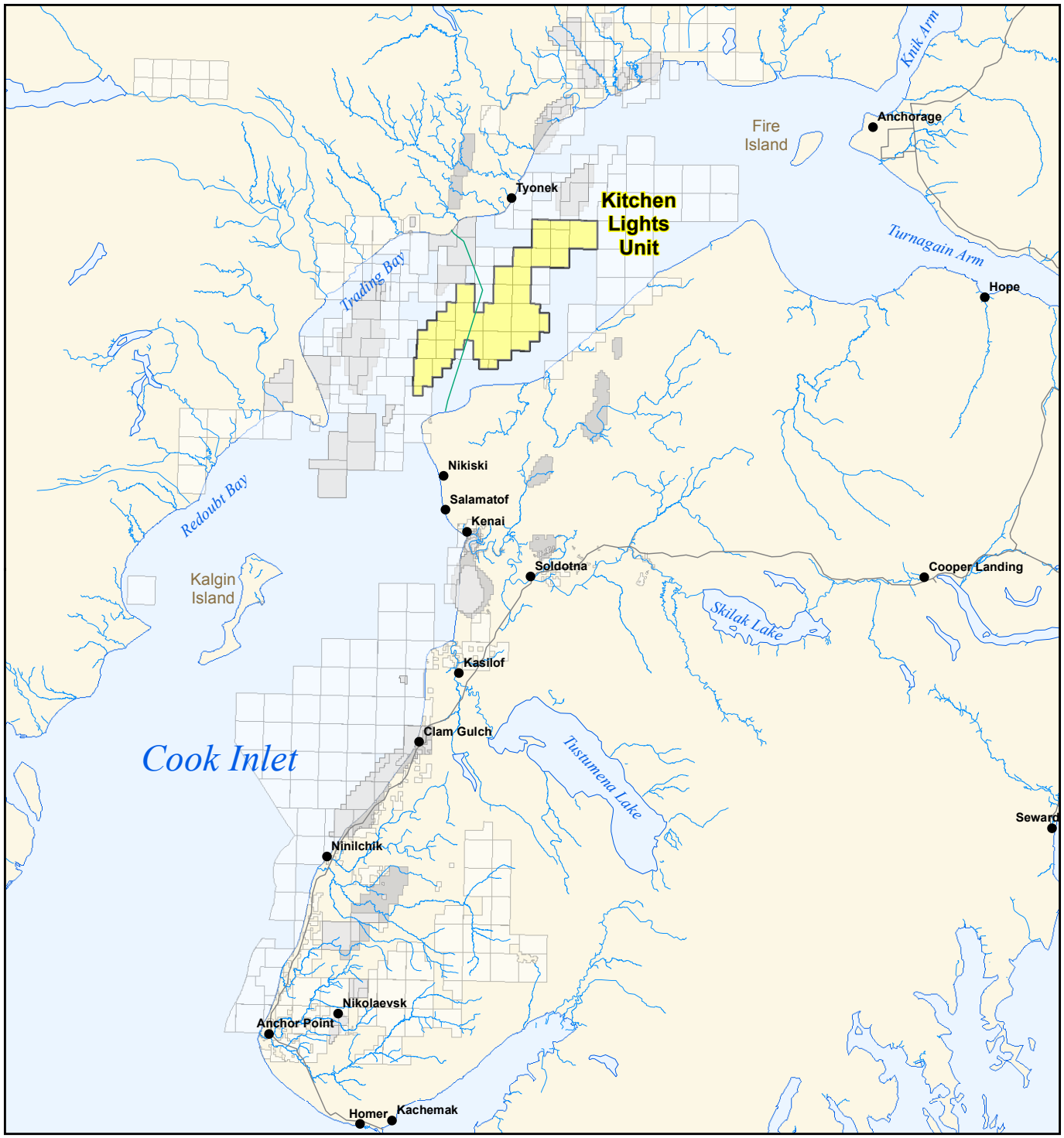
2.0 AREA DESCRIPTION

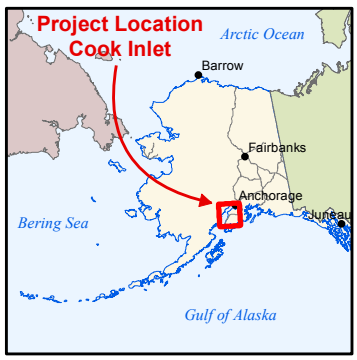
Cook Inlet is a shallow tidal estuary in Southcentral Alaska that fills a large portion of the northeast-southwest trending foreland basin known as the Susitna Lowland (U.S. Geological Survey 1996). Cook Inlet is a V-shaped trough with shallow platforms on its eastern and western boundaries. Mountains surround the basin of the Inlet to the north, west, and east; to the south, the Inlet opens into the Gulf of Alaska and Shelikof Strait. Cook Inlet is divided into upper and lower sections by two prominent land outcrops, known as the East and West Forelands, located just north of the City of Nikiski. The KLU lease block is located approximately 6.5 miles north of Boulder Point (Figure 2-1).

This section describes historical temperature, salinity, and turbidity values for Upper Cook Inlet and references data collected during previous KLU sampling events (KLU No. 1 through KLU No. #5) during exploration activities under the National Pollutant Discharge Elimination System General Permit No. AKG-31-5000.

2.1 BATHYMETRY AND CIRCULATION

Water depths in the vicinity of KLU range from approximately 19 meters at the shallower sites to 79 meters within the trough (Minerals Management Service 1996). Cook Inlet tidal currents are relatively strong and have a large effect on water circulation and turbulence in the Inlet; tides regularly reach a differential of 7 meters and exhibit currents in excess of 5 knots (2.5 meters per second [m/s]) at full tidal flow (National Oceanic and Atmospheric Administration [NOAA] 2014). Tidal current velocity can reach as high as 4 m/s in constricted areas, such as between the East and West Forelands (Mulherin et al. 2001). Water current velocity in Cook Inlet diminishes during the hour on either side of slack tide periods at both high and low tides. Due to the extreme tidal fluctuations in Cook Inlet, the slack tide period during tidal transitions is quite brief and the current velocity increases rapidly before and after slack tide as tidal waters fill or recede from the basin.





Cook Inlet Gas Gathering System (CIGGS)

Active Leases

Unit Boundary

Kitchen Lights Unit

All Locations Are Approximate

0 5 10 15 20

Miles

NAD 1983 StatePlane Alaska 4, Feet

N

FURIE OPERATING ALASKA
LOCATION AND VICINITY MAP
2016 EXPLORATION PLAN OF OPERATIONS
COOK INLET, ALASKA

JACOBS	DATE:	PROJECT MANAGER:	FIGURE NO:
	16 DEC 2015	K. NEPTUN	2-1

P:\Furie\2016_PlanOfOperations\MXD\FigA-1_KLU_VicinityMap.mxd beatycj

2.2 TEMPERATURE

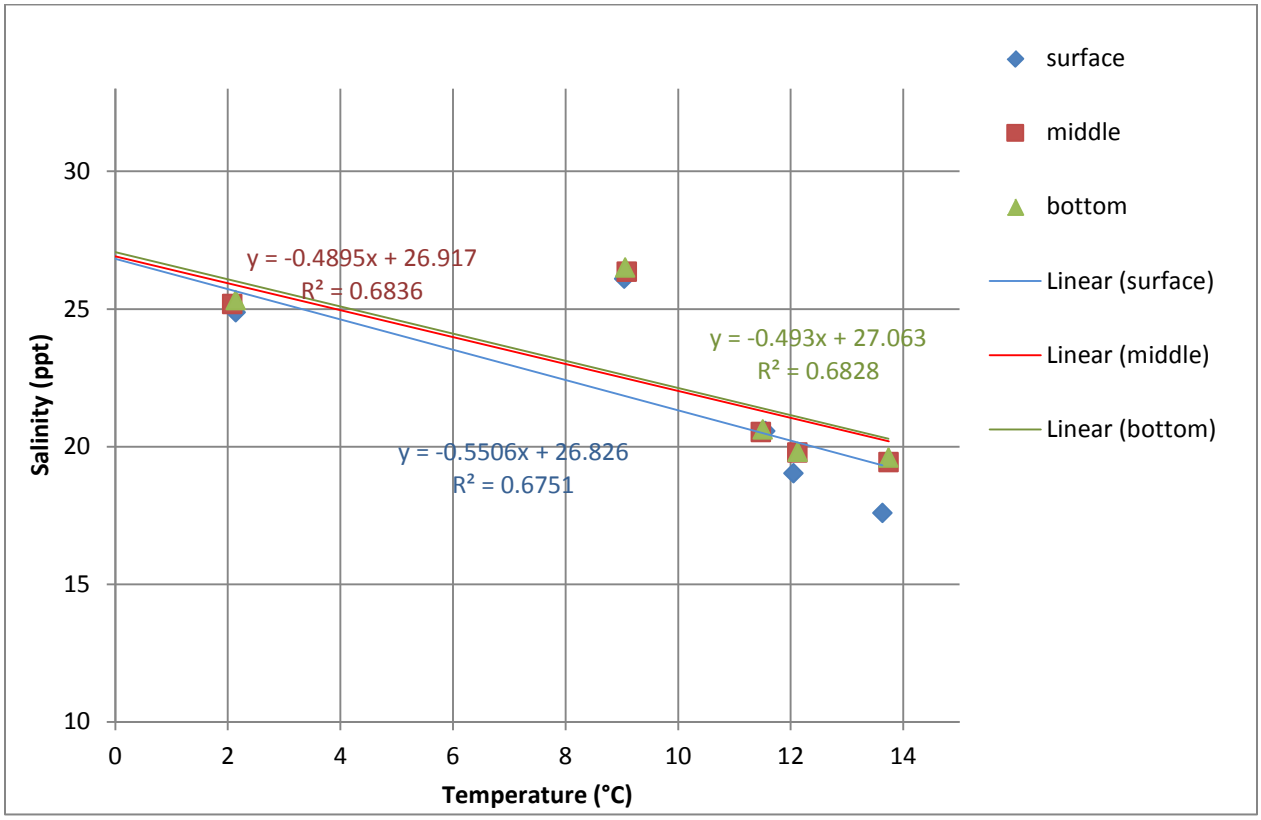
The large tidal range and relatively shallow bathymetry in Upper Cook Inlet causes waters to warm rapidly in late spring/early summer and cool rapidly during the fall months (Pegau et al. 2006). Between the Forelands, water temperatures average 11 degrees Celsius (°C) during the fall (Okkonen and Howell 2003). Results from previous KLU sampling efforts by Furie indicate that spring water temperatures range between -0.2 and 2.3°C, while summer water temperatures increase to between 9 and 12°C, with late-summer highs in excess of 13°C (Furie 2014a,b,c, 2013a,b,c, 2012a,b).

2.3 SALINITY

Highest salinities reportedly occur during February when river discharge is low, whereas lowest salinities occur during August following the summer discharge pulse of fresh water (Pegau et al. 2006). Average salinity within the Forelands decreases by approximately 3 practical salinity units (PSU) from spring to fall (Pegau et al. 2006). Salinity in the Forelands ranges from less than 18 PSU at the surface to greater than 24.5 PSU at the deepest part of the channel during the fall. One study observed 30.60 PSU in the spring and 28.97 PSU in the fall (Okkonen and Howell 2003), while observed data from previous KLU sampling events indicate spring and early summer salinities of about 24-27 PSU and mid- to late-summer salinities of about 15-20 PSU (Furie 2014a,b,c, 2013a,b,c, 2012a,b). These values are indicative of the substantial freshwater input concentrated in the uppermost water column during the summer months.

Salinity appears to be inversely correlated with temperature (Figure 2-2). This correlation is expected: Cook Inlet water temperatures are lower in the spring and salinity is higher while the fresh water remains frozen, but as temperatures increase later in the spring and into the summer, snow and glacial melt contribute to the freshwater/riverine input, reducing the overall salinity of the Cook Inlet waters.

Figure 2-2
Temperature versus Salinity at KLU



Notes:
Each data point represents a monthly average value (from April through September).
Salinity measurements in units of ppt are essentially equivalent to those in PSU.
For definitions, refer to the Acronyms and Abbreviations section

2.4 TURBIDITY

The reported average turbidity of Upper Cook Inlet and Knik Arm is in the range of 400 to 600 nephelometric turbidity units (NTU) (Smith et al. 2005). During previous KLU sampling events, spring and summer values typically ranged from 80-180 NTU, with the exception of the pre-drilling sampling event on 14 July 2012 where values where readings were consistently over 1,800 NTU (Furie 2014a,b,c, 2013a,b,c, 2012a,b). There is no apparent correlation between turbidity and salinity or temperature, regardless of season (note that KLU sampling has only been performed in spring and summer). The high readings in July 2012 may be attributable to increased riverine output during this time. As indicated in the Ocean Discharge Criteria Evaluation published by ADEC (ADEC 2013), the lack of variability

within the water column of suspended particulate matter concentrations indicate vertical mixing. This is supported by a lack of variability in turbidity results vertically within the water column from previous KLU sampling events.

2.5 SEDIMENTS

Cook Inlet sediments consist predominantly of cobbles, pebbles, and sand with minor amounts of clay and silt. The depositional environment near KLU and the Forelands consists of gravel and sandy gravel, whereas northern Cook Inlet consists of sand and gravelly sand with minor silt and clay (Sharma and Burrell 1970). Coarse sediments and gravel are found in the mid-channel of Cook Inlet (where KLU is located), whereas fine-grained sediments have been found near the shore (Sharma and Burrell 1970). The Forelands are located in the zone of maximum turbulence, which helps to explain the lack of fine sand, silt, and clay in this area. High velocity currents in Upper Cook Inlet further prevent the deposition of clay and silt, and large quantities of sediments are transported considerable distances from the point of input (Sharma and Burrell 1970, Whitehouse et al. 1960).

Sediment grain size has a strong influence on the extent of sediment contamination. Finer-grained sediments have a higher surface-to-volume ratio, allowing greater concentration of contaminants per unit volume than coarser sediments. This is particularly true for contaminants that adsorb onto sediment particles. Moreover, finer sediments are more likely to be re-suspended by currents, to be moved further from their source, and to be deposited in areas further downstream than coarser sediments (Saupe et al. 2005). Table 2-1 presents a summary of contaminant concentrations in sediments in Southcentral Alaskan bays and estuaries.

Table 2-1
Summary of Sediment Contaminants in Southcentral Alaskan Bays and Estuaries*

Chemical Parameters	Mean Concentration for Southcentral Alaska Overall (mean µg/g ± SD)
Cd	0.22 ± 0.25
Cr	74.95 ± 171.82
Cu	35.51 ± 14.60
Pb	13.23 ± 3.62
Hg	0.07 ± 0.04
Zn	90.08 ± 28.11
Total PAH	224.45 ± 193.62

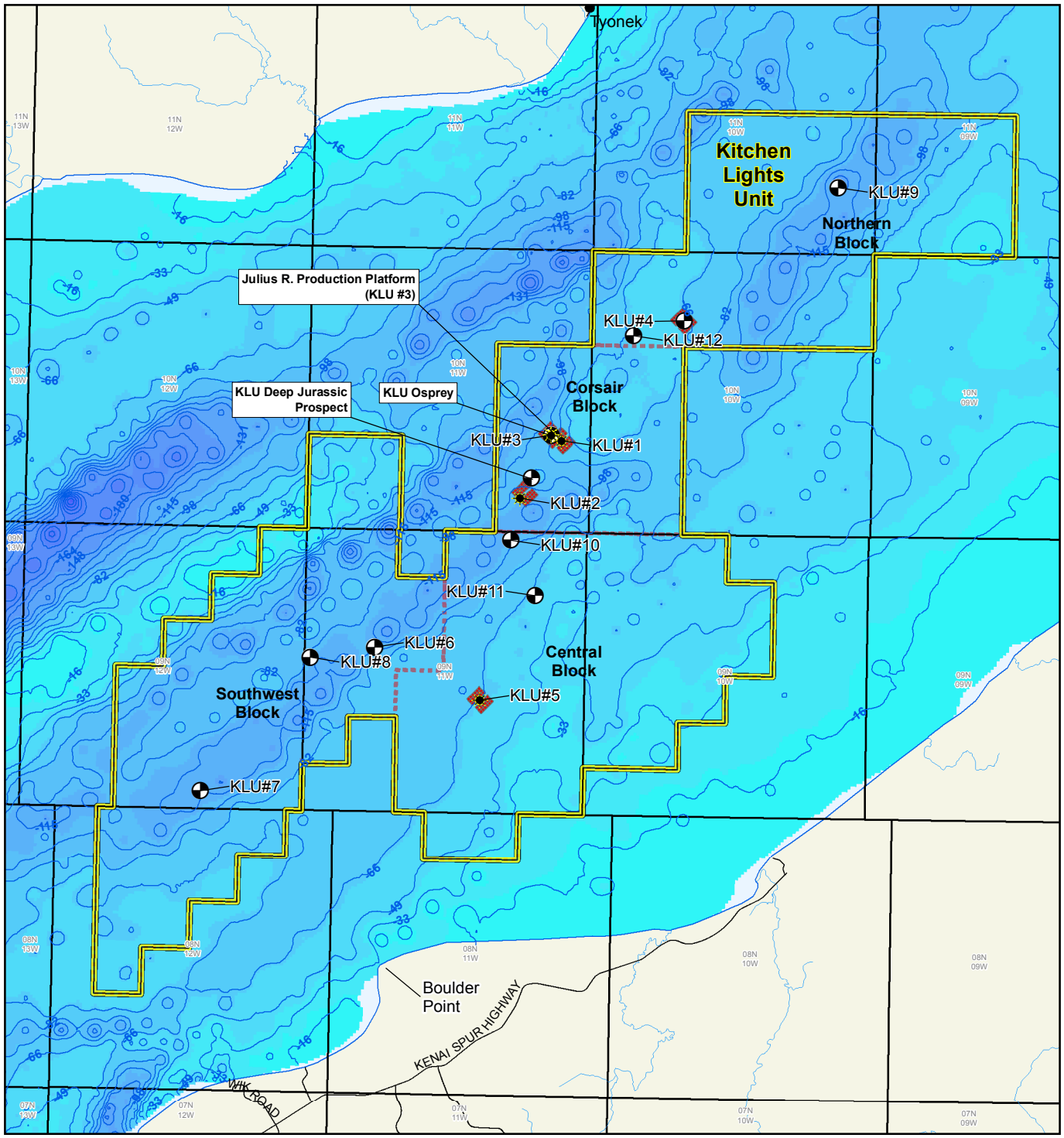
Notes:
*Data are from Saupe et al. 2005
For definitions, refer to the Acronyms and Abbreviations section
.

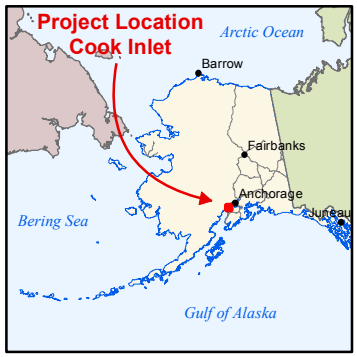
3.0 MONITORING OBJECTIVES

The objectives of environmental monitoring are to assess potential discharge-related influences to the marine environment and biota. Section 2.2.7.3 of the Permit identifies objectives that include determining statistically significant changes in sediment pollution concentrations/toxicity, assessing whether effects warrant adjustment of program, and providing information for permit reissuance. The previous sampling efforts at five locations within the KLU were only successful at collecting enough sediment for analytical samples in 3 out of 109 attempts. This part of Cook Inlet does not lie in a depositional area, and the substrate consists largely of pebbles and cobbles (Furie 2014a,b,c, 2013a,b,c, 2012a,b). Figure 3-1 presents the general bathymetry in the vicinity of KLU. Due to the lack of success in efforts to collect sediment samples in the KLU and the relatively uniform bathymetry and substrate composition, Furie is not proposing sediment samples. Instead, the primary objective of the study is to monitor for discharge-related effects through measurement and statistical comparison of receiving water pollutant concentrations. If results indicate that drilling-related influences are occurring, the monitoring program will be amended accordingly.

3.1 BASELINE DATA FROM PREVIOUS EFFORTS

No baseline data for total metals concentrations or hydrocarbon concentrations in the ambient waters of Cook Inlet were found for comparison. A previous study of Cook Inlet seawater (Trefry et al. 2012) reported the average dissolved concentrations and standard deviations for arsenic (As) (1.08 +/- 0.12 micrograms per liter [µg/L]), barium (Ba) (18.7 +/- 4.3 µg/L), chromium (Cr) (0.11 +/- 0.02 µg/L), copper (Cu) (0.009 +/- 0.007 µg/L), and lead (Pb) (0.023 +/- 0.015 µg/L). However, total metal concentration is a more appropriate indicator of the effect of drilling fluid discharges than dissolved metals. Previous studies conducted by Furie have not collected data on metals or hydrocarbons in seawater in Cook Inlet.





Proposed Exploration Wells
Previous Exploration/Development Wells
Bathymetric Contours, ft (NOAA 2016)
Previous Sampling Locations
Kitchen Lights Unit
Lease Block

All Locations Are Approximate

0 1 2 3 4 5 Miles

0 2 4 6 8 10 Kilometers

NAD 1983 StatePlane Alaska 4, Feet

N

FURIE OPERATING ALASKA, LLC
NOAA BATHYMETRY

COOK INLET, ALASKA

JACOBS	DATE: 08 MAR 2016	PROJECT MANAGER: T. HEIKKILA	FIGURE NO: 3-1

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3.2 DISCHARGES

Discharges from the Randolph Yost include drilling fluids and cuttings; domestic wastewater and graywater, deck drainage (through oil-water separator [OWS]); equipment wash-down water (through OWS); fire control test water (through OWS); non-contact cooling water; uncontaminated ballast water; excess cement slurry; and mud, cuttings, and cement at the seafloor. Compliance with the Permit conditions for each of these discharges will be monitored through sampling of effluent and reported on Discharge Monitoring Reports. The Permit limits, sampling protocols and analyses for compliance sampling are discussed in the Quality Assurance Project Plan (QAPP) (Attachment G to the NOI). The focus of this EMP is sampling of receiving waters to assess the potential environmental effect from the discharge of drilling fluids and drill cuttings.

Authorization from ADEC for a standard mixing zone will be requested. The cylindrical mixing zone with a 100-meter radius will extend from the water surface to the seafloor. The location of the mixing zone will be centered on the discharge pipe. Sampling efforts will occur outside the boundaries of this mixing zone.

3.3 SAMPLE LOCATION AND TIMING

The primary objective of each sampling event will be to collect samples both upstream and downstream of the drill rig during active discharge of drill cuttings and fluids. These discharges are intermittent and occur as mud requirements change during each stage of drilling. Coordinating with the drilling crew to mobilize a vessel and sampling crew to the site during periods of active discharge presents a significant logistical challenge. Favorable weather and tides are necessary for deployment of the vessel and sampling equipment. If feasible, the drilling crew will be asked to retain a portion of spent drilling fluids onsite to discharge while the sampling crew is in position.

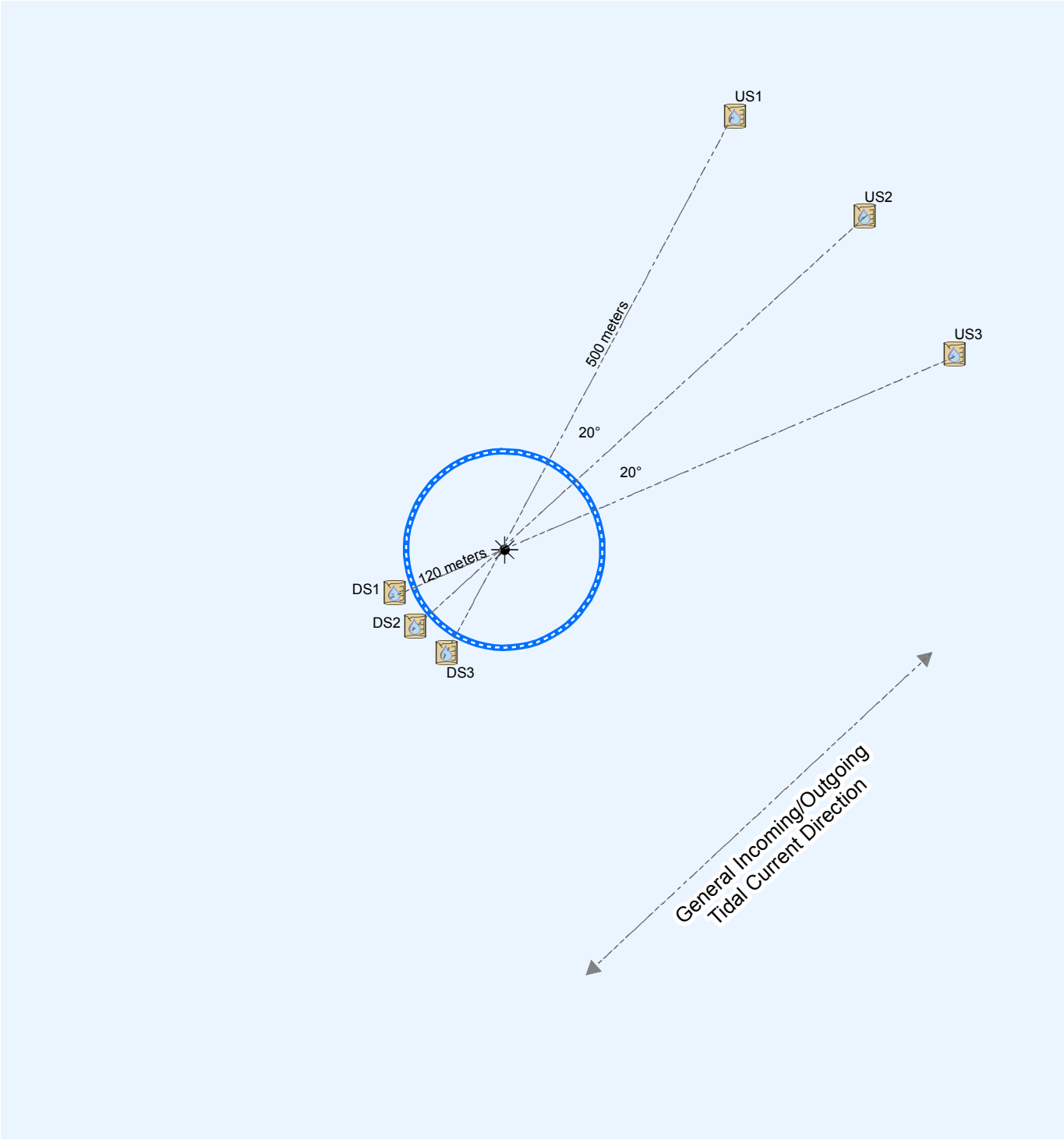
Samples will be collected at three depths from each of three locations upstream and three locations downstream of the discharge point. Nine primary samples will be collected upstream and nine samples will be collected downstream. Sample collection is described further in

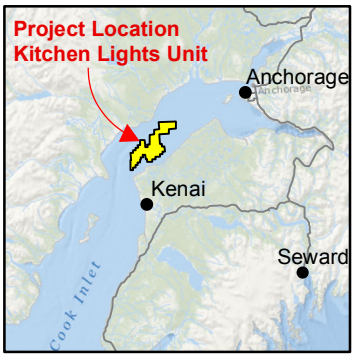
Section 3.4. The upstream samples represent the water quality baseline against which the downstream samples will be compared. Due to the significant riverine output northeast of the KLU, outgoing tidal flow is greater than that of the incoming. A plume associated with drilling fluid discharges would be expected to travel further to the southwest on an outgoing tide than it would to the northeast on an incoming tide. For this reason, sampling and observation will be conducted on an outgoing tide to avoid capturing a residual plume returning on an incoming tide during upstream baseline sampling. An outgoing tide is also preferred over a slack tide to ensure the current is not swirling or stagnant.

The direction (bearing) of the water current will be determined by monitoring floating debris or the direction of the vessel drift (if little or no wind is present). If wind is significant, a drogue will be deployed for several hundred meters that will be unaffected by wind, and its beginning and ending positions will be recorded (U.S. Army Corps of Engineers [USACE] 2002). The current direction will be calculated by a spreadsheet or by plotting on a global positioning system (GPS) receiver.

The baseline samples (US1, US2, and US3 shown in Figure 3-2) will be collected at three locations 500 meters upstream of the discharge point of the Randolph Yost. The spacing between each sample will be approximately 175 meters. The downstream samples (DS1, DS2, and DS3 shown in Figure 3-2) will be collected from three locations in a similar manner, but will be collected 120 meters from the discharge point, outside the 100 meter mixing zone. The spacing between the downstream samples will be approximately 40 meters. The locations of both the upstream and downstream samples will be positioned on the centerline of the current direction and offset 20 degrees to either side of the current direction.

Planned sample latitudes and longitudes will be calculated once the discharge point is established and the bearing of the outgoing current direction is determined in the field. Actual sample locations will be recorded using a handheld GPS receiver or the vessel's GPS device.





Proposed Well Location

Proposed Water Column Sample Location

100 Meter Mixing Zone

0 50 100 150 200 250
Meters

0 100 200 300 400 500
Feet

US: Upstream
DS: Downstream

WGS 1984 UTM Zone 5N

N

KITCHEN LIGHTS UNIT
PROPOSED WATER COLUMN
ENVIRONMENTAL SAMPLE LOCATIONS
COOK INLET, ALASKA

JACOBS	DATE: 08 MAR 2016	PROJECT MANAGER: K. NEPTUN	FIGURE NO: 3-2

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3.4 SAMPLE COLLECTION

Water column samples will be collected using Niskin bottles (or similar) at 1 meter below the surface, midway between the surface and the seafloor, and 2 meters above the seafloor during active discharge at upstream and downstream locations. Samples will be collected from three depths at each of three locations downstream of the rig for a total of nine primary samples. Samples will be collected from three depths upstream of the rig in three locations for a total of nine primary samples. The collection of samples at three depths in three locations downstream will allow for analysis of variance (ANOVA) between depths and may identify the depth of highest effect in the water column.

To collect samples at depth in the water column, the vessel may need to position upstream and drift toward the desired sample location while the sampler lowers the Niskin to the target depth. The vessel operator may need to counteract drift caused by wind in order to keep the vessel vertically aligned above the sample instruments. Additional weights or a downrigger mechanism may also be necessary to achieve near vertical alignment above the sample instruments. Longitude and latitude will be recorded as the Niskin bottles are triggered to close. If vertical alignment is not achievable, the samplers will record the estimated offset distance and bearing of the sample location relative to the position of the vessel.

Temperature, salinity, and turbidity will be measured in situ using a conductivity-temperature-depth (CTD) meter equipped with a turbidity meter. At each location, readings of depth, temperature, turbidity, and salinity will be logged once per second as the CTD is lowered into the water column. The sampler will be held at three target depths to allow readings to stabilize for 10 seconds at 1 meter below the sea surface, halfway between the sea surface and the seafloor, and 2 meters above the seafloor. Water column samples will be collected with the Niskin bottles during the period where the CTD is held at the target depth. Upon retrieval, the contents of the Niskin will be transferred to the appropriate size sample container for each analysis. The Niskin will be rinsed and decontaminated with de-ionized water between deployments.

3.5 SAMPLE HANDLING AND ANALYSIS

Samples will be collected and handled as specified in the QAPP (Attachment G to the NOI). Water column samples will be analyzed for:

- Total metal concentration (Ba, cadmium [Cd], Cr, Cu, mercury [Hg], Pb, and zinc [Zn])
- Total aromatic hydrocarbons (TAH)
- Total aqueous hydrocarbons (TAqH)

Analytes were chosen based on previous environmental monitoring studies that have been conducted in Cook Inlet (Saupe et al. 2012, Savoie et al. 2012, Trefry et al. 2012, U.S. Geological Survey 2001). Arsenic will not be analyzed due to the high background levels present in the Cook Inlet basin (U.S. Geological Survey 2001). TAH and TAqH will be determined through the analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAH) concentrations. Table 3-1 presents the analyses and sample volumes for each parameter.

Table 3-1
Water Column Sample Analyses and Volume

Parameters	Method	Sample Quantity - Volume
Total Metals (Ba, Cd, Cr, Cu, Pb, and Zn)	EPA 1640 / SW6020	1 - 500 mL
Total Metals (Hg)	EPA 1640 / SW7470	1 - 500 mL
BTEX	SW8260	3 – 40 mL VOA
PAH	SW8270SIM	2 – 1 L

Note:
For definitions, refer to the Acronyms and Abbreviations section

3.6 SAMPLE NAMING CONVENTION

Water column samples collected with the Niskin will be assigned an identification number designated by year, well name, sample location, and depth below the surface. Sample locations will be designated as upstream (designated by "US") and downstream (designated by "DS"). There are three upstream and three downstream locations; therefore, the samplers will also number each position 1 through 3 in an order of their choosing (e.g., north to south or chronologically). For example, a sample collected in 2016 at well KLU No. 6 in the third upstream location at 1 meter below the surface would be labeled 16KLU6-US3-01. Leading zeros will be maintained for depth values. Duplicate samples will have the letter "X" appended after the depth (e.g., 16KLU6-US3-01X).

3.7 DATA ANALYSIS AND HYPOTHESIS TESTING

The mean and standard error for the depth, temperature, and salinity readings will be reported for each sample location and target depth. No statistical analysis is planned for these parameters to compare upstream baseline data to downstream data. Statistical analysis will be conducted on all remaining parameters: total metals concentrations (each individual metal), TAH, TAqH, and turbidity.

To evaluate the relationship between the upstream baseline data set and the downstream plume data set, a one-tailed *t*-test comparison of the means of each parameter will be performed at a 95 percent confidence level (significance level $\alpha = 0.05$). The mean parameter concentration in the downstream plume ($\mu_{downstream}$) will be compared to the mean parameter concentration in the upstream baseline ambient water ($\mu_{upstream}$) by testing the following hypotheses:

- *The null hypothesis (H_0)*: The mean parameter concentration in the downstream plume is less than or equal to the mean parameter concentration in the upstream baseline ambient water ($\mu_{downstream} \leq \mu_{upstream}$).
- *The alternative hypothesis (H_A)*: The mean parameter concentration in the downstream plume is greater than the mean parameter concentration in the upstream baseline ambient water ($\mu_{downstream} > \mu_{upstream}$).

If a duplicate sample is collected in the upstream baseline data set, the higher concentration value of the primary or duplicate sample will be rejected, and the lower value will be included for analysis. Conversely, in the downstream data set the lower concentration value will be rejected and the higher value will be included. Tests for outliers within each data set will be performed. The data sets will also be evaluated for normality and transformations of the data to a reasonable approximation of normality may also be performed.

A rejection of the null hypothesis for a parameter will indicate a statistically significant difference in the plume concentration above baseline conditions. If a pollutant parameter does exhibit a statistically significant difference in concentration above baseline conditions, it will also be compared to the appropriate water quality criteria in the Alaska Administrative Code (AAC), Title 18, Chapter 70, Section 20 (18 AAC 70.020) and the *Alaska Water Quality Criteria Manual for Toxic and other Deleterious Organic and Inorganic Substances* (ADEC 2008). Additional statistical analyses to compare concentrations by depth, position, or by other groupings may be performed using ANOVA techniques, if appropriate.

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4.0 REPORTING

Furie will analyze the data collected during each sampling event and submit a draft report within 180 days. The reports will include descriptions of sample collection methodology and data analysis techniques. The reports will address the environmental monitoring objectives by using appropriate descriptive and analytical methods to test for and describe any influences of the effluent on water quality. The reports will contain all relevant quality assurance/quality control information including, but not limited to, instrumentation, laboratory procedures, detection limits/precision requirements of the applied analyses, and sample collection methodology.

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Furie Operating Alaska, LLC
1029 West 3rd Ave., Suite 500
Anchorage, Alaska 99501

Permit # AKG315100
March 25, 2016

Alaska Department of Environmental Conservation
Division of Water – Waste Water Discharge, Oil & Gas Section
555 Cordova St
Anchorage, AK 99501 USA

Subject: Notice of Intent (NOI), APDES General Permit AKG315100, Furie Operating Alaska, LLC, Cook Inlet Exploratory Drilling Program

Dear Natalie Wagner and Gerry Brown,

Furie Operating Alaska, LLC (Furie) is providing a notice of intent (NOI) for coverage under APDES General Permit AKG315100 regarding authorized discharges related to oil and gas exploration drilling to be conducted in state of Alaska coastal waters of the upper Cook Inlet. Drilling will be conducted by the Randolph Yost jack-up drill rig.

The purpose of the permit application is to allow Furie to conduct drilling activities in coastal waters, starting with a five-year exploration period that is scheduled to begin in April 2016. The initial drilling program will consist of five (5) wells in the Kitchen Lights Unit (KLU) lease block. Depending on results, additional wells may be drilled.

Furie hereby submits this NOI to satisfy the requirements of 40 CFR Part 435 (a) and (d). Completion of the NOI information is being provided by Furie as prescribed by General Permit AKG315100. This includes preparing and submitting the following documentation:

- NOI Information Sheet
- Initial Site Assessment
- Line Drawings and Flow Balances
- Environmental Monitoring Plan
- Plan of Operations
- Biological Evaluation
- Biological Assessment
- Drilling Fluids Plan
- Best Management Practices Plan
- Wastewater Engineering Plan Submittal Letter

A Quality Assurance Project Plan has been developed and will be implemented within 90 days of discharging; this document is available upon request. The Drilling Fluids Plan is currently missing toxicity information for one drilling fluid additive and has not received a final review by the drilling fluids contractor. A revised version of the Drilling Fluids Plan will be provided to ADEC for review and approval prior to discharging drilling fluids or cuttings.

An engineering plan review for the marine sanitation device onboard the Randolph Yost was submitted to the Alaska Department of Environmental Conservation, Division of Water- Wastewater Discharge Authorization Program on 19 February 2016. Additional information was requested by the Division and was provided on 22 February 2016 and 22 March 2016. An approval to operate the marine sanitation device has not been granted. A

waiver from minimum treatment requirements for domestic wastewater will be submitted shortly. Domestic wastewater and gray water will be containerized until approval for operation and discharge has been received.

We would also like to note that deck drainage will include a comingled outfall that includes bilge water and fire control test water. The bilge water will be comprised primarily of equipment wash down water. These sources will be combined and routed through the oil-water separator, to be discharged as a single outfall (Outfall 002, Deck Drainage). Further discussions of deck drainage and/or Outfall 002 refer to this combined outfall.

If you have questions, please contact me at (907) 229-8398.

Best Regards,

Bruce Webb
Senior Vice President
Furie Operating Alaska, LLC

Cc: Kristina Neptun, Jacobs Engineering

Attachments:
Notice of Intent Information Sheet
Initial Site Assessment and Site Map (NOI Attachment A)
Line Drawings and Flow Balances (NOI Attachment B)
Environmental Monitoring Plan (NOI Attachment C)
Other Environmental Reports (Plan of Operations and Biological Assessment) (NOI Attachment D)
Drilling Fluids Plan (NOI Attachment E)
Best Management Practices Plan (NOI Attachment F)
Wastewater Engineering Plan Submittal Letter (Attachment G)

Daily Environmental Compliance Assessment - Randolph Yost
Date: 06/24/2016

Area	Spills / Leaks	Issues	Observations	Action Necessary
Rig Floor	No	No	Iron Roughneck hydraulic unit leaking at the unit connections - needs to be tightened & cleaned	Repaired
Upper Pipe Rack	No	No	Mud ditch stopping up due to gravels in the mud, crews monitoring	Monitor
Storage Decks	No	No		
Lower Pipe Rack	Yes	Yes	Halliburton unit leaked ~40 gallons of D168 Uniflac - contained and picked up, placed back in tote for disposal	None
Main Deck	No	No		
Oil Water Separator	N/A	N/A	Gravity seperation only, no OWS capability	
Marine Sanitation Devices	No	No		
Shale Shakers	No	Yes	Mud ditch stopping up caused mud back-ups behind shakers - crews cleaning as needed	None
Paint Locker	No	No		
Accumulator Room	No	No		
Cranes	No	No		
Welding Areas	No	No		
Water Producing Equipment	N/A	N/A	Non-functional	
Cement Unit/Room	No	No		
SCR Room	No	No		
Sack Room	No	No		
Engine Room	No	No		
Mud Pumps	No	No		
Pit Room	No	No		

Permitted Discharges	Discharge	Visisble Sheen	Observations	Action Necessary
Drill Fluids & Cuttings	No	N/A		
Non-Contact Cooling Water	No	N/A	Water Temperature (^{o}F): Inlet 65 Outlet 76	
Oil Water Separator	No	N/A	Deck OWS not currently in use	
Wastewater	Yes	No	No sheen, monitored 3-4 times per day	
Blowout Preventer	No	N/A		
Fire Control System	No	N/A		
Ballast Water	No	N/A		
Bilge Water	No	N/A		

Marine Sanitation Devices	pH	Temp	TRC in	TRC out	Gallons	Barrels	m^3	Observations	Action Necessary
Untreated Gray water	--	--	--	--	--	--		Not authorized to discharge directly	
OmniPure 5538					12,661.8	301.5	47.9		
OmniPure 2300	--	--	--	--	--	--		Discharging to OmniPure 8353, no direct discharge	

Diesel Storage Tanks	Spills / Leaks	Observations	Action Necessary
Fuel Receipt Area	No		
Fuel Fill/Transfer Areas	No		
Storage Tanks	No		
Pollution Pans	No		

Discharge Testing	Conducted	Results	Observations	Action Necessary
Static Sheen Test	N/A	N/A		
Visible Sheen Test	Yes	No	AM 6:38 10:45 PM 12:18 17:06 Monitored Times	
Analytical Samples	No	Yes		

Notes:

Adding brine solution to OmniPure inlet tank to attempt to stabilize salinity and prevent system errors due to low salinity
Utilizing brine tank until booster pump/brine injector arrives

New PVC line for MSD effluent should have been ordered today to replace the 1" line with a 2" line.

GENERAL EXPLORATION PERMIT
AKG315100
NOTICE OF INTENT

ATTACHMENT E

DRILLING FLUIDS PLAN

KITCHEN LIGHTS UNIT

COOK INLET, ALASKA

March 2016

Developed for:
Furie Operating Alaska, LLC
1029 W. 3rd Ave Suite 500
Anchorage, Alaska 99501

Prepared by:
Jacobs Engineering Group Inc.
4300 B Street, Suite 600
Anchorage, Alaska 99503

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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
APDES	Alaska Pollutant Discharge Elimination System
API	American Petroleum Institute
bbl	barrel
BHST	bottomhole static temperature
CFR	Code of Federal Regulations
ECD	equivalent circulating density
Furie	Furie Operating Alaska LLC
G&I	grind and inject
HPHT	high pressure, high temperature
KCl	potassium chloride
KLU	Kitchen Lights Unit
KOH	potassium hydroxide
LCM	lost circulation material
MD	measured depth
NOI	Notice of Intent
Permit	APDES General Permit AKG315100
PPE	personal protective equipment
ppb	pounds per barrel
ppg	pounds per gallon
ppm	parts per million
SPP	suspended particulate phase
TIH	trip in hole
TVD	true vertical depth
v/v	volume per volume
YP	yield point

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1.0 INTRODUCTION

Furie Operating Alaska, LLC (Furie) is providing a notice of intent (NOI) for coverage under Alaska Department of Environmental Conservation's (ADEC) Alaska Pollutant Discharge Elimination System (APDES) General Permit AKG315100 (Permit) regarding oil and gas exploration drilling to be conducted in Kitchen Lights Unit (KLU) in upper Cook Inlet. The purpose of the Permit application is to authorize the discharge of drilling-related fluids and cuttings, and other discharges, to the waters of Cook Inlet during exploration drilling activities starting in April 2016.

Drilling will be conducted by the jack-up drill rig Randolph Yost (Yost) during ice-free months. Furie's plans for drilling activities in coastal waters include a five-year, five well exploration program.

Furie provides this Drilling Fluids Plan to ADEC as an attachment to its NOI for coverage under the Permit, pursuant to Chapter 40, Part 435, Subparts A and D of the Code of Federal Regulations (40 CFR 435 [A] and [D]), and as outlined and prescribed by the Permit.

This plan states the procedures for the formulation and control of drilling fluids and chemical additive systems for exploratory drilling. This plan summarizes the components of the basic drilling fluid types and specialty/contingency additives. The commercial names, descriptions, and maximum proposed discharge concentrations are provided for each product. It is estimated that approximately 3,500 barrels (bbl) cuttings and 5,000 bbl mud will be used for each well.

An estimate of worst-case cumulative discharge toxicity, and a description of how overall toxicity will be minimized is provided. These elements are intended to ensure compliance with the 30,000 parts per million (ppm) suspended particulate phase (SPP) toxicity limitation in Table 2, Section 2.2 of the Permit. A copy of the plan will be on board the Yost at all times and it will be implemented during drilling operations. Table 1-1 presents the proposed project support team. Additional information on the roles and responsibilities of key personnel responsible for the drilling fluid program, reporting requirements, and best practices for safe handling of drilling fluid products is presented in Exhibit A.

Table 1-1
Halliburton Project Support Team

Title	Name	Cell Number	Office Number	Email address
Technical Professional	Derek Rader	(907) 351-3772	(907) 275-2626	derek.rader@halliburton.com
Senior Technical Professional	Chris Okland	(907) 350-2847	(907) 275-2612	christopher.okland@halliburton.com
Operations Leader	Chris Mackinnon	(907) 227-5045	(907) 275-2617	chris.mackinnon@halliburton.com
Stock-point Supervisor	Charles Roney	(907) 690-0128	(907) 776-3930	charles.roney@halliburton.com

The following mud program was prepared for a grassroots well on the Yost jack-up rig in Cook Inlet, Alaska. Two basic types of drilling fluid will be used. A freshwater AQUAGEL®-based spud mud will be used to drill a 26-inch surface hole vertically to 1,600 feet measured depth (MD) where 20-inch casing will be set and cemented. A 2% KCL/BDF-499™/GEM™ GP drilling fluid will be used for the subsequent hole sections. The 17 1/2-inch section will be drilled to 4,800 feet MD where 13-5/8-inch casing will be set. A 12-1/4-inch intermediate hole will be drilled to 13,000 feet MD where 9-5/8-inch casing will be set. An 8-1/2-inch hole will be drilled to 16,500 feet MD and a 7-inch liner cemented across the production interval. Table 1-2 presents general well data; Table 1-3 presents reservoir data.

Table 1-2
Well Data

Operator	Furie Operating Alaska LLC
Well No.	KLU
Field/Block	Kitchen Lights Unit
Location	Alaska, USA
Well Type	Producer
Maximum Expected Mud Density	17.5 ppg
Estimated Days	60
Estimated Total Fluid Cost	$3,000,000
Anticipated BHST at Total Depth of well	268° F

Note:
For additional definitions, see the Acronyms and Abbreviations section.

Table 1-3
Reservoir Data

Primary Target #1	16,500 feet MD / 16,500 feet TVD
Primary Target #1 Depth	16,500 feet MD / 16,500 feet TVD
Estimated Mud Weight for Target #1	17.5 ppg

Note:
For additional definitions, see the Acronyms and Abbreviations section.

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2.0 OBJECTIVES

The primary objective is to drill the well in a manner that protects the safety of the personnel and the environment.

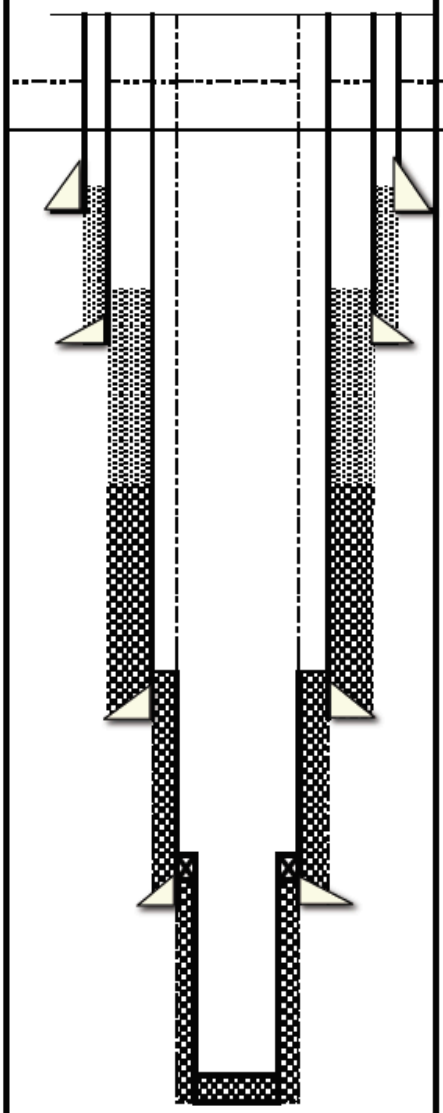
2.1 WELL OBJECTIVES

The well will be spudded with a freshwater AQUAGEL®-based spud mud weighted at 9.3 pounds per gallon (ppg). The primary focus for surface hole drilling operations will be adequate mud weight for well control and sufficient mud viscosity for efficient hole cleaning. Background lost circulation material (LCM) (BARACARB®, STEELSEAL®, and BAROFIBRE®) will be added while drilling the surface interval to prevent losses.

A 2% KCL/BDF-499™/GEM™ GP mud system will be maintained while drilling the 17-1/2-inch, 12-1/4–inch, and 8-1/2-inch hole intervals. This mud system offers good LCM responses if losses are encountered. Special emphasis will be placed on maintaining low equivalent circulating densities (ECD) and surge/swab pressures to minimize the potential for lost circulation and disturbing the coal beds. This mud is formulated with three constituents to provide waste minimization and effective wellbore stabilization: glycol (GEM™ GP), ionic inhibition (potassium chloride [KCl]), and amine inhibition (BDF-499™). This system will be used to help prevent reservoir damage, minimize losses, and provide wellbore stability. BARACARB® 5/25/50 will be utilized in this system to maintain wellbore stability. A combination of BARO-TROL® PLUS and SOLTEX® will be used to stabilize coal formations. BARAZAN® D PLUS will be used as the primary viscosfier while drilling the 17-1/2-inch and 12-1/4-inch hole sections and replaced with Geovis® XT for the 8-1/2-inch hole. The listed mud formulations have been tested to meet all APDES compliance regulations. See Exhibit B for the safety data sheet information.

Figure 2-1
Well Design

FURIE OPERATING of ALASKA, LLC
KITCHEN LIGHTS UNIT EXPLORATION WELL
COOK INLET, ALASKA
6/16/15
WELL BORE SCHEMATIC FOR DIRECTIONAL PLAN AT PROPOSED TOTAL DEPTH



TUBULARS & SETTING DEPTHS		MW (PPG)	FORMATION EVALUATION
DEPTH (KB) MD	DRILL FLOOR RKB TO SEA FLOOR HIGH TIDE MEAN LOW LOW WATER		
	SEA FLOOR		
	MUD LINE SUSPENSION		
400'	30" x 1 1/2" W/T DRIVE PIPE		
			MWD-LWD (RESISTIVITY-GR)
	26" WELL BORE		
1600'	20" CONDUCTOR CASING +/-11.5# FIT (EXTENDED TO 12.5#)	9.3#	
	17 1/2" WELL BORE		MWD/LWD: RESISTIVITY-GR ELECTRIC LOGS (OPTIONAL): NEUTRON-DENSITY-DIPOLE SONIC-GR-CALIPER MDT's CMR-FMI ROTARY SWC's
4,800'	13 5/8" CASING (4800' TVD) 14# LOT	9.5 - 10.4 #	MWD/LWD: RESISTIVITY-GR-NEUTRON-DENSITY
	12 1/4" WELL BORE		ELECTRIC LOGS (OPTIONAL): NEUTRON-DENSITY-DIPOLE SONIC-GR-CALIPER MDT's CMR-FMI ROTARY SWC's
12,700'	7" TOP OF LINER (12,700' TVD)		
13,000'	9 7/8" LINER (13,000' TVD) 18# LOT	10.4 - 11.5#	
	8 1/2" WELL BORE		MWD/LWD: RESISTIVITY-GR-NEUTRON-DENSITY ELECTRIC LOGS (OPTIONAL): NEUTRON-DENSITY-DIPOLE SONIC-GR-CALIPER MDT's CMR-FMI ROTARY SWC's
16,500'	TOTAL DEPTH (16,500' TVD)	14.0 - 17.5#	

Table 2-1
Casing Design

Hole Size	Casing Size	Depth MD/TVD (feet)
NA	30–inch Conductor	400/400
26-inch	20-inch	1,600/1,600
17-1/2-inch	13-5/8-inch	4,800/4,800
12-1/4-inch	9-5/8-inch	13,000/13,000
8-1/2-inch	7-inch	16,500/16,500

Notes:
For additional definitions, see the Acronyms and Abbreviations section.

Table 2-2
Drilling Fluid Target Properties

26-inch Hole from 400 feet to 1,600 feet						
MD	**Mud Weight**	**Viscosity**	**Plastic Viscosity**	**Yield Point**	**pH**	**degree API**
400 feet- 1,600 feet	9.3	80 - 120	40 - 20	35 - 55	8.5-9.5	< 10.0
17-1/2" Surface Interval from 1,600 feet to 4,800 feet						
MD	**Mud Weight**	**Viscosity**	**Plastic Viscosity**	**Yield Point**	**pH**	**degree API**
1,600 feet - 4,800 feet	9.5	50 - 53	6 - 11	19 - 24	8.5-9.5	< 10.0
12-1/4" Production Interval from 4,800 feet to 13,000 feet						
MD	**Mud Weight**	**Viscosity**	**Plastic Viscosity**	**Yield Point**	**pH**	**HPHT**
4,800 feet - 13,000 feet	10.4 – 11.5	40 - 53	6 - 15	13 - 24	8.5-9.5	≤ 10.0
8-1/2" Production Interval from 13,000 feet to 16,500 feet						
MD	**Mud Weight**	**Viscosity**	**Plastic Viscosity**	**Yield Point**	**pH**	**degree API**
13,000 feet - 16,500 feet	14.0 – 17.5	40 - 53	11 - 18	18 - 25	8.5-9.5	< 10.0

Notes:
degree API = A unit of measurement established by the American Petroleum Institute (API) that indicates the density of a liquid. Fresh water has an API density of 10.
For additional definitions, see the Acronyms and Abbreviations section.

2.2 DRILLING FLUID

The primary objectives for drilling fluids are as follows:

- Ensure zero fluid-related health, safety, and environmental incidents.
- Achieve wellbore stability.
- Ensure that any lost circulation is mitigated/controlled.
- Achieve good zonal isolation.

- Achieve minimal formation damage.
- Ensure zero fluids-related non-productive time.
- Minimize drilling wastes.
- Maximize rate of penetration.

Critical fluid issues are:

- Eliminate/Control losses
- Wellbore stability
- Maintaining a low ECD to reduce the risk of losses
- Reducing drilling wastes with the inhibited drilling fluid
- Following all Permit compliance regulations

3.0 INTERVAL SUMMARIES

3.1 26-INCH SURFACE INTERVAL 400 FEET – 1,600 FEET MD

This interval consists of drilling a 26-inch diameter borehole for a 20-inch diameter casing. The basic drilling fluid for this interval is the freshwater AQUAGEL®-based spud mud. The goals for this interval include the installation of casing, efficient hole cleaning, and maintaining mud weight.

Hazards and/or concerns for this interval are:

- Preventing lost circulation through ECD management.
- Optimize solids control equipment to maintain density, sand content, and reduce the waste stream.
- Maintain yield point (YP) between 55 - 35 to optimize hole cleaning and to control ECD.
- Pump high viscosity sweeps to enhance hole cleaning efforts. Monitor sweep effectiveness.
- Successfully cement casing.

3.1.1 Mud Type/Operation Summary

AQUAGEL® and BARAZAN® D PLUS will be used to maintain rheology. The system will begin with a 55 YP, but this will be reduced when clays are encountered. A minimum of 35 YP will be maintained at all times while drilling. If hole cleaning becomes less effective, the YP will be increased. DEXTRID® LT and/or PAC™-L will be used for filtrate control. Background LCM (10 - 20 pounds per barrel [ppb] total) BARACARB®/BAROFIBRE®/STEELSEAL® will be used in the system while drilling the surface interval to prevent losses and strengthen the wellbore. While drilling, the torque and drag will be monitored to determine if liquid lubricant is required. TORQ-TRIM® II may be used to less than 1.0 percent for lubrication, otherwise approval from management and ADEC will be required prior to additions of other lubricants. CON DET® PRE-MIX may be added to reduce the incidence of bit balling and shaker blinding when penetrating high-clay content sections. The pH of the drilling fluid will be maintained in the 8.5 – 9.5 range with caustic soda. Daily additions of ALDACIDE® G or X-CIDE® 207 will be made to control bacterial action.

A 50-barrel (bbl), 50 ppb LCM pill comprised of base mud, 10 ppb of BARACARB® 25, 20 ppb of BARACARB® 50, and 20 ppb of BARACARB® 150 (see LCM Tree in Figure 3-1) will be mixed prior to drilling out of the conductor, available for immediate use if losses are observed while drilling the surface hole. The recommended LCM material will be mixed in thinned base mud.

The system YP will be reduced with DESCO® as required to run casing, but without jeopardizing hole conditions. Casing will be installed carefully to minimize surge and swab pressures. System rheology will be reduced to a YP of less than 20 once the casing is landed. Cementers will be consulted on the YP value they have targeted.

Sweep formulations will be 20 bbl mud with 1.0 ppb BARAZAN® D added.

Upon reaching total depth, a Walnut "flag" (20 bbl pill with 15 ppb of Walnut M) may be pumped to gauge hole washout, and to help calculate the required cement volume. The cement will then be pumped and drilling mud will be used to bump the plug. The chase mud will be pretreated with 1 ppb bicarbonate and 0.5 ppb citric acid. Table 3-1 presents the target properties of the interval, Table 3-2 presents the formulation concentrations of the base mud, and Table 3-3 presents the additives planned for contingencies encountered in the 400-foot to 1600-foot interval.

Table 3-1
26-inch Interval Spud Mud Target Properties

MD	Mud Weight	Viscosity	Plastic Viscosity	Yield Point	pH	degree API
400 feet- 1,600 feet	9.3	80 - 120	40 - 20	35 - 55	8.5-9.5	< 10.0

Notes:
degree API = A unit of measurement established by the American Petroleum Institute (API) that indicates the density of a liquid. Fresh water has an API density of 10.
For additional definitions, see the Acronyms and Abbreviations section.

Table 3-2
26-inch Interval Spud Mud System Formulation: AQUAGEL®/Freshwater Spud Mud

Product	Product Description	Product Function	Maximum Concentration
Fresh Water	Fresh Water	Mud Base	90.5 percent by volume
AQUAGEL®	Treated sodium montmorillonite	Primary viscosifier	25 ppb
BARAZAN® D PLUS	Dispersion enhanced xantham gum	Secondary viscosifier	up to 1.0 ppb as needed
PAC™-L	Polyanionic cellulose	Filtration control agent	1 ppb if required for less than 10 API FL
DEXTRID® LT	Modified potato starch	Filtration control agent	1 ppb if required for less than 10 API FL
BARACARB® 5/25/50	Sized Calcium Carbonate	Lost circulation material	5 ppb total (1.67 ppb each)
STEELSEAL® 50/100/400	Graphite	Lost circulation material	5 ppb total (1.67 ppb each)
BAROFIBRE®	Fibrous cellulosic material	Seepage loss additive	4.0 ppb
BAROID® 41	Ground barium sulfate	Weighting agent	50 ppb as required for weight 9.3 ppg
Caustic soda	Sodium hydroxide	Alkalinity control	0.1 ppb (8.5 – 9.5 pH)
ALDACIDE® G	Glutaraldehyde Solution	Microbiocide	0.1 ppb
X-CIDE® 207	Diatomaceous earth, calcined Magnesium nitrate 5-chloro-2-methyl-4-isothiazolin-3-one Magnesium chloride 2-Methyl-4-isothiazolin-3-one Crystalline silica: cristobalite Crystalline silica: Quartz	Microbiocide	0.05 ppb
BARO-TROL® PLUS	Blended Hydrocarbon Powder	Shale Stabilizer	4.0 ppb

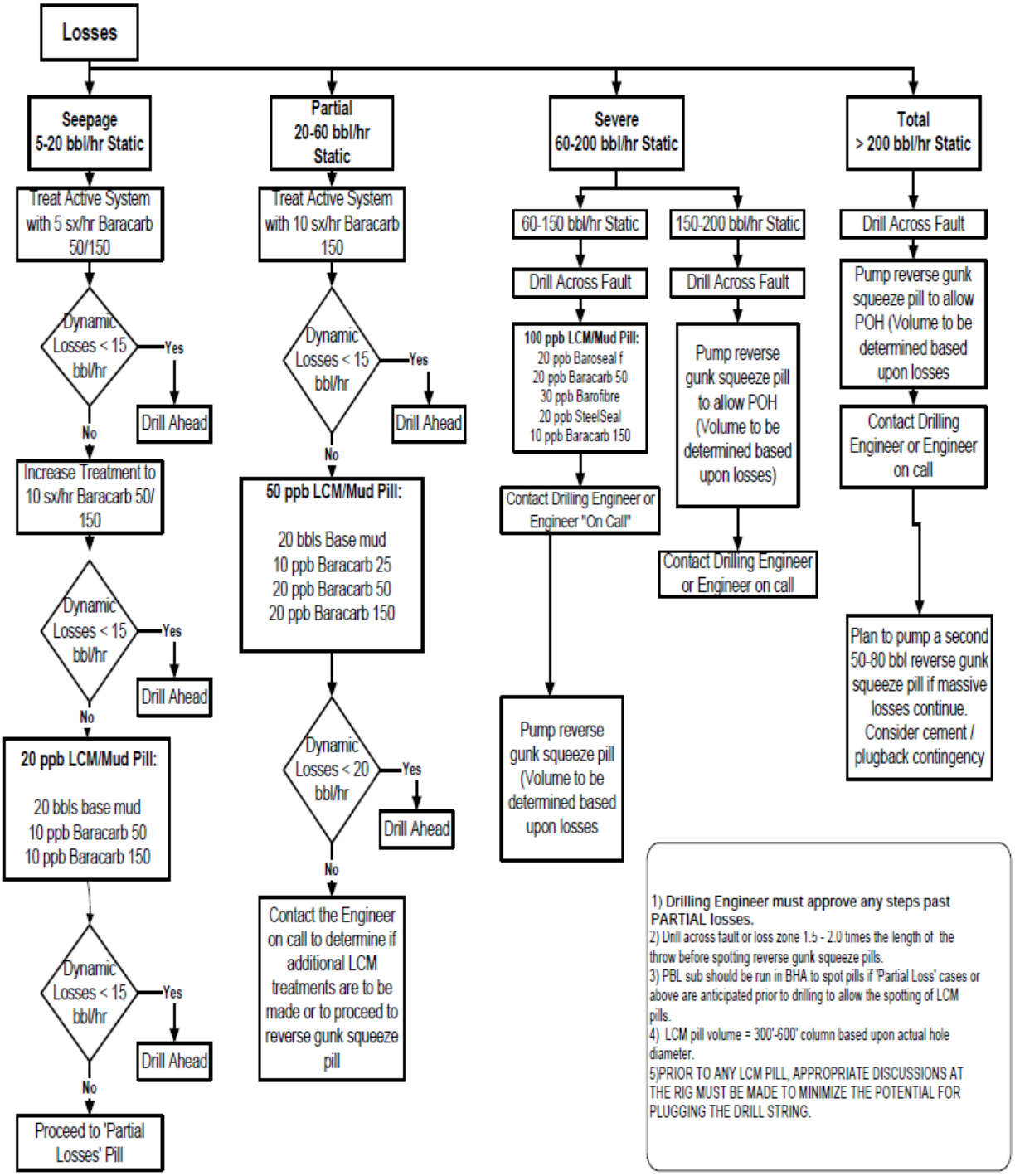
Notes:
API FL = A test to measure static filtration behavior of water mud at ambient (room) temperature and 100-pounds per square inch differential pressure, usually performed according to specifications set by API, using a static filter press.
For additional definitions, see the Acronyms and Abbreviations section.

Table 3-3
26-inch Interval Contingencies and Products

Contingency	Product(s)	Product Description	Product Function	Maximum Concentration
Bit balling and shaker blinding	CON DET® PREMIX	Isopropanol	Anionic surfactant	0.5 percent
50 bbl LCM pill if losses observed while drilling surface hole	BARACARB® 25	Sized Calcium Carbonate	Lost Circulation Material	10 ppb
	BARACARB® 50	Sized Calcium Carbonate	Lost Circulation Material	20 ppb
	BARACARB® 150	Sized Calcium Carbonate	Lost Circulation Material	20 ppb
If losses/ sloughing in interval, run pill prior to installing casing	BARACARB® 5/25/50	Sized Calcium Carbonate	Lost Circulation Material	20 ppb (6.67 ppb each)
	BARO-TROL® PLUS	Blended hydrocarbon powder	Filtration Control Agent	2 ppb
	SOLTEX®	Hydrocarbon Powder	Shale Stabilizer	2 ppb
Excessive torque and drag - lubrication required	TORQ-TRIM® II	Isopropanol and diethanolamine blend	Lubricant	less than 1.0 percent by volume
Reduce the YP to run casing	DESCO®	tannin-based product	deflocculant	1 ppb
Gauging of hole washout to calculate cement volume	Walnut M	walnut shells	Lost Circulation Material	15 ppb

Note:
For additional definitions, see the Acronyms and Abbreviations section.

Figure 3-1
Lost Circulation Tree



3.2 17 1/2-INCH INTERVAL 1,600 FEET – 4,800 FEET MD

This interval consists of drilling a 17 ½-inch diameter borehole for a 13 5/8-inch diameter casing. The base drilling fluid planned for this interval is the 2% KCL/BDF-499™/GEM™ GP mud. Interval goals include providing borehole stability, efficient hole cleaning, and running production casing.

Hazards and/or concerns for this interval are:

- Preventing lost circulation.
- Optimize solids control equipment to maintain density and sand content.
- Maintain YP between 13 - 24 to optimize hole cleaning and to control ECD.
- Pump high viscosity sweeps to enhance hole-cleaning efforts. Monitor sweep effectiveness.
- Successfully land and cement casing.

3.2.1 Mud Type/Operation Summary

Soda ash and citric acid will be used to pretreat muds to guard against any negative effects of the cement. BARAZAN® D PLUS will be used to maintain rheological parameters. BARACARB® 5/25/50 should be maintained at 10 ppb. BARO-TROL® PLUS and SOLTEX® should be added to help control coal seams. The mud will be maintained as clean as possible while drilling. Should sweeps be required, a high viscosity sweep is recommended. Daily additions of ALDACIDE® G or X-CIDE® 207 will be made to control bacterial action.

PAC™-L/DEXTRID® LT will be used for filtrate control. While drilling, the torque and drag will be monitored to determine if liquid lubricant is required. TORQ-TRIM® II may be used to less than 1.0 percent for lubrication, otherwise approval from management and ADEC will be required prior to additions of other lubricants. When penetrating high-clay content sections, the addition of CON DET® PRE-MIX is recommended to reduce the incidence of bit balling and shaker blinding. The pH will be maintained between 8.5 and 9.5 with caustic soda or potassium hydroxide (KOH).

The system rheology may be relaxed as hole conditions allow. This will also lower the ECD for any possible loss zones which might be found and reduce swab tendencies. However, preparations should be made to increase the YP if hole cleaning becomes less effective. If any trips are required, spotting a 20-bbl, 20-ppb LCM pill across the loss zone should be considered. The pill should consist of base mud with 20 ppb of BARACARB® 5/25/50. This pill would reduce the effects of tripping back in and allow time for the LCM to "soak" into the zone. BARACARB® 5/25/50 will not dehydrate the mud which will allow for lower ECD on the first bottoms up after trip in hole (TIH).

The system YP will be reduced with DESCO® as required to run casing, but without jeopardizing hole conditions. Casing will be run carefully to minimize surge and swab pressures. System rheology will be reduced to a YP of less than 20 once the casing is landed. Cementers will be consulted on the YP value they have targeted. If losses or sloughing are observed in this interval, spotting a BARACARB®/BARO-TROL® PLUS/SOLTEX® pill (20 ppb of the different sizes of BARACARB®, and 4 ppb BARO-TROL® PLUS/SOLTEX®) may be considered prior to running the casing.

Mud Type2% KCl/BDF-499™/GEM™ GP

1. Mud weight	Maintain the density from 9.5 – 10.4 ppg or as directed; use solids control and whole mud dilution. Increase the density as required for hole stability/coal sloughing if needed. Maximize solids control usage.
2. Rheology	Maintain a YP between 19 - 24 or as needed to achieve adequate hole cleaning. Pump high viscosity sweeps throughout the interval as needed, particularly prior to POH for casing. Optimized mud rheology and flow rate will be the primary mechanisms for achieving hole cleaning in this deviated wellbore. Maximize pipe rotation (ideally greater than 100 RPM).
3. Lubricity:	TORQ-TRIM® II is the only lubricant available for use while discharging overboard. Lubricant level must stay less than 1percent to achieve APDES compliance.
4. Other Issues	The use of good drilling practices to minimize excessive swab and surge pressure should be employed to reduce the chances for losses and differential sticking. LCM (BARACARB® 5/25/50) and shale stabilizers (BARO-TROL® PLUS, SOLTEX®) should be maintained at elevated concentrations while drilling coals to help strengthen the wellbore. All black products (BARO-TROL® PLUS and SOLTEX®) should be approved by company representative before use while drilling the 13-5/8" interval.

Sweeps

High viscosity sweeps or weighted sweeps will be utilized as needed to clean the hole. All sweeps pumped will be monitored and their effectiveness will be reported. The objective of the sweep is to change the flow characteristics/carrying capacity that are inherent with the mud system.

Table 3-4 presents the target properties of the interval, Table 3-5 presents the formulation concentrations of the base mud, and Table 3-6 presents the additives planned for contingencies encountered in the 1,600-foot to 4,800-foot interval.

Table 3-4
17 ½-inch Interval Interval 2% KCl/BDF-499™/GEM™ GP Mud Target Properties

1,600 feet to 4,800 feet					
Mud Weight*	**Viscosity**	**Plastic Viscosity**	**Yield Point**	**pH**	**HPHT**
9.3 – 10.4	50-53	6 - 11	19 - 24	8.5-9.5	≤ 10.0

Notes:
* Mud weight and rheology should be adjusted as hole conditions dictate.
For additional definitions, see the Acronyms and Abbreviations section.

Table 3-5
17 ½-inch Interval Primary Mud System Formulation: 2% KCL/BDF-499™/GEM™ GP

Product	Product Description	Product Function	Maximum Concentration
Fresh Water	Fresh Water	Mud Base	90.5 percent by volume
KCl	Potassium Chloride	Clay Inhibition	7 ppb
Caustic Soda	Sodium Hydroxide	Alkalinity Source	0.2 ppb (9 pH)
BARAZAN® D PLUS	Dispersion Xanthan Gum	Primary Viscosifier	1.0 ppb (as required 18 YP)
DEXTRID® LT	Modified Potato Starch	Filtration Control	2 ppb
PAC™-L	Polyanionic Cellulose	Filtration Control Agent	1 ppb
BDF-499	Amine Inhibitor	Clay Inhibition	4 ppb
GEM™ GP	Polyalkylene Glycol	Shale Stabilizer	1.0 percent by volume
BARACARB® 5/25/50	Sized Calcium Carbonate	Lost Circulation Material	10 ppb (3.3 ppb of each)
BARO-TROL® PLUS	Blended Hydrocarbon Powder	Shale Stabilizer	2 ppb
SOLTEX®	Hydrocarbon Powder	Shale Stabilizer	2 ppb
BAROID® 41	Ground Barium Sulfate	Weighting Agent	70-140 ppb as needed for 9.5 – 10.4 ppg
ALDACIDE® G	Glutaraldehyde Solution	Microbiocide	0.1 ppb
X-CIDE® 207	Diatomaceous earth, calcined Magnesium nitrate 5-chloro-2-methyl-4-isothiazolin-3-one Magnesium chloride 2-Methyl-4-isothiazolin-3-one Crystalline silica: cristobalite Crystalline silica: Quartz	Microbiocide	0.05 ppb
Soda Ash	Soda Ash	Pretreatment	1 ppb
Citric Acid	Citric Acid	Pretreatment	1 ppb

Note:
For additional definitions, see the Acronyms and Abbreviations section.

Table 3-6
17 ½-inch Interval Contingencies and Products

Contingency	Product(s)	Product Description	Product Function	Maximum Concentration
Bit balling and Shaker Blinding	CON DET® PREMIX	Isopropanol	Anionic surfactant	0.5 percent
20 bbl/20 ppb LCM pill to reduce the effects of tripping	BARACARB® 50	Sized Calcium Carbonate	Lost Circulation Material	10 ppb
	STEELSEAL® 50/100/400	Calcined petroleum coke	Lost Circulation Material	10 ppb (3.33 ppb each)
If losses/ sloughing in interval, run pill prior to installing casing	BARACARB® 5/25/50	Sized Calcium Carbonate	Loss Circulation Material	20 ppb (6.67 ppb each)
	BARO-TROL® PLUS	Blended hydrocarbon powder	Filtration Control Agent	2 ppb
	SOLTEX®	Hydrocarbon Powder	Shale Stabilizer	2 ppb
Excessive torque and drag - lubrication required	TORQ-TRIM® II	Isopropanol and diethanolamine blend	Lubricant	less than 1.0 percent by volume
Reduce the YP to run casing	DESCO®	tannin-based product	deflocculant	1 ppb

Note:
For additional definitions, see the Acronyms and Abbreviations section.

3.3 12-1/4-INCH INTERVAL 4,800 FEET – 13,000 FEET MD

This interval consists of drilling a 12 ¼-inch diameter borehole for a 9 5/8-inch diameter casing. Interval goals include providing borehole stability, efficient hole cleaning, and running intermediate casing.

Hazards and/or concerns for this interval are:

- Preventing lost circulation.
- Optimize solids control equipment to maintain density and sand content.
- Maintain YP between 13-24 to optimize hole cleaning and to control ECD.
- Pump high viscosity sweeps to enhance hole-cleaning efforts. Monitor sweep effectiveness.
- Successfully land and cement casing.

3.3.1 Mud Type/Operation Summary

Soda ash and citric acid should be used to pretreat for any negative effects of the cement. BARAZAN® D PLUS should be used to maintain rheological parameters. BARACARB® 5/25/50 should be maintained at 5 ppb (1.67 ppb each) and BAROFIBRE®\STEELSEAL® 50/100/400 should be maintained at 5 ppb (1.25 ppb each) for a total of 10 ppb LCM. BARO-TROL® should be added to help control coal seams. Maintain the mud as clean as possible while drilling. Should sweeps be required, a high viscosity sweep is recommended. Daily additions of X-CIDE® 207/ALDACIDE® G **MUST** be made to control bacterial action.

PAC™-L/DEXTRID® LT should be used for filtrate control. While drilling, monitor the torque and drag to determine if liquid lubricant is required. TORQ-TRIM® II may be used to less than 1.0 percent for lubrication, otherwise approval from management and ADEC will be required prior to additions of other lubricants. When penetrating high-clay content sections, the addition of CON DET® PREMIX is recommended to reduce the incidence of bit balling and shaker blinding. Maintain the pH in the 8.5 – 9.5 range with caustic soda or KOH.

The system rheology may be relaxed as hole conditions allow. This will also lower the ECD for any possible loss zones which might be found and reduce swab tendencies. However, be prepared to increase the YP if hole cleaning becomes an issue. Stress slow pipe movement to the drillers to reduce surge/swab. Stage pumps up slowly after connections and begin rotation prior to pumping (this will break the gels and reduce the pressure required to break the gels). If any trips are required, consider spotting a 20 bbl, 20 ppb LCM pill across the loss zone. The pill should consist of base mud with 10 ppb BARACARB® 50 and 10 ppb STEELSEAL® added. This pill would reduce the effects of tripping back in and allow time for the LCM to “soak” into the zone. STEELSEAL® and BARACARB® will not dehydrate the mud, which will allow for lower ECD on the first bottoms-up after TIH.

Reduce system YP as required for running casing as allowed (do not jeopardize hole conditions). Run casing carefully to minimize surge and swab pressures. Reduce the system rheology once the casing is landed to a YP less than 20 (check with the cementers to see what YP value they have targeted). Consider spotting a STEELSEAL®/BARO-TROL® PLUS pill (20 ppb of the

different sizes of STEELSEAL®, 4 ppb BARO-TROL® PLUS) prior to running the casing if losses or sloughing have been seen in this interval.

Mud Type2% KCl/BDF-499™/GEM™ GP

1. Mud weight	Maintain the density from 10.4 to 11.5 ppg or as directed; use solids control and whole mud dilution. Increase the density as required for hole stability/coal sloughing. Maximize solids control usage.
2. Rheology	Maintain a YP between 13 - 24 or as needed to achieve adequate hole cleaning. Pump high viscosity sweeps throughout the interval as needed, particularly prior to POH for casing. Optimized mud rheology and flow rate will be the primary mechanisms for achieving hole cleaning in this deviated wellbore. Maximize pipe rotation (ideally greater than 100 RPM).
3. Lubricity:	TORQ-TRIM® II is the only lubricants available for use while discharging overboard. Lubricant level must stay less than 1percent to achieve compliance with toxicity levels.
4. Other Issues	The use of good drilling practices to minimize excessive swab and surge pressure should be employed to reduce the chances for losses and differential sticking. LCM (BARACARB® 5/25/50, STEELSEAL® 50/100/400, BAROFIBRE®) and shale stabilizers (BARO-TROL® PLUS, SOLTEX®) should be maintained at elevated concentrations while drilling coals to help strengthen the wellbore.

<u>Sweeps</u>

Utilize high viscosity sweeps or weighted sweeps as needed to clean the hole. Monitor all sweeps pumped and report their effectiveness. The objective of the sweep is to change the flow characteristics/carrying capacity that are inherent with the mud system. Select sweep type accordingly.

Table 3-7 presents the target properties of the interval, Table 3-8 presents the formulation concentrations of the base mud, and Table 3-9 presents the additives planned for contingencies encountered in the 4,800-foot to 13,000-foot interval.

Table 3-7
12 1/4-inch Interval 2% KCl/BDF-499™/GEM™ GP Mud Target Properties

4,800 feet to 13,000 feet					
Mud Weight	**Viscosity**	**Plastic Viscosity**	**Yield Point**	**pH**	**HPHT**
10.4 – 11.5	40 - 53	6 - 15	13 - 24	8.5 - 9.5	≤ 10.0

Note:
For additional definitions, see the Acronyms and Abbreviations section.

Table 3-8
12 ¼-inch Interval Primary Mud System Formulation: 2% KCL/BDF-499™/GEM™ GP

Product	Product Description	Product Function	Maximum Concentration
Fresh Water	Fresh Water	Mud Base	90.5 percent by volume
KCl	Potassium Chloride	Clay Inhibition	7 ppb
Caustic Soda	Sodium Hydroxide	Alkalinity Source	0.2 ppb (9 pH)
BARAZAN® D PLUS	Dispersion Xanthan Gum	Primary Viscosifier	1.0 ppb (as required for 18 YP)
DEXTRID® LT	Modified Potato Starch	Filtration Control	2 ppb
PAC™-L	Polyanionic Cellulose	Filtration Control Agent	1 ppb
BDF-499	Amine Inhibitor	Clay Inhibition	4 ppb
GEM™ GP	Polyalkylene Glycol	Shale Stabilizer	1.0 percent by volume
BARACARB® 5/25/50	Sized Calcium Carbonate	Lost Circulation Material	5 ppb (1.67 ppb each)
BAROFIBRE®	Mixture	Lost circulation material	1.25 ppb
STEELSEAL® 50/100/400	Calcined petroleum coke	Lost Circulation Material	3.75 ppb (1.25 ppb each)
BAROID® 41	Ground Barium Sulfate	Weighting Agent	140-210 ppb as needed 10.4 – 11.5 ppg
ALDACIDE® G	Glutaraldehyde Solution	Microbiocide	0.2 ppb
X-CIDE® 207	Diatomaceous earth, calcined Magnesium nitrate 5-chloro-2-methyl-4-isothiazolin-3-one Magnesium chloride 2-Methyl-4-isothiazolin-3-one Crystalline silica: cristobalite Crystalline silica: Quartz	Microbiocide	0.05 ppb
BARO-TROL® PLUS	Blended Hydrocarbon Powder	Shale Stabilizer	4.0 ppb
Soda Ash	Soda Ash	Pretreatment	1 ppb
Citric Acid	Citric Acid	Pretreatment	1 ppb

Note:
For additional definitions, see the Acronyms and Abbreviations section.

Table 3-9
12 ¼-inch Interval Contingencies and Products

Contingency	Product(s)	Product Description	Product Function	Maximum Concentration
Bit balling and shaker blinding	CON DET® PREMIX	Isopropanol	Anionic surfactant	0.5 percent
140 bbl/20 ppb LCM pill to reduce the effects of tripping	BARACARB® 50	Sized Calcium Carbonate	Lost Circulation Material	10 ppb
	STEELSEAL® 50/100/400	Calcined petroleum coke	Lost Circulation Material	10 ppb (3.3 ppb each)
If losses/ sloughing in interval, run pill prior to installing casing	STEELSEAL® 50/100/400	Calcined petroleum coke	Lost Circulation Material	20 ppb (6.67 ppb each)
	BARO-TROL® PLUS	Blended hydrocarbon powder	Filtration Control Agent	4 ppb
Excessive torque and drag - lubrication required	TORQ-TRIM® II	Isopropanol and diethanolamine blend	Lubricant	less than 1.0 percent by volume

Note:
For additional definitions, see the Acronyms and Abbreviations section.

3.4 8-1/2-INCH PRODUCTION INTERVAL 13,000 FEET – 16,500 FEET MD

This interval consists of drilling a 8 ½-inch diameter borehole for a 7-inch diameter casing Interval goals include providing borehole stability, efficient hole cleaning, and running production casing.

Hazards and/or concerns for this interval are:

- Preventing lost circulation.
- Optimize solids control equipment to maintain density and sand content.
- Maintain YP between 15 - 25 to optimize hole cleaning and to control ECD.
- Pump high viscosity sweeps to enhance hole-cleaning efforts. Monitor sweep effectiveness.
- Successfully land and cement casing.

3.4.1 Mud Type/Operation Summary

Soda ash and citric acid should be used to pretreat for any negative effects of the cement. GEOVIS XT will replace BARAZAN® D PLUS during this interval. GEOVIS XT retains a higher degree of optimal rheological properties while drilling at elevated temperatures.

BARACARB® 5/25/50 should be maintained at 5 ppb and BAROFIBRE®\STEELSEAL® 50/100/400 should be maintained at 5 ppb for a total of 10 ppb LCM. BARO-TROL® PLUS and SOLTEX® should be added to help control coal seams. Maintain the mud as clean as possible while drilling. Should sweeps be required, a high viscosity sweep is recommended. Daily additions of X-CIDE® 207/ALDACIDE® G **MUST** be made to control bacterial action.

PAC™-L/DEXTRID® LT should be used for filtrate control. While drilling, monitor the torque and drag to determine if liquid lubricant is required. TORQ-TRIM® II may be used to less than 1.0 percent for lubrication, otherwise approval from management and ADEC will be required prior to additions of other lubricants. When penetrating high-clay content sections, the addition of CON DET® PREMIX is recommended to reduce the incidence of bit balling and shaker blinding. Maintain the pH in the 8.5 – 9.5 range with caustic soda or KOH.

The system rheology may be relaxed as hole conditions allow. This will also lower the ECD for any possible loss zones which might be found and reduce swab tendencies. However, be prepared to increase the YP if hole cleaning becomes an issue. Stress slow pipe movement to the drillers to reduce surge/swab. Stage pumps up slowly after connections and begin rotation prior to pumping (this will break the gels and reduce the pressure required to break the gels). If any trips are required, consider spotting a 20 bbl, 20 ppb LCM pill across the loss zone. The pill should consist of base mud with 10 ppb BARACARB® 50 and 10 ppb STEELSEAL® added. This pill would reduce the effects of tripping back in and allow time for the LCM to "soak" into the zone. STEELSEAL® and BARACARB® will not dehydrate the mud which will allow for lower ECD on the first bottoms up after TIH.

Reduce system YP as required for running casing as allowed (do not jeopardize hole conditions). Run casing carefully to minimize surge and swab pressures. Reduce the system rheology once the casing is landed to a YP less than 20 (check with the cementers to see what YP value they have targeted). Consider spotting a STEELSEAL®/BARO-TROL® PLUS/SOLTEX® pill (20 ppb of the different sizes of STEELSEAL®, 4 ppb BARO-TROL® PLUS) prior to running the casing if losses or sloughing have been seen in this interval.

Mud Type2% KCl/BDF-499™/GEM™ GP

1. Mud weight	Maintain the density from 14.0 to 17.5 ppg or as directed; use solids control and whole mud dilution. Increase the density as required for hole stability/coal sloughing. Maximize solids control usage.
2. Rheology	Maintain a YP between 18 - 25 or as needed to achieve adequate hole cleaning. Pump high viscosity sweeps throughout the interval as needed, particularly prior to POH for casing. Optimized mud rheology and flow rate will be the primary mechanisms for achieving hole cleaning in this deviated wellbore. Maximize pipe rotation (ideally greater than 100 RPM).
3. Lubricity:	TORQ-TRIM® II is the only lubricants available for use while discharging overboard. Lubricant level must stay less than 1percent to achieve compliance with toxicity levels.
4. Other Issues	The use of good drilling practices to minimize excessive swab and surge pressure should be employed to reduce the chances for losses and differential sticking. LCM (BARACARB® 5/25/50, STEELSEAL® 50/100/400) and shale stabilizers (BARO-TROL® PLUS, SOLTEX®) should be maintained at elevated concentrations while drilling coals to help strengthen the wellbore.

Sweeps

Utilize high viscosity sweeps or weighted sweeps as needed to clean the hole. Monitor all sweeps pumped and report their effectiveness. The objective of the sweep is to change the flow characteristics/carrying capacity that are inherent with the mud system. Select sweep type accordingly.

Table 3-10 presents the target properties of the interval, Table 3-11 presents the formulation concentrations of the base mud, and Table 3-12 presents the additives planned for contingencies encountered in the 4,800-foot to 13,000-foot interval.

Table 3-10
Target Properties

13,000 feet to 16,500 feet					
Mud Weight	**Viscosity**	**Plastic Viscosity**	**Yield Point**	**pH**	**HPHT**
14.0 – 17.5	40 - 53	11 - 18	18 - 25	8.5 - 9.5	≤ 10.0

Notes:
HPHT= high pressure, high temperature
For additional definitions, see the Acronyms and Abbreviations section.

Table 3-11
8 1/2-inch Interval Primary Mud System Formulation: 2% KCL/BDF-499™/GEM™ GP

Product	Product Description	Product Function	Maximum Concentration
Fresh Water	Fresh Water	Mud Base	90.5 percent by volume
KCl	Potassium Chloride	Clay Inhibition	7 ppb
Caustic Soda	Sodium Hydroxide	Alkalinity Source	0.2 ppb (9 pH)
GEOVIS® XT	Enhanced dispersion xanthan gum	Primary viscosifier	1.0 ppb (as required 18 YP)
DEXTRID® LT	Modified Potato Starch	Filtration Control	2 ppb
PAC™-L	Polyanionic Cellulose	Filtration Control Agent	1 ppb
BDF-499	Amine Inhibitor	Clay Inhibition	4 ppb
GEM™ GP	Polyalkylene Glycol	Shale Stabilizer	1.0 percent by volume
BARACARB® 5/25/50	Sized Calcium Carbonate	Lost Circulation Material	10 ppb (3.3 ppb of each)
BAROID® 41	Ground Barium Sulfate	Weighting Agent	140-210 ppb as needed 10.4 – 11.5 ppg
ALDACIDE® G	Glutaraldehyde Solution	Microbiocide	0.3 ppb
X-CIDE® 207	Diatomaceous earth, calcined Magnesium nitrate 5-chloro-2-methyl-4-isothiazolin-3-one Magnesium chloride 2-Methyl-4-isothiazolin-3-one Crystalline silica: cristobalite Crystalline silica: Quartz (SiO2)	Microbiocide	0.05 ppb
BARO-TROL® PLUS	Blended Hydrocarbon Powder	Shale Stabilizer	4.0 ppb
Soda Ash	Soda Ash	Pretreatment	1 ppb
Citric Acid	Citric Acid	Pretreatment	1 ppb

Note:
For additional definitions, see the Acronyms and Abbreviations section.

Table 3-12
8 1/2-inch Interval Contingencies and Products

Contingency	Product(s)	Product Description	Product Function	Maximum Concentration
Bit balling and shaker blinding	CON DET® PREMIX	Isopropanol	Anionic surfactant	0.5
20 bbl/20 ppb LCM pill to reduce the effects of tripping	BARACARB® 50	Sized Calcium Carbonate	Lost Circulation Material	10 ppb
	STEELSEAL® 50/100/400	Calcined petroleum coke	Lost Circulation Material	10 ppb
If losses/ sloughing in interval, run pill prior to installing casing	STEELSEAL® 50/100/400	Calcined petroleum coke	Lost Circulation Material	20 ppb
	BARO-TROL® PLUS	Blended hydrocarbon powder	Filtration Control Agent	4 ppb
Excessive torque and drag - lubrication required	TORQ-TRIM® II	Isopropanol and diethanolamine blend	Lubricant	less than 1.0 percent by volume

Note:
For additional definitions, see the Acronyms and Abbreviations section

3.5 SOLIDS CONTROL EQUIPMENT

The use of all solids control equipment should be maximized to ensure that the solids content of the system is kept to a minimum during the production interval (13,000 feet to 16,500 feet). The fluid should be kept as clean as possible by maximizing the use of the centrifuge. Additionally, the shale shakers should be run with as fine a screen size as possible. To accomplish this, these steps should be followed:

- Size shakers screens with coarse mesh initially
- Adjust screen size as solids loading, mud rheology and flowrates allow
- Inspect the shakers frequently, taking time to repair / replace damaged screens

3.6 COAL DRILLING

From extensive prior experience drilling coal seams in Cook Inlet, several best practices are recommended. Good planning and drilling practices are also emphasized as key components for success. If coal seams are encountered, the following best practices should be employed:

- The drill pipe should be kept in tension to prevent a whipping effect which can disturb coal sections.
- Asphalt-type additives (BARO-TROL® PLUS at 4 ppb) should be used to further stabilize coal seams.
- Fluid density should be increased as required to control the running coal.
- Good hole cleaning should be emphasized through control of hydraulics, rate of penetration, and system rheology.

In the event that sloughing coal is encountered, spotting a 30 ppb BARO-TROL® PLUS pill across the coal seam should be considered. The pill can be safely "squeezed" into the coal by closing the bag and applying pressure at a level not to exceed the total annular pressure loss.

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4.0 TOXICITY ASSESSMENT

Section 2.2.8.3.3 of the Permit requires an assessment and determination of drilling fluid system toxicity. There are two primary base mud systems identified in this plan: AQUAGEL®/freshwater spud mud and 2% KCl/BDF-499™/GEM™ GP mud. The supplier of these mud systems has provided toxicological data for each base system. The supplier also provided toxicological data for contingency additives not included in the base mud, and for additives required at concentrations greater than the contained in the base mud.

Table 4-1 presents the supplier-provided toxicological data for the base spud mud interval and contingency additives. Table 4-2 presents the toxicological data for the 2% KCl/BDF-499™/GEM™ GP mud used in the remaining intervals. The highest concentration proposed for any interval is presented for each additive below.

Table 4-1
Supplier-Provided Toxicological Data: AQUAGEL®/Freshwater Spud Mud

Component(s)	Proposed Maximum Concentration	Test Concentration	96-Hour LC50 (ppm SPP)	Type of test	Testing Laboratory (Report)
AQUAGEL®/Freshwater Spud Mud					
AQUAGEL®	25 ppb	Whole System	Greater than 1,000,000	EPA SPP *Mysidopsis bahia*	Baroid Bioassay Laboratory (Sample 100826-2)
BARAZAN® D PLUS	1.0 ppb				
PAC™-L	1 ppb				
DEXTRID® LT	1 ppb				
BARACARB® 5/25/50	5 ppb				
STEELSEAL® 50/100/400	5 ppb				
BAROFIBRE®	4.0 ppb				
BAROID® 41	50 ppb				
Caustic soda	0.1 ppb				
ALDACIDE® G	0.1 ppb				
X-CIDE® 207	0.05 ppb				
BARO-TROL® PLUS	4.0 ppb				
Contingency Additives					
CON DET® PREMIX	0.5 percent by volume	10 ppb (approximately 3 percent by volume)	196,200	EPA SPP in GM#7[1] *Mysidopsis bahia*	Unknown

Table 4-1
Supplier-Provided Toxicological Data: AQUAGEL®/Freshwater Spud Mud (Continued)

Component(s)	Proposed Maximum Concentration	Test Concentration	96-Hour LC50 (ppm SPP)	Type of test	Testing Laboratory (Report)
BARACARB® 25/50/150 (pill)	50 ppb (10, 20, 20 ppb each)	20 ppb	328,300	EPA SPP in 11.5ppg PETROFREE LE *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-3661)
BARACARB® 5/25/50	20 ppb (6.67 ppb each)	20 ppb	328,300	EPA SPP in 11.5ppg PETROFREE LE *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-3661)
BARO-TROL® PLUS	2 ppb	8 ppb	577,500	EPA SPP in 15% NaCl HYDRO-GUARD *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-7197)
SOLTEX®	2 ppb	4 ppb	250,000	EPA SPP in 2% KCl/BDF-499/GEM GP *Mysidopsis bahia*	Halliburton Technology – Bioassay Services (Report 5528-HTC 23 October 2013)
TORQ-TRIM® II	less than 1.0 percent by volume	1 percent by volume	87,400	EPA SPP in KCl-Polymer *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-7351)
DESCO®	1 ppb	TBD	TBD	TBD	TBD
Walnut M	15 ppb	10 ppb	Greater than 1,000,000	EPA SPP in GM#7 *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-7351)

Notes:
[1]GM#7 = generic mud #7, a standard lightly treated lignosulfonate mud.
For additional definitions, see the Acronyms and Abbreviations section

Table 4-2
Supplier-Provided Toxicological Data: 2% KCl/BDF-499™/GEM™ GP Mud

Component(s)	Proposed Maximum Concentration	Test Concentration	96-Hour LC50 (ppm SPP)	Type of test	Testing Laboratory (Report and date)
2% KCl/BDF-499TM/GEMTM GP Mud					
KCl	7 ppb	Whole System (with BDF-499 at 7.0 ppb)	Greater than 1,000,000	EPA SPP *Mysidopsis bahia*	Baroid Technology Center (Report BL-7914)
Caustic Soda	0.2 ppb				
BARAZAN® D PLUS	1 ppb				
GEOVIS® XT	1 ppb				
DEXTRID® LT	2 ppb				
PAC™-L	1 ppb				
BDF-499	4 ppb				
GEM™ GP	1.0 percent by volume				

Table 4-2
Supplier-Provided Toxicological Data: 2% KCl/BDF-499™/GEM™ GP Mud (Continued)

Component(s)	Proposed Maximum Concentration	Test Concentration	96-Hour LC50 (ppm SPP)	Type of test	Testing Laboratory (Report and date)
BARACARB® 5/25/50	10 ppb				
BARO-TROL® PLUS	4 ppb				
SOLTEX®	2 ppb				
BAROID® 41	210 ppb				
ALDACIDE® G	0.3 ppb				
X-CIDE® 207	0.05 ppb				
Soda Ash	1 ppb				
Citric Acid	1 ppb				
Contingency Additives					
CON DET® PREMIX	0.5 percent by volume	10 ppb (approximately 3 percent by volume)	196,200	EPA SPP in GM#7[1] *Mysidopsis bahia*	Unknown
STEELSEAL® 50/100/400	20 ppb	10 ppb	Greater than 1,000,000	EPA SPP in GM#7[1] *Mysidopsis bahia*	Unknown
BARACARB® 5/25/50	20 ppb (6.67 ppb each)	20 ppb	328,300	EPA SPP in 11.5ppg PETROFREE LE *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-3661)
BARO-TROL® PLUS	4 ppb	8 ppb	577,500	EPA SPP in 15% NaCl HYDRO-GUARD *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-7197)
SOLTEX®	2 ppb	4 ppb	250,000	EPA SPP 2% KCl/BDF-499/GEM GP *Mysidopsis bahia*	Halliburton Technology – Bioassay Services (Report 5528-HTC 23 October 2013)
TORQ-TRIM® II	less than 1.0 percent by volume	1 percent by volume	87,400	EPA SPP in KCl-Polymer *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-7351)
DESCO®	1 ppb	TBD	TBD	TBD	TBD
Walnut M	15 ppb	10 ppb	Greater than 1,000,000	EPA SPP in GM#7 *Mysidopsis bahia*	Baroid Bioassay Laboratory (Report BL-7351)

Notes:
[1]GM#7 = generic mud #7, a standard lightly treated lignosulfonate mud – similar in composition to the 2% KCl/BDF-499TM/GEMTM GP Mud.
For additional definitions, see the Acronyms and Abbreviations section.

4.1 WORST-CASE CUMULATIVE DISCHARGE TOXICITY ESTIMATE

An industry standard additive acute toxicity equation (EPA 2013) (Standard Equation A, see below) was employed to estimate the toxicity of the worst-case cumulative discharge (Tables 4-3 and 4-4). The worst-case discharge includes the base mud and all contingency additives for each mud system at maximum concentrations that may be used. Furie does not anticipate the use of all contingency additives at the same time but has assumed such for a worst-case toxicity analysis. Furthermore, using the maximum concentration of each component is highly unlikely.

Standard Equation A - Cumulative Acute Toxicity

$$\frac{10^6}{LC_t} = \frac{C_{base\ mud}}{LC_{base\ mud}} + \sum_{i=1}^{N} \frac{C_{i\ additive}}{LC_{i\ additive}}$$

Notes:
As presented in NPDES General Permit CAG280000 Fact Sheet.
LC: 96-hour median lethal concentration (LC50) in ppm (concentration that results in 50 percent mortality of a test population in 96 hours)
LC_t: the total fluid system's (base mud including additives) 96-hour LC50 in ppm
$C_{base\ mud}$: concentration of the base mud in ppm
$LC_{base\ mud}$:96-hour LC50 of the base mud
$C_{i\ additive}$: concentration of the ith additive
$LC_{i\ additive}$: 96-hour LC50 of the ith additive

Table 4-3
Estimated Worst-Case Cumulative Discharge Toxicity AQUAGEL®/Freshwater Spud Mud

Fluid System	96-Hour LC50
Base mud	greater than 1,000,000 ppm SPP (test result)
All contingency additives	664,479 ppm SPP (calculated result)
Total	399,211 ppm SPP (calculated result)

Note:
Details of the toxicity estimate calculation are presented in Attachment 2.

Table 4-4
Estimated Worst-Case Cumulative Discharge Toxicity 2% KCl/BDF-499™/GEM™ GP Mud

Fluid System	96-Hour LC50 (calculation result)
Base mud	greater than 1,000,000 ppm SPP (test result)
All contingency additives	1,000,000 ppm SPP (calculated result)
Total	607,199 ppm SPP (calculated result)

Note:
Details of the toxicity estimate calculation are presented in Attachment 2.

Standard Equation A (NPDES General Permit CAG280000 Fact Sheet) is a weighted formula that considers the proposed concentration of each system component (see below). The supplier-provided maximum recommended concentrations and the 96-hour median lethal concentration (LC50) toxicological data were input into the equation. Results of the calculations are presented in Tables 4-3 and 4-4 and the estimate details are presented in the toxicity estimate spreadsheet in Attachment 2.

4.1.1 Conservative Estimate Factors

The following factors create a conservative toxicity estimate:

Toxicities of additives are overestimated. The bioassay test for each proposed additive used generic mud #7 as the base mud, which is similar to 2% KCl/BDF-499TM/GEMTM GP mud with these exceptions: BARACARB®, BARO-TROL® PLUS, and TORQ-TRIM® II. As the base muds used for these tests includes additional components not present in the proposed base mud (see bullet above), this likely overestimates the toxicity of each proposed additive and the total additive toxicity. In addition, the total additive toxicity is an overestimation of actual toxicity because it is extremely unlikely that all of the contingency additives would be used in the maximum concentration proposed at one time.

Conservative LC50 values for primary fluid system components. The drilling fluid system components comprising approximately 50 percent of the proposed fluid concentration are of such low toxicity, that the greatest acute toxicity test concentrations (50 or 100 percent SPP) did not result in 50 percent mortality of the test population within the 96-hour test period. The specific LC50 was not identified for these components, but is presented as some value greater than the

highest test concentration. Due to this unknown, the greatest test concentration is used as the LC50, even if the component resulted in no mortality.

4.2 MINIMIZATION

The proposed drilling fluids are comprised of the least toxic products available to perform the function necessary. First, water-based products were chosen over synthetic or oil-based drilling fluids because they present an overall lower toxicity for the mixture yet will provide the necessary functions at the target depths for this project.

Overall toxicity will be minimized by limiting fluid use to an as-needed basis, applying the least toxic fluid alternatives available (see Section 5.0), recirculating used fluids as much as practicable, and removing as much unnecessary used fluids from the borehole as is feasible prior to discharge. Products are to be used only according to manufacturer's recommendations.

4.3 TOXICITY DETERMINATION

Discharges resulting from the exploration drilling are expected to meet and exceed the toxicity industry standard, i.e., the whole mud exhibiting a 96-hour LC50 value of or greater than 30,000 ppm SPP. The toxicity estimate of the worst-case cumulative discharge is very conservative, yet is 399,211 ppm SPP for the spud mud and all additives combined, and 607,199 ppm SPP for the 2% KCl/BDF-499TM/GEMTM GP mud and all additives combined indicating low toxicity.

Use of product types not proposed in this Drilling Fluids Plan must meet the criteria described in the next section before application.

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5.0 CRITERIA FOR CONTINGENCY ADDITIVES

The overall toxicity of the drilling fluid should be minimized whenever possible. If additives become necessary that are not listed on the proposed interval mud summaries, they will not be used without first considering the following criteria:

- Discharge of any drilling product containing diesel oil or nonaqueous drilling fluids will not be allowed.
- The minimum concentration of the additive needed to achieve the desired result should be used.
- Use an alternative product already on the proposed inventory with known toxicity, which will have the same desired effect in the mud. As part of operating policy, products already in stock will be used before special shipments are arranged.
- Assess the nature of the additive to determine its level of toxicity. The following additives are considered to be low toxicity, and may be used as required to achieve specific mud characteristics without a toxicity estimation:
    - Mica (as needed)
    - Cellophane flakes (as needed)
    - Nut hulls (as needed)
    - Inert spheres (as needed)
    - SAPP (0.5 ppb)
    - Calcium carbide (as needed)
    - Vegetable plus polymer fibers, flakes, granules (50 ppb)
    - Zinc carbonate and lime (as needed)
    - Zinc oxide (as needed).

- An new estimate of the toxicity of the discharged whole mud/additive system is required before a new product is added to the fluid system, unless it is either:
    a) equivalent to a component listed in the proposed interval mud summaries or
    b) included in the above list of relatively inert additives

  If neither a) nor b) applies, Standard Equation A shall be used to determine whether a new contingency additive may be used: **See Section 5.1 for instructions to calculate an estimate of cumulative discharge toxicity**.

- No additives shall be applied if the estimated cumulative discharge toxicity with the additive is less than 30,000 ppm SPP unless adequate written documentation is attached that shows the estimation is worst-case (e.g., more additives that will be used and/or higher concentrations of additive than will be used). The decision to apply an additive that causes

estimated cumulative discharge toxicity to be less than 30,000 ppm SPP will be made by the Mud Technician in concurrence with Furie's Environmental Manager. **ADEC Wastewater Discharge Authorization staff must be contacted for approval prior to use and discharge** (Natalie Wagner, Technical Contact, at 907-269-7956 or Gerry Brown, Section Manager, at 907-269-4874).

- An additive that does not cause the estimated cumulative discharge toxicity to exceed 30,000 ppm SPP may be discharged with approval by the Mud Technician after contacting ADEC.

5.1 CALCULATE ESTIMATE OF CUMULATIVE DISCHARGE TOXICITY

Standard Equation A shall be used to determine whether a new contingency additive may be used:

1. A drilling fluid toxicity spreadsheet prepared by Furie for the proposed base mud will be used to estimate discharge toxicity for a potential additive (see Attachment 2).
2. Simply record bioassay data (see below for details) for the new additive as indicated on the spreadsheet and copy the formula in the "Proposed Max Concentration (ppm)/LC50" column. The estimated discharge toxicity is automatically recalculated.
3. Save, print, and attach an initialed and dated copy of the re-estimation to this Drilling Fluids Plan.

Bioassay data. Obtain bioassay information for the additive(s) under consideration from the Furie Mud Contractor's environmental office. Try to locate bioassay data that represents the same concentration of product that you propose to use. If data is not available for the exact concentration, use a greater concentration, if available. It is acceptable to use bioassay data that represents mixtures of additives that contain the additive under consideration. List the "extra" additives and their concentrations on the spreadsheet and note that they will not be used. This documents the worst-case nature of the estimate (e.g., more additives are represented than will be used).

6.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 2013 (December). *Addendum to Fact Sheet: Final National Pollutant Discharge Elimination System ("NPDES") General Permit No. CAG280000 of Offshore Oil and Gas Exploration, Development and Production Operations off Southern California.*

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EXHIBIT A

Drilling Fluid Program Roles, Reporting, and Environmental Requirements

A.1 ROLES AND RESPONSIBILITIES

Roles and responsibilities of key persons are described below.

Mud Engineer:

- Maintain drilling fluid inventories
- Order mud products
- Generate daily mud reports
- Communicate daily regarding operational issues
- Liaison with Drilling Foreman for fluid issues
- Communicate with the Anchorage office daily

Drilling Supervisor/Foreman:

- Ensure safe practices and policies are followed at all times
- Document weekly safety meetings and forward the document to Anchorage
- Ensure the crew follows all platform rules and guidelines
- Schedule and approve all crew rotation
- Ensure proper quality assurance/quality control for all slurries prior to disposal
- Ensure annulus is monitored during each injection
- Produce a Daily Activity Report with the input crew and mud engineer
- Communicate with the Anchorage office daily

Lead Operator:

- Works at direction of supervisor
- Responsible for active pumping of slurry
- Monitors slurry to maintain proper parameters
- Directs operator duties

A.2 REPORTING REQUIREMENTS

Daily Reports:

- **Daily Mud Check Reports** produced by the Mud Engineer (submitted to Drilling Supervisor/Foreman)
- **Daily Activity Reports** produced by Drilling Supervisor/Foreman.
- **Injection Reports** for each injection to be produced by the Mud Engineer.

End-of-Well Report:

A complete drilling fluid summary will be compiled by the Mud Engineer along with the Drilling Supervisor/Foreman and submitted at the end of each well. Per Section 2.2.6.2 of the Permit, the End of Well Report will include the following items and summaries:

- Well name, number, latitude, longitude, beginning drill date, and hole diameter at depth, and well completion date
- A precise chemical inventory of all constituents added downhole, including all drilling fluid additives used to meet specific drilling requirements
- The base drilling fluid type
- The name and total amount of each constituent in the discharged drilling fluid
- The total volumes of drilling fluid create and added downhole
- The maximum concentration of each constituent in the drilling fluid
- The total volumes of drilling fluid discharged to surface waters
- The estimated amount of each constituent in the drilling fluid discharged to surface waters
- Any use of surfactants, dispersants, and detergents
- The name and total amount of each chemical additive, the results of the diesel oil analysis, and the results of the metals analysis per Sections 2.2.6.1, 2.2.6.3, and 2.2.6.5.1 of the Permit, respectively.

A.3 HANDLING OF DRILLING FLUID PRODUCTS: HEALTH, SAFETY, AND ENVIRONMENTAL BEST PRACTICES

Health and Safety:

- Drilling crews will be instructed in the proper procedures for handling fluid products.
- Personal protective equipment (PPE) charts will be posted in the pit room, the mud lab, and the office of the Drilling Forman.
- PPE must be in good working order and be utilized as recommended by the PPE charts.
- Product additions should be made in complete units (sacks, drums, cans), as much as possible in order to minimize inventory of partial units.
- Ensure all safety data sheets for materials are up to date and readily available for workers to access for information.

Environmental:

- Use products with the least toxicity to achieve desired effect
- Use the minimum amount/concentration necessary to achieve desired effect
- Ensure that any product stored outside is protected from the weather.
- Do not store partial units (sacks) outside.
- When transferring fluids and/or cuttings from the rig to tanks, ensure all hoses are properly secured.

EXHIBIT B

Drilling Fluids Safety Data Sheets

Table B-1
Summary of Potential Drilling Fluids

Products	Product Description	Product Function
ALDACIDE® G	Glutaraldehyde solution	Microbiocide
AQUAGEL®	Crystalline silica	Viscosifier
BARACARB®	Sized calcium carbonate	Lost circulation material
BARAZAN® D PLUS	Xanthum gum polymer	Viscosifier
BAROFIBRE®	Mixture	Lost circulation material
BAROID® 41	Ground barium sulfate	Weighting agent
BARO-TROL® PLUS	Blended hydrocarbon powder	Shale stabilizer
BDF-499™	Amine inhibitor	Clay inhibition
Bicarbonate	Sodium bicarbonate	Buffer
Caustic soda	Sodium hydroxide	Alkalinity source
Citric Acid	Citric acid	Scale remover pH control
CON DET® PRE-MIX	Isopropanol	Anionic surfactant
DESCO®	tannin-based product	deflocculant
DEXTRID® LT	Modified potato starch	Filtration control
GEM™ GP	Polyalkylene glycol	Shale stabilizer
GEOVIS® XT	Enhanced dispersion xanthan gum	Primary viscosifier
PAC™-L	Polyanionic cellulose	Filtration control agent
Potassium chloride	Potassium chloride	Clay inhibition
Potassium Hydroxide	Potassium hydroxide	pH control
Soda Ash	Sodium carbonate	Buffer
SOLTEX®	Hydrocarbon Powder	Shale Stabilizer
STEELSEAL®	Calcined petroleum coke	Lost circulation material
TORQ-TRIM® II	Isopropanol and diethanolamine blend	Lubricant
Walnut M	Walnut shells	Lost circulation material
X-CIDE® 207	Mixture	Microbiocide

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **ALDACIDE® G ANTIMICROBIAL**

Revision Date: 11-Dec-2014

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: ALDACIDE® G ANTIMICROBIAL
Synonyms: None
Chemical Family: Aldehyde
Application: Biocide

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Glutaraldehyde	111-30-8	10 - 30%	0.05 ppm	Not applicable
Methanol	67-56-1	0.1 - 1%	TWA: 200 ppm STEL: 250 ppm Skin	TWA: 200 ppm

3. HAZARDS IDENTIFICATION

Hazard Overview
Keep out of reach of children May cause eye burns. May cause irreversible eye damage. May cause severe skin irritation. May be harmful if swallowed. May be harmful if inhaled May cause allergic skin reaction.

4. FIRST AID MEASURES

Inhalation
If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and discard.

Eyes
Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Ingestion
Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Notes to Physician	Probable mucosal damage may contraindicate the use of gastric lavage. No specific antidote. Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	> 527
Autoignition Temperature (C):	> 275
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media	Water fog, carbon dioxide, foam, dry chemical.
Special Exposure Hazards	Decomposition in fire may produce toxic gases.
Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.
NFPA Ratings:	Health 3, Flammability 1, Reactivity 0
HMIS Ratings:	Health 3, Flammability 1, Physical Hazard 0 , PPE: J

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Use only competent persons for cleanup.
Environmental Precautionary Measures	Prevent from entering sewers, waterways, or low areas.
Procedure for Cleaning / Absorption	Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions	Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Avoid breathing mist. Do not swallow. Wash hands after use. Launder contaminated clothing before reuse.
Storage Information	Store away from acids. Store away from alkalis. Keep container closed when not in use. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation. If vapors are strong enough to be irritating to the nose or eyes, the TLV is probably being exceeded and special ventilation or respiratory protection maybe required.

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Full Facepiece Respirator with Organic vapor cartridge with particulate prefilter.
Hand Protection	Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness) This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection	Butyl coated apron or clothing.
Eye Protection	Splashproof chemical monogoggles or safety glasses with side shields in conjunction with a face shield. Do NOT wear contact lenses.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Clear light yellow
Odor:	Sharp
pH:	3.1-4.5
Specific Gravity @ 20 C (Water=1):	1.064
Density @ 20 C (lbs./gallon):	8.87
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	213
Boiling Point/Range (C):	100.5
Freezing Point/Range (F):	14 to 23
Freezing Point/Range (C):	-5 / -10
Vapor Pressure @ 20 C (mmHg):	0.2
Vapor Density (Air=1):	0.8
Percent Volatiles:	100
Evaporation Rate (Butyl Acetate=1):	0.9
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	-0.333
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	Keep away from heat, sparks and flame.

Incompatibility (Materials to Avoid) Strong acids. Strong alkalis.

Hazardous Decomposition Products Carbon monoxide and carbon dioxide.

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation Harmful if inhaled. Causes severe respiratory irritation. Vapors given off by heated product may be harmful. May cause allergic respiratory reaction. Inhalation of vapors may result in skin sensitization.

Eye Contact May cause eye burns. May cause permanent eye damage. High vapor concentration will cause irritation.

Skin Contact May cause skin burns. This product contains ingredients which may produce an allergic skin reaction. It should be treated as a skin sensitizer.

Ingestion Causes burns of the mouth, throat and stomach. Harmful if swallowed. Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glutaraldehyde	111-30-8	252 mg/kg (Rat) 316 mg/kg (Rat)	> 2000 mg/kg (Rat) 560 µL/kg (Rabbit)	0.48 mg/L (Rat, 4h)
Methanol	67-56-1	> 1187 - 2769 mg/kg (Rat) 3000 mg/kg (Monkey) 300 mg/kg (Human)	15800 mg/kg (Rabbit) 393 mg/kg (Primate)	87.5 mg/L (Rat) 6h vapour 128.2 mg/L (Rat) 4h vapour 83.2 mg/L (Rat) 4 h 64000 ppm (Rat) 4 h 10 mg/L (Human)

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: May be highly toxic to aquatic life.
LC50: (96 hour) 13 mg/l (Lepomis macrochirus)

Acute Crustaceans Toxicity: TLM48: 0.11 mg/l (Acartia tonsa)
TLM48: 29.73 mg/l (Daphnia magna)

Acute Algae Toxicity: EC50: 8.1 mg/l (Skeletonema costatum)

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Glutaraldehyde	111-30-8	EC50(72h): 0.61 mg/L (Desmodesmus subspicatus)	LC50: 7.8-22 mg/L (Lepomis macrochirus); LC50: 7.8-13 mg/L (Oncorhynchus mykiss); LC50: 5.4 mg/L (Pimephales promelas)	No information available	EC50(48h): 0.56 - 1.0 mg/L (Daphnia magna)

Methanol	67-56-1	EC50(96h): ca. 22000 mg/L (Pseudokirchnerella subcapitata, Growth rate)	LC50: 28200 mg/l (Pimephales promelas) LC50(96h): 12700 – 15400 mg/L (Lepomis macrochirus) 200 hr NOEC for % Embryo-cardiovascular for stage 2 = 15800 mg/L	IC50(3h): > 1000 mg/L (activated sludge)	EC50(96h): 18260 mg/L (Daphnia magna) NOEC(21d): 122 mg/L (Daphnia magna, Reproduction)

12.2. Persistence and degradability

Readily biodegradable

Substances	CAS Number	Persistence and Degradability
Glutaraldehyde	111-30-8	Readily biodegradable (90-100% @ 28d)
Methanol	67-56-1	Readily biodegradable (95-97% @ 20d)

12.3. Bioaccumulative potential

Does not bioaccumulate

Substances	CAS Number	Log Pow
Glutaraldehyde	111-30-8	0.22
Methanol	67-56-1	-0.77 BCF 1.0 – 4.5 (Cyprinus carpio) BCF < 10 (Leuciscus idus melanotus)

12.4. Mobility in soil

No information available

12.5. Results of PBT and vPvB assessment

No information available.

Substances	PBT and vPvB assessment
Methanol	Not PBT/vPvB

12.6. Other adverse effects

No information available

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

US DOT

UN Number: UN3265
UN Proper Shipping Name: Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es): 8
Packing Group: III
NAERG: NAERG 153

US DOT Bulk

DOT (Bulk) Not applicable

Canadian TDG ul0

UN Number: UN3265
UN Proper Shipping Name: Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es): 8
Packing Group: III

IMDG/IMO

UN Number: UN3265

UN Proper Shipping Name:	Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es):	8
Packing Group:	III
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number:	UN3265
UN Proper Shipping Name:	Corrosive Liquid, Acidic, Organic, N.O.S. (Contains Glutaraldehyde)
Transport Hazard Class(es):	8
Packing Group:	III

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

Special Precautions for User: None

Labels: Corrosive

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
Federal Insecticide, Fungicide and Rodenticide Act:	Label in accordance with Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requirements.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D1B Toxic Materials D2B Toxic Materials E Corrosive Material

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

SAFETY DATA SHEET

according to Regulation (EC) No. 453/2010

AQUAGEL®

Revision Date: 03-Sep-2015 **Revision Number:** 24

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product Identifier

Product Name AQUAGEL®
Internal ID Code HM003469

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier
Sector of use SU2a - Mining, (without offshore industries)
SU2b - Offshore industries
Product category PC20 - Products such as pH-regulators, flocculants, precipitants, neutralization agents, other unspecific
Process categories PROC 26 - Handling of solid inorganic substances at ambient temperature

1.3. Details of the supplier of the safety data sheet

Halliburton Manufacturing Services, Ltd.
Halliburton House, Howemoss Crescent
Kirkhill Industrial Estate
Dyce
Aberdeen, AB21 0GN
United Kingdom

www.halliburton.com

For further information, please contact
E-Mail address: fdunexchem@halliburton.com

1.4. Emergency telephone number

+44 8 08 189 0979 / 1-760-476-3961

Emergency telephone - §45 - (EC)1272/2008	
Europe	**112**
Croatia	Centar za kontrolu otrovanja (CKO): (+385 1) 23-48-342 (Poison Control Center (PCC) - Institute for Medical Research and Occupational Health)
Cyprus	+210 7793777
Denmark	Poison Control Hotline (DK): +45 82 12 12 12
France	ORFILA (FR): + 01 45 42 59 59
Germany	Poison Center Berlin (DE): +49 030 30686 790
Italy	Poison Center, Milan (IT): +39 02 6610 1029
Netherlands	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
Norway	Poisons Information (NO):+ 47 22 591300
Poland	Poison Control and Information Centre, Warsaw (PL): +48 22 619 66 54; +48 22 619 08 97
Romania	+40 21 318 36 06
Spain	Poison Information Service (ES): +34 91 562 04 20
United Kingdom	NHS Direct (UK): +44 0845 46 47

SECTION 2: Hazards Identification

2.1. Classification of the substance or mixture

REGULATION (EC) No 1272/2008

Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373

2.2. Label Elements

Hazard Pictograms

Signal Word **Warning**

Hazard Statements

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Precautionary Statements - EU (§28, 1272/2008)

P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P314 - Get medical attention/advice if you feel unwell
P501 - Dispose of contents/container to an approved waste disposal plant

Contains

Substances	**CAS Number**
Crystalline silica, quartz	14808-60-7
Crystalline silica, cristobalite	14464-46-1
Crystalline silica, tridymite	15468-32-3

2.3. Other Hazards

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

SECTION 3: Composition/information on Ingredients

3.1. Substances Substance

Substances	EINECS	CAS Number	PERCENT (w/w)	EU - CLP Substance Classification	REACH No.
Crystalline silica, quartz	238-878-4	14808-60-7	1 - 5%	STOT RE 1 (H372)	No data available
Crystalline silica, cristobalite	238-455-4	14464-46-1	0.1 - 1%	STOT RE 1 (H372)	No data available
Crystalline silica, tridymite	239-487-1	15468-32-3	0.1 - 1%	STOT RE 1 (H372)	No data available

For the full text of the H-phrases mentioned in this Section, see Section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

4.2. Most Important symptoms and effects, both acute and delayed
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

4.3. Indication of any immediate medical attention and special treatment needed
Notes to Physician Treat symptomatically

SECTION 5: Firefighting Measures

5.1. Extinguishing media
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture
Special Exposure Hazards
Not applicable.

5.3. Advice for firefighters
Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate all persons from the area.
See Section 8 for additional information

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

6.4. Reference to other sections
See Section 8 and 13 for additional information.

SECTION 7: Handling and Storage

7.1. Precautions for Safe Handling
This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 24 months.

7.3. Specific End Use(s)
Exposure Scenario No information available
Other Guidelines No information available

SECTION 8: Exposure Controls/Personal Protection

8.1. Control parameters

Exposure Limits

Substances	CAS Number	EU	UK	Netherlands	France
Crystalline silica, quartz	14808-60-7	Not applicable	TWA: 0.1 mg/m³	TWA: 0.075 mg/m³	TWA: 0.1 mg/m³
Crystalline silica, cristobalite	14464-46-1	Not applicable	Not applicable	TWA: 0.075 mg/m³	TWA: 0.05 mg/m³
Crystalline silica, tridymite	15468-32-3	Not applicable	Not applicable	TWA: 0.075 mg/m³	TWA: 0.05 mg/m³

Substances	CAS Number	Germany	Spain	Portugal	Finland
Crystalline silica, quartz	14808-60-7	Not applicable	TWA: 0.1 mg/m³	TWA: 0.025 mg/m³	TWA: 0.05 mg/m³
Crystalline silica, cristobalite	14464-46-1	Not applicable	TWA: 0.05 mg/m³	TWA: 0.025 mg/m³	TWA: 0.05 mg/m³
Crystalline silica, tridymite	15468-32-3	Not applicable	Not applicable	Not applicable	TWA: 0.05 mg/m³

Substances	CAS Number	Austria	Ireland	Switzerland	Norway
Crystalline silica, quartz	14808-60-7	TWA: 0.15 mg/m³	0.1 mg/m³ TWA (respirable dust) 0.3 mg/m³ STEL (calculated, respirable dust)	TWA: 0.15 mg/m³	TWA: 0.3 mg/m³ TWA: 0.1 mg/m³ STEL: 0.9 mg/m³ STEL: 0.3 mg/m³
Crystalline silica, cristobalite	14464-46-1	TWA: 0.15 mg/m³	0.1 mg/m³ TWA (respirable dust) 0.3 mg/m³ STEL (calculated, respirable dust)	TWA: 0.15 mg/m³	TWA: 0.15 mg/m³ TWA: 0.05 mg/m³ STEL: 0.45 mg/m³ STEL: 0.15 mg/m³
Crystalline silica, tridymite	15468-32-3	TWA: 0.15 mg/m³	0.1 mg/m³ TWA (respirable dust) 0.3 mg/m³ STEL (calculated, respirable dust)	TWA: 0.15 mg/m³	TWA: 0.15 mg/m³ TWA: 0.05 mg/m³ STEL: 0.45 mg/m³ STEL: 0.15 mg/m³

Substances	CAS Number	Italy	Poland	Hungary	Czech Republic
Crystalline silica, quartz	14808-60-7	Not applicable	TWA: 2 mg/m³ TWA: 0.3 mg/m³ TWA: 4.0 mg/m³ TWA: 1.0 mg/m³	TWA: 0.15 mg/m³	TWA: 0.1 mg/m³
Crystalline silica, cristobalite	14464-46-1	Not applicable	TWA: 2 mg/m³ TWA: 0.3 mg/m³ TWA: 4.0 mg/m³ TWA: 1.0 mg/m³	TWA: 0.15 mg/m³	TWA: 0.1 mg/m³
Crystalline silica, tridymite	15468-32-3	Not applicable	TWA: 2 mg/m³ TWA: 0.3 mg/m³ TWA: 4.0 mg/m³ TWA: 1.0 mg/m³	TWA: 0.15 mg/m³	TWA: 0.1 mg/m³

Substances	CAS Number	Denmark	Romania	Croatia	Cyprus
Crystalline silica, quartz	14808-60-7	TWA: 0.3 mg/m³ TWA: 0.1 mg/m³	TWA: 0.1 mg/m³	TWA: 0.1 mg/m³	Not applicable
Crystalline silica, cristobalite	14464-46-1	TWA: 0.15 mg/m³ TWA: 0.05 mg/m³	TWA: 0.05 mg/m³	TWA: 0.05 mg/m³	Not applicable
Crystalline silica, tridymite	15468-32-3	TWA: 0.15 mg/m³ TWA: 0.05 mg/m³	TWA: 0.05 mg/m³	TWA: 0.05 mg/m³	Not applicable

Derived No Effect Level (DNEL) No information available.

Worker

General Population

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal protective equipment

If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system

SECTION 9: Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Powder **Color:** Tan to Gray
Odor: Mild earthy **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	8-10
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Flammability (solid, gas)	No data available
upper flammability limit	No data available
lower flammability limit	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.65
Water Solubility	Dispersible
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

SECTION 10: Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
Hydrofluoric acid.

10.6. Hazardous Decomposition Products

Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

SECTION 11: Toxicological Information

11.1. Information on Toxicological Effects

Acute Toxicity

Inhalation

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mechanical irritation to eye.

Skin Contact May cause mechanical skin irritation.

Ingestion None known.

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, quartz	14808-60-7	>15,000 mg/kg (Human)	No data available	No data available
Crystalline silica, cristobalite	14464-46-1	>15,000 mg/kg (Human)	No data available	No data available
Crystalline silica, tridymite	15468-32-3	>15,000 mg/kg (Human)	No data available	No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the skin
Crystalline silica, cristobalite	14464-46-1	Non-irritating to the skin
Crystalline silica, tridymite	15468-32-3	Non-irritating to the skin

Substances	CAS Number	Eye damage/irritation
Crystalline silica, quartz	14808-60-7	Mechanical irritation of the eyes is possible.
Crystalline silica, cristobalite	14464-46-1	Mechanical irritation of the eyes is possible.
Crystalline silica, tridymite	15468-32-3	Mechanical irritation of the eyes is possible.

Substances	CAS Number	Skin Sensitization
Crystalline silica, quartz	14808-60-7	No information available.
Crystalline silica, cristobalite	14464-46-1	No information available
Crystalline silica, tridymite	15468-32-3	No information available

Substances	CAS Number	Respiratory Sensitization
Crystalline silica, quartz	14808-60-7	No information available
Crystalline silica, cristobalite	14464-46-1	No information available
Crystalline silica, tridymite	15468-32-3	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, quartz	14808-60-7	Not regarded as mutagenic.
Crystalline silica, cristobalite	14464-46-1	Not regarded as mutagenic.
Crystalline silica, tridymite	15468-32-3	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, quartz	14808-60-7	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury.
Crystalline silica, cristobalite	14464-46-1	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury.
Crystalline silica, tridymite	15468-32-3	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, quartz	14808-60-7	No information available
Crystalline silica, cristobalite	14464-46-1	No information available
Crystalline silica, tridymite	15468-32-3	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, quartz	14808-60-7	No significant toxicity observed in animal studies at concentration requiring classification.
Crystalline silica, cristobalite	14464-46-1	No significant toxicity observed in animal studies at concentration requiring classification.
Crystalline silica, tridymite	15468-32-3	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, quartz	14808-60-7	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)
Crystalline silica, cristobalite	14464-46-1	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)
Crystalline silica, tridymite	15468-32-3	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, quartz	14808-60-7	Not applicable
Crystalline silica, cristobalite	14464-46-1	Not applicable
Crystalline silica, tridymite	15468-32-3	Not applicable

SECTION 12: Ecological Information

12.1. Toxicity

Ecotoxicity Effects

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, quartz	14808-60-7	No information available	LL0 (96h) 10,000 mg/L (Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)
Crystalline silica, cristobalite	14464-46-1	No information available	LL0 (96h) 10,000 mg/L (Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)
Crystalline silica, tridymite	15468-32-3	No information available	LL0 (96h) 10,000 mg/L(Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Crystalline silica, quartz	14808-60-7	No information available
Crystalline silica, cristobalite	14464-46-1	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, tridymite	15468-32-3	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Crystalline silica, quartz	14808-60-7	No information available
Crystalline silica, cristobalite	14464-46-1	No information available
Crystalline silica, tridymite	15468-32-3	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, quartz	14808-60-7	No information available
Crystalline silica, cristobalite	14464-46-1	No information available
Crystalline silica, tridymite	15468-32-3	No information available

12.5. Results of PBT and vPvB assessment

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT). This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Substances	PBT and vPvB assessment
Crystalline silica, quartz	Not PBT/vPvB
Crystalline silica, cristobalite	Not PBT/vPvB
Crystalline silica, tridymite	No data available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

SECTION 13: Disposal Considerations

13.1. Waste treatment methods

Disposal Method If practical, recover and reclaim, recycle, or reuse by the guidelines of an approved local reuse program. Should contaminated product become a waste, dispose of in a licensed industrial landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

SECTION 14: Transport Information

IMDG/IMO

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

RID

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

ADR

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

14.1. UN Number: Not restricted

14.2. UN Proper Shipping Name: Not restricted

14.3. Transport Hazard Class(es): Not applicable

14.4. Packing Group: Not applicable

14.5. Environmental Hazards: Not applicable

14.6. Special Precautions for User: None

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

SECTION 15: Regulatory Information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories

EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Legend
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

Germany, Water Endangering Classes (WGK) WGK 0: Generally not water endangering.

15.2. Chemical Safety Assessment
No information available

SECTION 16: Other Information

Full text of H-Statements referred to under sections 2 and 3
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

Key or legend to abbreviations and acronyms
bw – body weight
CAS – Chemical Abstracts Service
CLP – REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Classification, Labelling and Packaging of substances and mixtures
EC – European Commission
EC10 – Effective Concentration 10%
EC50 – Effective Concentration 50%

EEC – European Economic Community
ErC50 – Effective Concentration growth rate 50%
IBC Code – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL0 – Lethal Loading 0%
LL50 – Lethal Loading 50%
MARPOL – International Convention for the Prevention of Pollution from Ships
mg/kg – milligram/kilogram
mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NOEC – No Observed Effect Concentration
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
PC – Chemical Product category
PEL – Permissible Exposure Limit
ppm – parts per million
PROC – Process category
REACH – REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
STEL – Short Term Exposure Limit
SU – Sector of Use category

Key literature references and sources for data
www.ChemADVISOR.com/

Revision Date: 03-Sep-2015
Revision Note
SDS sections updated: 1

This safety data sheet complies with the requirements of Regulation (EC) No. 453/2010

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB**

Revision Date: 12-Mar-2014

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB
Synonyms: None
Chemical Family: Mineral
Application: Bridging Agent

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Calcium carbonate	471-34-1	60 - 100%	10 mg/m^3	15 mg/m^3
Crystalline silica, quartz	14808-60-7	0 - 1%	TWA: 0.025 mg/m^3	$\frac{10 \text{ mg/m}^3}{\%SiO2 + 2}$

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.
Notes to Physician	Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Lower (oz./ft3):	
Flammability Limits in Air - Upper (%):	Not Determined
Flammability Limits in Air - Upper (oz./ft3):	

Fire Extinguishing Media	All standard firefighting media.
Special Exposure Hazards	Not applicable.
Special Protective Equipment for Fire-Fighters	Not applicable.
NFPA Ratings:	Health 0, Flammability 0, Reactivity 0
HMIS Ratings:	Health 1*, Flammability 0, Physical Hazard 0 , PPE: E

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	None known.
Procedure for Cleaning / Absorption	Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions	Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store away from acids. Store in a cool, dry location. Store locked up. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Respiratory Protection Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715:2009, or equivalent respirator when using this product.

Hand Protection Normal work gloves.

Skin Protection Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid Powder
Color:	White
Odor:	Odorless
pH:	8-9
Specific Gravity @ 20 C (Water=1):	2.7
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	157
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid None anticipated

Incompatibility (Materials to Avoid) Strong acids.

Hazardous Decomposition Products Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause eye irritation

Skin Contact May cause skin irritation.

Ingestion None known

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	471-34-1	6450 mg/kg (Rat) > 2000 mg/kg (Rat)	> 2000 mg/kg (Rat)	> 3 mg/L (Rat) 4h
Crystalline silica, quartz	14808-60-7	500 mg/kg (Rat)	No data available	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Calcium carbonate	471-34-1	EC50(72h): > 14 mg/L (growth rate) (Desmodesmus subspicatus)	LC50(96h): > 100 mg/L (saturated solution) (Oncorhynchus mykiss)	No information available	EC50(48h): > 100 mg/L (saturated solution) (Daphnia magna)
Crystalline silica, quartz	14808-60-7	EC50(72h): 89 mg/L (biomass) (Scenedesmus subspicatus) (similar substance)	LC50(96h): 508 mg/L (Danio rerio) (similar substance)	No information available	LC50(48h): 731 mg/L (Daphnia magna) (similar substance) LC50(48h) 33.5 mg/L (Ceriodaphnia dubia) (similar substance)

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

Substances	Persistence and Degradability
Calcium carbonate	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, quartz	The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Does not bioaccumulate

12.4 Mobility in soil

No information available

12.5 Results of PBT and vPvB assessment

No information available.

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

14. TRANSPORT INFORMATION

Land Transportation

DOT

Not restricted

Canadian TDG

Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels:	None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARAZAN® D PLUS**

Revision Date: 03-Dec-2013

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARAZAN® D PLUS
Synonyms: None
Chemical Family: Polysaccharide
Application: Viscosifier

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Xanthan gum	11138-66-2	60 - 100%	10 mg/m^3	15 mg/m^3

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye irritation Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	400
Autoignition Temperature (C):	204
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0 , PPE: B

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Slippery when wet. Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	White to off white
Odor:	Slight
pH:	7 (1%)
Specific Gravity @ 20 C (Water=1):	1.6
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	52.4
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	1,000,000

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation	May impede respiration.
Eye Contact	May cause mild eye irritation.
Skin Contact	None known.
Ingestion	None known

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation

Xanthan gum	11138-66-2	> 5000 mg/kg (Rat) > 45000 mg/kg (Rat)	No data available	> 21 mg/L (Rat) > 5.25 mg/L (Rat)

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: TLM96: 320-560 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: TLM96: > 75000 ppm (Mysidopsis bahia)
Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Xanthan gum	11138-66-2	No information available	TLM96: 320-560 ppm (Oncorhynchus mykiss)	No information available	TLM96: > 75000 ppm (Mysidopsis bahia)

12.2 Persistence and degradability
Readily biodegradable

12.3 Bioaccumulative potential
Does not bioaccumulate

12.4 Mobility in soil
No information available

12.5 Results of PBT and vPvB assessment
No information available.

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROFIBRE®**

Revision Date: 05-Mar-2014

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROFIBRE®
Synonyms: None
Chemical Family: Nut Hulls
Application: Loss Circulation Material

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Contains no hazardous substances	Mixture	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye irritation Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation Under normal conditions, first aid procedures are not required.

Skin Under normal conditions, first aid procedures are not required.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	380
Flash Point/Range (C):	193
Flash Point Method:	PMCC
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	0.29
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0, Flammability 0, Physical Hazard 0 , PPE: B

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection	Safety glasses.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid Powder
Color:	Tan
Odor:	Odorless
pH:	4.9 (1%)
Specific Gravity @ 20 C (Water=1):	1.3
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	24-31
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	374
Freezing Point/Range (C):	190
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	None known.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation	May cause mild respiratory irritation.
Eye Contact	May cause mild eye irritation.
Skin Contact	None known.
Ingestion	None known

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances	Mixture	No data available	No data available	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: LC50: 445 mg/l (Cyprinus carpio)
Acute Crustaceans Toxicity: TLM48: 1875 mg/l (Daphnia magna)
Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances	Mixture	No information available	No information available	No information available	No information available

12.2 Persistence and degradability
Biodegradable.

12.3 Bioaccumulative potential
Does not bioaccumulate

12.4 Mobility in soil
No information available

12.5 Results of PBT and vPvB assessment
No information available.

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels:	None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® 41**

Revision Date: 07-Jan-2015

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® 41
Synonyms: None
Chemical Family: Mineral
Application: Weight Additive

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Barium sulfate	7727-43-7	60 - 100%	TWA: 10 mg/m^3	15 mg/M3
Crystalline silica, quartz	14808-60-7	1 - 5%	TWA: 0.025 mg/m^3	$\frac{10\ mg/m^3}{\%SiO2 + 2}$

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

4. FIRST AID MEASURES

Inhalation
If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin
Wash with soap and water. Get medical attention if irritation persists.

Eyes
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion	Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.
Notes to Physician	Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media	All standard firefighting media.
Special Exposure Hazards	Not applicable.
Special Protective Equipment for Fire-Fighters	Not applicable.
NFPA Ratings:	Health 1, Flammability 0, Reactivity 0
HMIS Ratings:	Health 1*, Flammability 0, Physical Hazard 0 , PPE: E

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	None known.
Procedure for Cleaning / Absorption	Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions	This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Storage Information	Do not reuse empty container. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Respiratory Protection	Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Pink to tan to gray
Odor:	Odorless
pH:	8 - 9
Specific Gravity @ 20 C (Water=1):	4.1
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	100 -155
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	233.4

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	None known.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mild eye irritation.

Skin Contact None known.

Ingestion May produce nervous system effects such as feeling of weakness, unsteady walk, and dilation of blood vessels. May affect the heart and cardiovascular system.

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Prolonged inhalation of fine barium sulfate dusts form harmless nodular granules in lung, an affliction called baritosis. Baritosis produces no symptoms of bronchitis or emphysema, and lung functioning is not affected although dyspnea, upon exertion, may occur. The nodulation disappears if exposure is stopped.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Barium sulfate	7727-43-7	> 307,000 mg/kg (Rat) > 2000mg/kg (Rat) (similar substance - barium dichloride)	> 2,000 mg/kg (Rabbit)	No data available
Crystalline silica, quartz	14808-60-7	> 5000 mg/kg (Rat)	No data available	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: TLM96: 7500 ppm (Oncorhynchus mykiss)

Acute Crustaceans Toxicity: TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 132.6 ppb

Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Barium sulfate	7727-43-7	EC50(72h): (growth rate) > 61.1 mg/L (Pseudokirchnerella subcapitata) EC50(72h): > 34.31 mg/L (Pseudokirchnerella subcapitata) (elemental Barium)	TLM96: 7500 ppm (Oncorhynchus mykiss) LC50(96h): > 174 mg/L (Danio rerio) LC50(96h): > 97.5 mg/L (Danio rerio) (elemental Barium) LC50(28d): 42700 ug/L (Oncorhynchus mykiss) (elemental Barium)	EC50(3h): (respiration rate) >1000 mg/L (activated sludge)	TLM96: > 1,000,000 ppm (Mysidopsis bahia) LC50(48h): 14500 ug/L (Daphnia magna) (elemental Barium) EC16(3wk): 5800 ug/L (Daphnia magna) (elemental Barium) EC16(3wk): 4800 ug/L (Daphnia magna)
Crystalline silica, quartz	14808-60-7	No information available	LL0(96h): 10000 mg/L(Danio rerio) (similar substance)	No information available	LL50(24h): > 10000 mg/L (Daphnia magna) (similar substance)

12.2. Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

Substances	CAS Number	Persistence and Degradability
Barium sulfate	7727-43-7	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, quartz	14808-60-7	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Does not bioaccumulate

Substances	CAS Number	Log Pow
Barium sulfate	7727-43-7	BCF: 1.2 - 74.4 L/kg (Lepomis macrochirus)
Crystalline silica, quartz	14808-60-7	No information available

12.4. Mobility in soil

No information available

12.5. Results of PBT and vPvB assessment

No information available.

Substances	PBT and vPvB assessment
Barium sulfate	No data available
Crystalline silica, quartz	Not PBT/vPvB

12.6. Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

US DOT

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable

US DOT Bulk

DOT (Bulk) Not applicable

Canadian TDG ul0

UN Number: Not restricted

UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable

IMDG/IMO
UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable

IATA/ICAO
UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable
Special Precautions for User: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

SAFETY DATA SHEET

Product Trade Name: **BARO-TROL® PLUS**

Revision Date: 13-Jul-2015 **Revision Number:** 23

1. Identification

1.1. Product Identifier

Product Trade Name: BARO-TROL® PLUS
Synonyms: None
Chemical Family: Blend
Internal ID Code HM003562

1.2 Recommended use and restrictions on use

Application: Shale Inhibitor
Uses Advised Against No information available

1.3 Manufacturer's Name and Contact Details

Manufacturer/Supplier Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Stewardship
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

1.4. Emergency telephone number

Emergency Telephone Number (281) 575-5000

2. Hazard(s) Identification

2.1 Classification in accordance with paragraph (d) of §1910.1200

Carcinogenicity	Category 1A - H350
Specific Target Organ Toxicity - (Repeated Exposure)	Category 1 - H372
Combustible dust	Combustible dust

2.2. Label Elements

Hazard Pictograms

Signal Word Danger

Hazard Statements H350 - May cause cancer

H372 - Causes damage to organs through prolonged or repeated exposure

May form combustible dust concentrations in air.

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product

Response
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Crystalline silica, quartz	14808-60-7

2.3 Hazards not otherwise classified
None known

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - US
Crystalline silica, quartz	14808-60-7	1 - 5%	Carc. 1A (H350) STOT RE 1 (H372)

The exact percentage (concentration) of the composition has been withheld as proprietary.

4. First-Aid Measures

4.1. Description of first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

4.2 Most important symptoms/effects, acute and delayed
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease. Carcinogen. Prolonged or repeated exposure may cause damage to organs.

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically.

5. Fire-fighting measures

5.1. Extinguishing media

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

5.2 Specific hazards arising from the substance or mixture

Special Exposure Hazards

Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

5.3 Special protective equipment and precautions for fire-fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust.
See Section 8 for additional information

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 60 months.

8. Exposure Controls/Personal Protection

8.1 Occupational Exposure Limits

Substances	CAS Number	OSHA PEL-TWA	ACGIH TLV-TWA
Crystalline silica, quartz	14808-60-7	TWA: 10 mg/m^3 %SiO2 + 2	TWA: 0.025 mg/m^3

8.2 Appropriate engineering controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

8.3 Individual protection measures, such as personal protective equipment

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, AS/NZS 1715:2009, or equivalent respirator when product vapor or mist is present.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color:**	Black to Brown
Odor:	Asphalt	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Flammability (solid, gas)	No data available
upper flammability limit	No data available
lower flammability limit	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.42
Water Solubility	Dispersible
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical Stability

Stable

10.3. Possibility of Hazardous Reactions

Will Not Occur

10.4. Conditions to Avoid
None anticipated

10.5. Incompatible Materials
Strong oxidizers.

10.6. Hazardous Decomposition Products
Oxides of sulfur. Carbon monoxide and carbon dioxide. Toxic fumes. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

11.1 Information on likely routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

11.2 Symptoms related to the physical, chemical and toxicological characteristics

Acute Toxicity

Inhalation Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause eye irritation.

Skin Contact May cause skin irritation.

Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

11.3 Toxicity data

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, quartz	14808-60-7	>15,000 mg/kg (Human)	No data available	No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, quartz	14808-60-7	Non-irritating to the skin

Substances	CAS Number	Eye damage/irritation
Crystalline silica, quartz	14808-60-7	Mechanical irritation of the eyes is possible.

Substances	CAS Number	Skin Sensitization
Crystalline silica, quartz	14808-60-7	No information available.

Substances	CAS Number	Respiratory Sensitization
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, quartz	14808-60-7	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, quartz	14808-60-7	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, quartz	14808-60-7	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, quartz	14808-60-7	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, quartz	14808-60-7	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, quartz	14808-60-7	Not applicable

12. Ecological Information

12.1. Toxicity

Ecotoxicity Effects

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, quartz	14808-60-7	No information available	LL0 (96h) 10,000 mg/L (Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Crystalline silica, quartz	14808-60-7	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Crystalline silica, quartz	14808-60-7	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, quartz	14808-60-7	No information available

12.5 Other adverse effects

No information available

13. Disposal Considerations

13.1. Waste treatment methods

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. Transport Information

US DOT

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

US DOT Bulk

DOT (Bulk) Not applicable

Canadian TDG

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable
Special Precautions for User: None

15. Regulatory Information

US Regulations

US TSCA Inventory All components listed on inventory or are exempt.

EPA SARA Title III Extremely Hazardous Substances

Substances	CAS Number	EPA SARA Title III Extremely Hazardous Substances
Crystalline silica, quartz	14808-60-7	Not applicable

EPA SARA (311,312) Hazard Class
Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals

Substances	CAS Number	Toxic Release Inventory (TRI) - Group I	Toxic Release Inventory (TRI) - Group II
Crystalline silica, quartz	14808-60-7	Not applicable	Not applicable

EPA CERCLA/Superfund Reportable Spill Quantity

Substances	CAS Number	CERCLA RQ
Crystalline silica, quartz	14808-60-7	Not applicable

EPA RCRA Hazardous Waste Classification
If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65 The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law One or more components listed.

NJ Right-to-Know Law One or more components listed.

PA Right-to-Know Law One or more components listed.

Canadian Regulations

Canadian DSL Inventory All components listed on inventory or are exempt.

16. Other information

Preparation Information

Prepared By
Chemical Stewardship
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

Revision Date: 13-Jul-2015

Reason for Revision Update to Format
SECTION:
2

Additional information
For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key or legend to abbreviations and acronyms
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
ErC50 – Effective Concentration growth rate 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PEL – Permissible Exposure Limit
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
UN – United Nations
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **Bicarbonate of Soda**

Revision Date: 20-Dec-2012

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: Bicarbonate of Soda
Synonyms: None
Chemical Family: Carbonate
Application: Buffer

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Sodium bicarbonate	144-55-8	60 - 100%	10 mg/m^3	15 mg/m^3

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0, Flammability 0, Reactivity 0 , PPE: B

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store away from acids. Store in a dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	White
Odor:	Odorless
pH:	8
Specific Gravity @ 20 C (Water=1):	2.16
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	41.2
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong acids. Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation	May cause mild respiratory irritation.
Eye Contact	May cause eye irritation
Skin Contact	May cause mild skin irritation.
Ingestion	None known

Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium bicarbonate	144-55-8	4220 mg/kg (Rat)	No data available	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium bicarbonate	144-55-8	No information available	No information available	No information available	No information available

12.2 Persistence and degradability
No information available

12.3 Bioaccumulative potential
No information available

12.4 Mobility in soil
No information available

12.5 Results of PBT and vPvB assessment
No information available.

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CAUSTIC SODA**

Revision Date: 24-Mar-2014

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CAUSTIC SODA
Synonyms: None
Chemical Family: Hydroxide
Application: pH Control

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Sodium hydroxide	1310-73-2	60 - 100%	2 mg/m^3	2 mg/M3

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory burns. May be harmful if swallowed.

4. FIRST AID MEASURES

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

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse. Destroy or properly dispose of contaminated shoes.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards May form explosive mixtures with strong acids. Reaction with steel and certain other metals generates flammable hydrogen gas.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 3, Flammability 0, Reactivity 1
HMIS Ratings: Health 3, Flammability 0, Physical Hazard 1 , PPE: Es

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Neutralize to pH of 6-8. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from acids. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Localized ventilation should be used to control dust levels.

Respiratory Protection Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715:2009, or equivalent respirator when using this product.

Hand Protection Impervious rubber gloves. Nitrile gloves. Butyl rubber gloves.

Skin Protection Full protective chemical resistant clothing. Rubber boots.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	White to off white
Odor:	Odorless
pH:	14
Specific Gravity @ 20 C (Water=1):	2.13
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	71.5
Boiling Point/Range (F):	2535
Boiling Point/Range (C):	1390
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Soluble in alcohols
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	40

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid None anticipated

Incompatibility (Materials to Avoid) Contact with acids. Peroxides. Halogenated compounds. Prolonged contact with aluminum, lead, or zinc may liberate flammable hydrogen.

Hazardous Decomposition Products None known.

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

- **Inhalation** Causes severe respiratory burns. May cause chemical pneumonia.
- **Eye Contact** May cause eye burns.
- **Skin Contact** Causes severe burns.
- **Ingestion** Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	1310-73-2	No data available	1350 mg/kg (Rabbit)	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: TLM96: 730 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium hydroxide	1310-73-2	No information available	LC50: 45.4 mg/l (Oncorhynchus mykiss)	No information available	EC50(48 h): 40.4 mg/L (Ceriodaphnia sp.)

12.2 Persistence and degradability
The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential
Does not bioaccumulate

12.4 Mobility in soil
No information available

12.5 Results of PBT and vPvB assessment
No information available.

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

UN1823, Sodium Hydroxide, Solid , 8 , II
NAERG 154

Canadian TDG
Sodium Hydroxide, Solid , 8 , UN1823 , II

ADR

UN1823, Sodium Hydroxide, Solid , 8 , II

Air Transportation

ICAO/IATA

UN1823, Sodium Hydroxide, Solid , 8 , II

Sea Transportation

IMDG

UN1823, Sodium Hydroxide, Solid , 8 , II
EmS F-A, S-B

Other Transportation Information

Labels: Corrosive

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Sodium Hydroxide//1310-73-2
EPA CERCLA/Superfund Reportable Spill Quantity	EPA Reportable Spill Quantity is 1000 Pounds based on Sodium hydroxide (CAS: 1310-73-2).
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	E Corrosive Material

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CITRIC ACID**

Revision Date: 20-Nov-2012

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CITRIC ACID
Synonyms: None
Chemical Family: Organic acid
Application: Scale Remover pH Control

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Citric acid	77-92-9	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	1832
Autoignition Temperature (C):	1000
Flammability Limits in Air - Lower (%):	8
Flammability Limits in Air - Upper (%):	65

Fire Extinguishing Media	Water fog, carbon dioxide, foam, dry chemical.
Special Exposure Hazards	Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.
Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.
NFPA Ratings:	Health 1, Flammability 0, Reactivity 0
HMIS Ratings:	Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	Prevent from entering sewers, waterways, or low areas.
Procedure for Cleaning / Absorption	Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions	Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
Storage Information	Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use in a well ventilated area.
Respiratory Protection	Dust/mist respirator. (N95, P2/P3)
Hand Protection	Impervious rubber gloves. Nitrile gloves. Neoprene gloves. Butyl rubber gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	White
Odor:	Odorless
pH:	1.8
Specific Gravity @ 20 C (Water=1):	1.66

9. PHYSICAL AND CHEMICAL PROPERTIES

Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	192.12

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong alkalis.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation.
Skin Contact	May cause skin irritation.
Eye Contact	May cause severe eye irritation.
Ingestion	Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined

Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Biodegradable
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	E Corrosive Material

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

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*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CON DET PREMIX**

Revision Date: 04-Jan-2011

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CON DET PREMIX
Synonyms: None
Chemical Family: Surfactant
Application: Anionic Surfactant

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Isopropanol	67-63-0	1 - 5%	200 ppm	400 ppm

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and skin irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	210
Flash Point/Range (C):	99
Flash Point Method:	PMCC
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Material is slippery underfoot.

Storage Information Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Transparent Red

9. PHYSICAL AND CHEMICAL PROPERTIES

Odor:	Alcohol
pH:	9.5 @ 1%
Specific Gravity @ 20 C (Water=1):	1.06
Density @ 20 C (lbs./gallon):	8.8
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	25
Freezing Point/Range (C):	-3.9
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	2.0
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	336 @ 38C
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Skin Contact	Causes drying of the skin. May cause mild skin irritation.
Eye Contact	May cause mild eye irritation.
Ingestion	May cause abdominal pain, vomiting, nausea, and diarrhea.
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.
Toxicity Tests	

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Isopropanol//67-63-0
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	D2B Toxic Materials

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

QMAX SOLUTIONS INC. 'Largest Canadian Drilling Fluids Company'

Q'MAX MATERIAL SAFETY DATA SHEET

Section I: IDENTIFICATION OF PRODUCT

Product Name:	**DESCO CHROME-FREE**
Product Use:	**Oil Well Fluid Additive**
Chemical Family:	**Mixture**
WHMIS CLASSIFICATION:	Class D-2(A) and Class D-2 (B)
WORK PLACE HAZARD:	Potential Carcinogen; Skin and Eye Irritant
SHIPPING NAME:	Not Dangerous Goods
TDG CLASSIFICATION:	Not Regulated
PACKAGE GROUP:	Not Applicable
PIN:	Not Applicable

Section II: HAZARDOUS INGREDIENTS

Ingredient	Percent	CAS Number	OSHA PEL	ACGIH TLV	LD(50)	LC(50)
Crystaline Silica	<1%	Various	0.1 mg/m³	.01 mg/m³	No Data	N/A
Ferrous sulphate	10%	7720-78-7	1 mg/m³	1 mg/m³	No Data	N/A

Section III: TOXICOLOGICAL PROPERTIES

Route of Entry: • SKIN • EYE CONTACT • INHALATION • INGESTION

SKIN CONTACT:	May cause irritation, redness and itching to the skins; may cause dermatitis.
EYE CONTACT:	May cause severe irritation to the eyes.
INHALATION:	Will be irritating to mucous membranes of nose, throat and upper respiratory tract. This product contains free crystalline silica and long term exposure to dust containing crystalline silica may cause silicosis, a progressive pulmonary fibrosis which may be associated with significantly impaired pulmonary function, cardiopulmonary impairment and death.
INGESTION:	May cause gastrointestinal tract irritation, shock, liver damage, rapid heart beat, and death.

Section IV: FIRST AID MEASURES

EYE CONTACT:	Flush with running water for 15 minutes holding the eye lid open. Call a physician and seek medical aid.
SKIN CONTACT:	Wash with soap and running water for 15 minutes. Wash clothes prior to reuse. If irritation persists, get medical attention.
INHALATION:	Remove patient to fresh air. Administer oxygen if breathing is difficult. Administer CPR if breathing has ceased. Call a physician.
INGESTION:	Immediately give 2 glasses of water. Induce vomiting if patient is conscious. Seek medical attention. Keep patient warm and at rest.
NOTE TO PHYSICIAN:	This product contains iron salts. If severity of poisoning requires chelation therapy, the following is recommended: Gastric lavage using Deproxamine 2 grams in 1 liter of water containing sodium bicarbonate, 20 mg/l. Leave 10 mg of Deproxamine in 50 ml of 5% sodium bicarbonate in the stomach.

Section V: PHYSICAL DATA

APPEARANCE AND ODOUR:	Fine reddish-brown powder with small white specks; odourless
SPECIFIC GRAVITY:	1.5-1.7 g/cc

BOILING POINT (°C):	Not Applicable
MELTING POINT (°C):	Not Applicable
SOLUBILITY IN WATER:	Appreciable
pH @ 1.0%:	1% Solution=No Data
PERCENT VOLATILE BY VOLUME:	Loss on Ignition approximately 44% by weight.
EVAPORATION RATE:	Not Applicable
VAPOUR PRESSURES (mm Hg):	Not Applicable
VAPOUR DENSITY (Air=1):	Not Applicable

Section VI: FIRE AND EXPLOSION DATA

FLASH POINT:	Not Applicable
FLAMMABLE LIMITS:	Not Applicable
EXTINGUISHING MEDIA:	CO2, Water, Mist, Foam
SPECIAL FIRE FIGHTING PROCEDURES:	Fire Fighters must wear appropriate breathing apparatus and clothing. May release carbon, sulphur and iron oxides when burned.
UNUSUAL FIRE AND EXPLOSION PROCEDURES:	If in a finely divided and suspended state, treat as a non flammable dust.

Section VII: REACTIVITY DATA

STABILITY	Stable	• Unstable
INCOMPATIBILITY (conditions to avoid):	Strong oxidizing agents and alkalies.	
CONDITIONS OF REACTIVITY:	Heat	
HAZARDOUS DECOMPOSITION PRODUCTS:	It is possible to have sulphur and oxides of sulphur and carbon	
HAZARDOUS POLYMERIZATION:	Will not occur	• May Occur

Section VIII: PREVENTIVE MEASURE

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:	Use an NIOSH approved dust filter
VENTILATION:	Local exhaust ventilation is recommended for controlled products.
PROTECTIVE GLOVES:	Chemical resistant gloves.
EYE PROTECTION:	Use chemical goggles when handling this product.
OTHER PROTECTIVE EQUIPMENT:	It is suggested to use chemical resistant protective clothing when handling this product. Make eye bath and emergency shower available.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid ingestion. Do not breath the dust Wash thoroughly after handling. Practice reasonable caution and personal cleanliness. Launder exposed clothing before reuse. avoid skin and eye contact. Wear suitable protection for eyes and skin when handling. Store in dry well ventilated place.

STEPS TO BE TAKEN IN CASE THE MATERIAL IS SPILLED OR RELEASED

Use appropriate safety equipment. Avoid all bodily contact with spilled material. Small spills, sweep up and either recover or dispose in approved containers. Large spills, shovel and sweep up for reclamation or disposal. It is suggested that recovered material be reclaimed for reuse. Do not allow material to enter storm sewers or storm water inlets.

WASTE DISPOSAL METHOD

Dispose to conform with local disposal regulations. It is the responsibility of the user of this product to determine at the time of disposal whether the product meets criteria for hazardous waste. this product lends itself to recovering for reclamation if spilled.

Section IX: PREPARATION

The information contained herein is given in good faith, but no warranty, expressed or implied, is made

DATE ISSUED:	May 17, 1993
BY:	Product Safety Committee
DATE UPDATED:	October 1, 1999
VENDOR NUMBER:	19575

Return to MSDS Menu **Return to Main Menu**

site design and construction by : Cobra Internet Design 2000

HALLIBURTON

SAFETY DATA SHEET

according to Regulation (EC) No. 453/2010

DEXTRID LT

Revision Date: 11-Mar-2014 **Revision Number:** 5

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product Identifier

Product Name DEXTRID LT

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use

1.3. Details of the supplier of the safety data sheet

Halliburton Energy Services
Halliburton House, Howemoss Place
Kirkhill Industrial Estate
Dyce
Aberdeen, AB21 0GN
United Kingdom

Emergency Phone Number: +44 1224 795277 or +1 281 575 5000

www.halliburton.com

For further information, please contact

E-Mail address: fdunexchem@halliburton.com

1.4. Emergency telephone number

+44 1224 795277 or +1 281 575 5000

Emergency telephone - §45 - (EC)1272/2008	
Europe	**112**
Croatia	Centar za kontrolu otrovanja (CKO): (+385 1) 23-48-342 (Poison Control Center (PCC) - Institute for Medical Research and Occupational Health)
Cyprus	+210 7793777
Denmark	Poison Control Hotline (DK): +45 82 12 12 12
France	ORFILA (FR): + 01 45 42 59 59
Germany	Poison Center Berlin (DE): +49 030 30686 790
Italy	Poison Center, Milan (IT): +39 02 6610 1029
Netherlands	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
Norway	Poisons Information (NO):+ 47 22 591300
Poland	Poison Control and Information Centre, Warsaw (PL): +48 22 619 66 54; +48 22 619 08 97
Romania	+40 21 318 36 06
Spain	Poison Information Service (ES): +34 91 562 04 20
United Kingdom	NHS Direct (UK): +44 0845 46 47

SECTION 2: Hazards Identification

2.1. Classification of the substance or mixture

REGULATION (EC) No 1272/2008

2.2. Label Elements

Hazard Pictograms

Signal Word **None**

Hazard Statements
Not Classified

Precautionary Statements - EU (§28, 1272/2008)
None

Contains

2.3. Other Hazards
None known

SECTION 3: Composition/information on Ingredients

For the full text of the H-phrases mentioned in this Section, see Section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

4.2. Most Important symptoms and effects, both acute and delayed
No information available

4.3. Indication of any immediate medical attention and special treatment needed
Notes to Physician Treat symptomatically

SECTION 5: Firefighting Measures

5.1. Extinguishing media
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture
Special Exposure Hazards
Not applicable.

5.3. Advice for firefighters
Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
See Section 8 for additional information

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
6.4. Reference to other sections
See Section 8 and 13 for additional information.

SECTION 7: Handling and Storage

7.1. Precautions for Safe Handling

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

7.3. Specific End Use(s)

Exposure Scenario No information available

Other Guidelines No information available

SECTION 8: Exposure Controls/Personal Protection

8.1. Control parameters

Exposure Limits

Derived No Effect Level (DNEL) No information available.

Worker

General Population

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Engineering Controls None known.

Personal protective equipment

If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Environmental Exposure Controls No information available

SECTION 9: Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Not determined	**Color:**	Not determined
Odor:	Not determined	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Flammability (solid, gas)	No data available
upper flammability limit	No data available
lower flammability limit	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	No data available
Water Solubility	No data available
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available

Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

SECTION 10: Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
None known.
10.6. Hazardous Decomposition Products
None known.

SECTION 11: Toxicological Information

11.1. Information on Toxicological Effects
Acute Toxicity

Inhalation	Not determined
Eye Contact	Not determined
Skin Contact	Not determined
Ingestion	Not determined

Toxicology data for the components

SECTION 12: Ecological Information

12.1. Toxicity
Ecotoxicity Effects

12.2. Persistence and degradability

12.3. Bioaccumulative potential

12.4. Mobility in soil
No information available

12.5. Results of PBT and vPvB assessment
No information available.

12.6. Other adverse effects
Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

SECTION 13: Disposal Considerations

13.1. Waste treatment methods

Disposal Method	Dispose in accordance with local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

SECTION 14: Transport Information

IMDG/IMO

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

RID

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental hazard:	Not applicable

ADR

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental hazard:	Not applicable

IATA/ICAO

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental hazard:	Not applicable

14.1. UN Number: Not restricted

14.2. UN Proper Shipping Name: Not restricted

14.3. Transport Hazard Class(es): Not applicable

14.4. Packing Group: Not applicable

14.5. Environmental Hazards: Not applicable

14.6. Special Precautions for User: None

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

SECTION 15: Regulatory Information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories

EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Legend
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

Germany, Water Endangering Classes (WGK)	Not determined.

15.2. Chemical Safety Assessment
No information available

SECTION 16: Other Information

Full text of H-Statements referred to under sections 2 and 3
None

Key or legend to abbreviations and acronyms
bw – body weight
CAS – Chemical Abstracts Service
CLP – REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Classification, Labelling and Packaging of substances and mixtures
EC – European Commission
EC10 – Effective Concentration 10%
EC50 – Effective Concentration 50%
EEC – European Economic Community
ErC50 – Effective Concentration growth rate 50%
IBC Code – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL0 – Lethal Loading 0%
LL50 – Lethal Loading 50%
MARPOL – International Convention for the Prevention of Pollution from Ships
mg/kg – milligram/kilogram
mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NOEC – No Observed Effect Concentration
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
PC – Chemical Product category
PEL – Permissible Exposure Limit
ppm – parts per million
PROC – Process category
REACH – REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
STEL – Short Term Exposure Limit
SU – Sector of Use category

Key literature references and sources for data
www.ChemADVISOR.com/

Revision Note
Not applicable

This safety data sheet complies with the requirements of Regulation (EC) No. 453/2010

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **GEM™ GP**

Revision Date: 24-Mar-2014

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: GEM™ GP
Synonyms: None
Chemical Family: Glycol Ether
Application: Shale stabilizer

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Polyethylene glycol butyl ether	9004-77-7	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed.

4. FIRST AID MEASURES

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

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	330
Flash Point/Range (C):	166
Flash Point Method:	PMCC
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0 , PPE: D

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Storage Information Store away from oxidizers. Store away from acids. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.

Hand Protection Impervious rubber gloves. Nitrile gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Yellow to brown
Odor:	Mild
pH:	6.5 - 9
Specific Gravity @ 20 C (Water=1):	1.012
Density @ 20 C (lbs./gallon):	8.4
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	260
Boiling Point/Range (C):	126
Freezing Point/Range (F):	Not Determined **Max:** < 10
Freezing Point/Range (C):	-45 **Max.** < -12
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Miscible
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	7.3
Partition Coefficient/n-Octanol/Water:	0.436
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	Keep away from heat, sparks and flame.
Incompatibility (Materials to Avoid)	Strong oxidizers. Mineral acids.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation	May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Eye Contact	Causes eye damage.
Skin Contact	May cause skin irritation.
Ingestion	Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyethylene glycol butyl ether	9004-77-7	> 5000 mg/kg (Rat) > 2000 mg/kg (Rat)	6540 mg/kg (Rat) 3540 mg/kg (Rabbit) (similar substance – 2-(2-(2-butoxyethoxy)ethoxy)ethanol)	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: EC50: 475 ppm (Abra alba)
Acute Crustaceans Toxicity: TLM48: 310 mg/l (Acartia tonsa)
Acute Algae Toxicity: EC50: 391 mg/l (Skeletonema costatum)

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Polyethylene glycol butyl ether	9004-77-7	EC50: 391 mg/l (Skeletonema costatum) EC50(72h): 391 mg/L (growth rate) (Skeletonema costatum)	EC50: 475 ppm (Abra alba) LC50(96h): > 1000 - >1800 mg/L (Scophthalmus maximus)	IC50(16h): > 5000 mg/L (Growth inhibition, Activated sludge) (similar substance – 2-(2-(2-butoxyethoxy)ethoxy)ethanol) EC10(30m): > 1995 mg/L (respiration rate, activated sludge) (similar substance – 2-(2-(2-butoxyethoxy)ethoxy)ethanol)	TLM48: 310 mg/l (Acartia tonsa) EC50(48h): > 3200 mg/L (Daphnia magna) (similar substance – ethanol, 2-butoxy-, manufacture of, by-products from)

12.2 Persistence and degradability

Readily biodegradable

Substances	Persistence and Degradability
Polyethylene glycol butyl ether	Readily biodegradable (69% @ 28d)

12.3 Bioaccumulative potential

Does not bioaccumulate

Substances	Log Pow
Polyethylene glycol butyl ether	0.436

12.4 Mobility in soil

No information available

12.5 Results of PBT and vPvB assessment

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels:	None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Glycol ether
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory All components listed on inventory or are exempt.

WHMIS Hazard Class D2B Toxic Materials

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

Section 1: Product & Company Information

Product Name: Geovis XT

Chemical Family: Diutan Gum

Product Use: Oilfield Drilling Fluid

Workplace Hazardous Materials Information Systems Data (WHMIS):

	Class ID	Class	Workplace Hazard
	None	Not a Controlled Product	

Manufacturer Name: Bri-Chem Supply Ltd.

Address: Bay 4, 5510 - 3rd Street SE, Calgary, AB T2H 1J9 Canada

General Phone Number: (403)252-5904 / Emergency Contact: Chemtrec - 800-424-9300 (24/7)

General Fax Number: (403) 252-0041

MSDS Revision Date: March 13, 2013

Supercedes: March 24, 2010

Prepared By: Bri-Chem Supply Ltd.

Preparer's Phone: (403)252-5904 / Emergency Contact: Chemtrec - 800-424-9300 (24/7)

Section 2: Composition/Information on Ingredients

Chemical Name	Concentration	CAS#
Diutan Gum		125005-87-0

Section 3: Hazards Identification

Emergency Overview: Remove material from eyes, skin and clothing. In case of doubt, or if symptoms persist, seek medical attention. Launder heavily contaminated clothing before re-use.

Routes of Entry:

Skin Contact: Yes

Skin Absorption: No

Eye Contact: No

Inhalation: Yes

Ingestion: No

Potential Health Effects:

Skin: Prolonged contact with dry powder may cause drying or chapping.

Eye: Dry powder may cause foreign body irritation in some individuals.

Inhalation: Hygroscopic properties of the gum can form a paste or gel in the airway. Inhalation of dust may cause respiratory tract irritation. Excessive inhalation of dust may cause coughing and sneezing.

Ingestion: Not toxic if swallowed (less than a mouthfull), based on available information.

Section 4: First Aid Measures

Eye Contact: Hold eyelids apart and flush eyes with a steady, gentle stream of water for several minutes. If eye irritation persists, seek medical attention.

Skin Contact: Wash off with soap and plenty of water.

Inhalation: Remove patient to fresh air. If not breathing, administer artificial respiraton, and seek medical attention.

Ingestion: No significant adverse health effects are expected to develop, if only small amounts (less than a mouthful) are swallowed.

Other First Aid: Remove material from eyes, skin and clothing. In case of doubt, or if symptoms persist, seek medical attention. Launder heavily contaminated clothing before re-use.

Section 5: Fire Fighting Measures

Conditions Of Flammability: Treat as a Class A fire. Product will burn when in contact with a flame. Self-extinguishes when ignition source is removed. Tends to smoulder.

Extinguishing Media: Water, dry chemical, Carbon Dioxide (CO_2)

Flashpoint:

Upper Flammable Limit:

Lower Flammable Limit:

Autoignition Temperature:

Protective Equipment: Can contain sufficent fine material to cause a combustible dust explosion. Do not breathe smoke, gases, or vapours generated.

Sensitivity To Impact or Static Discharge:

Hazardous Combustion Products: Carbon dioxide (CO_2) carbon monoxide (CO)

Fire Comment: As in any fire, wear self-contained breathing apparatus (SCBA) pressure-demand, MSHA/NIOSH-approved, or equivalent, and full protective gear.

Slip hazard exists when spilled material becomes wet.

Section 6: Accidental Release Measures

Personnel Precautions: Use proper personal protective equipment as listed in section 8.

Spill Cleanup Measures: Extremely slippery when wet. Use vacuum equipment designed specifically for combustible dust. Take precautionary measures against static discharges. The use of water washdown is not recommended, unless the spilled material is already wet.

Section 7: Handling & Storage

Handling: Avoid dust formation. Provide appropriate exhaust ventilation in places where dust is formed. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid conditions that generate airborne dust in handling, transfer, and clean-up. Product may form combustible dust-air mixtures. Keep away from heat, flames, sparks, and other ignition sources. Avoid emptying package in or near flammable vapours. Static charges may cause flash fire. Remove material from eyes, skin, and clothing.

Storage: Store in a cool (10-27°C), dry (<65% relative humidity) place in a sealed container. Avoid storing near incompatible materials. (See Section 10.)

Section 8: Exposure Controls, Personal Protection, Exposure Guidelines

Engineering Controls: Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits in this section. The use of local mechanical exhaust ventilation is preferred at sources of air contamination such as open process equipment.

Personal Protective Equipment: Gloves are recommended if extended exposure is anticipated. This product does not cause significant eye irritation or eye toxicity requiring special protection. Where there is significant potential for eye contact, wear chemical goggles and have eye flushing equipment available. Although this product does not present a significant skin concern, minimize skin contamination by following good industrial practice.

Respiratory Protection: Avoid breathing dust. Use NIOSH/MSHA-approved respiratory protection equipment, when airborne exposures exceed established guidelines. Consult the respirator manufacturer to determine appropriate type equipment for a given application. Observe respirator use limitations specified by NIOSH or the manufacturer.

Exposure Limits:

Chemical Name	ACGIH TLV-TWA	OSHA PEL-TWA
Diutan Gum		15 mg/m^3 (total dust); 5 mg/m^3 (respirable)

Section 9: Physical & Chemical Properties

Physical State:	Solid
Odour And Appearance:	White to tan powder; slight odour
Odour Threshold:	Not determined
Boiling Point:	Not available
Evaporation Rate:	Not applicable
Melting Point:	Decomposes from approxima
Freezing Point:	Not applicable
Specific Gravity:	Not available
Solubility in Water:	
Vapour Density:	Not applicable
Vapour Pressure:	Not applicable
pH:	Approximately neutral (as 1% solution)
Flash Point:	
Volatility (% by volume):	Not applicable
Coefficient of Water to Oil distribution:	Not applicable

Section 10: Stability & Reactivity

Chemical Stability:	Yes
Hazardous Polymerization:	Will not occur.
Conditions Of Chemical Instability:	
Incompatible Substances:	Avoid strong oxidizing agents.
Special Decomposition Products:	Carbon monoxide, carbon dioxide

Section 11: Toxicological Information

Chemical Name	LD_{50} (Oral Rat)	LD_{50} (Dermal Rabbit)	LC_{50} (Inhalation Rat)
Diutan Gum	>5000 mg/kg		>5mg/L 4 hr

Effects Of Acute Exposure:

Effects Of Chronic Exposure: No adverse effects observed in long-term feeding studies with rats (up to 1000mg/kg/day).

General Irritancy Of Product: Dry powder may cause foreign body irritation in some individuals. Prolonged contact with dry powder may cause dryness or chapping of the skin. Excessive inhalation of dust may be annoying and can mechanicaly impede respiration.

Sensitization: None

Carcinogenicity: None

Reproductive Toxicity: None

Teratogenicity: None

Embryotoxicity: Not Available

Mutagenicity: None

Synergistic Products: None

Section 12: Ecological Information

Ecotoxicity: Not Available

Environmental Fate: Not Available

Section 13: Disposal Considerations

Waste Disposal: Dispose in accordance with local, provincial, and national regulations. Liquids may be sewered in accordance with regulations, if care is taken to avoid plugging or blocking of sewer systems, recognizing that these materials are intended to increase viscosity and form gels. Dry or wet solid material can be landfilled in accordance with applicable regulations. As a carbohydrate, this material is readily biodegradable, when at low concentrations, in a biological wastewater treatment plant.

Section 14: Transport Information

TDG Classification: Not hazardous

DOT UN Number:

Shipping Notes:

Section 15: Regulatory Information

Workplace Hazardous Materials Information Systems Data (WHMIS):

	Class ID	Class	Workplace Hazard
	None	Not a Controlled Product	

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

Section 16: Additional Information

MSDS Revision Date: March 13, 2013

MSDS Revision Notes:

MSDS Author: Bri-Chem Supply Ltd.

Disclaimer: This Health and Safety Information is correct to the best of our knowledge and belief at the date of its publication but we cannot accept liability for any loss, injury or damage which may result from its use. We shall ensure, so far as is reasonably practicable, that any revision of this Data Sheet is sent to all customers to whom we have directly supplied this substance, but must point out that it is the responsibility of any intermediate supplier to ensure that such revision is passed to the ultimate user. The information given in the Data Sheet is designed only as a guidance for safe handling, storage and the use of the substance. It is not a specification nor does it guarantee any specific properties. All chemicals should be handled only by competent personnel, within a controlled environment. Should further information be required, this can be obtained through the sales office whose address is at the top of this data sheet.

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **PAC™-L**

Revision Date: 20-Dec-2012

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: PAC™-L
Synonyms: None
Chemical Family: Carbohydrate
Application: Fluid Loss Additive

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Polysaccharide		60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	430
Flash Point/Range (C):	221
Flash Point Method:	Not Determined
Autoignition Temperature (F):	752
Autoignition Temperature (C):	400
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust. Avoid dust accumulations. Slippery when wet.

Storage Information Store away from oxidizers. Store in a dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	White to off white
Odor:	Odorless
pH:	6.5-9 (1%)
Specific Gravity @ 20 C (Water=1):	1.6
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	40-55
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Forms gel
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause mild respiratory irritation.
Skin Contact	May cause mild skin irritation.
Eye Contact	May cause mild eye irritation.
Ingestion	None known
Aggravated Medical Conditions	None known.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	LD50: 1260 mg/kg (Rat)
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Readily biodegradable
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity:	TLM96: > 500 mg/l (Golden orfe)
Acute Crustaceans Toxicity:	Not determined
Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels:	None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information	For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **POTASSIUM HYDROXIDE - SOLID**

Revision Date: 20-Nov-2012

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: POTASSIUM HYDROXIDE - SOLID
Synonyms: None
Chemical Family: Hydroxide
Application: pH Control

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Potassium hydroxide	1310-58-3	60 - 100%	2 mg/m^3	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory burns. May be fatal if swallowed.

4. FIRST AID MEASURES

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

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media	All standard firefighting media.
Special Exposure Hazards	Not applicable.
Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.
NFPA Ratings:	Health 3, Flammability 0, Reactivity 1
HMIS Ratings:	Health 3, Flammability 0, Reactivity 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	Prevent from entering sewers, waterways, or low areas.
Procedure for Cleaning / Absorption	Neutralize to pH of 6-8. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions	Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.
Storage Information	Store in a cool well ventilated area. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use in a well ventilated area.
Respiratory Protection	Dust/mist respirator. (N95, P2/P3)
Hand Protection	Impervious rubber gloves. Nitrile gloves. Neoprene gloves. Butyl rubber gloves.
Skin Protection	Rubber apron.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Clear White
Odor:	Odorless
pH:	Not Determined
Specific Gravity @ 20 C (Water=1):	2.04
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	Not Determined

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	0
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	56.11

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Strong acids. Peroxides. Aldehydes. Anhydrides. Amphoteric metals such as aluminum, magnesium, lead, tin, or zinc. Leather or wool.
Hazardous Decomposition Products	Flammable hydrogen gas.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Causes severe respiratory burns. May cause lungs to fill with fluids.
Skin Contact	Causes severe burns.
Eye Contact	May cause eye burns.
Ingestion	Causes burns of the mouth, throat and stomach.
Aggravated Medical Conditions	Skin disorders.
Chronic Effects/Carcinogenicity	Prolonged, excessive exposure may cause erosion of the teeth.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	LD50: 365 mg/kg (Rat)
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined

Genotoxicity: Not determined

Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: 251,200 ppm (Mysidopsis bahia) SPP @ 3 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

UN1813, Potassium Hydroxide, Solid, 8, II
RQ (Potassium hydroxide - 454 kg)
NAERG 154

Canadian TDG
Potassium Hydroxide, Solid, 8, UN1813, II

ADR

UN1813, Potassium Hydroxide, Solid, 8, II

Air Transportation

ICAO/IATA

UN1813, Potassium Hydroxide, Solid, 8, II
RQ (Potassium hydroxide - 454 kg)

Sea Transportation

IMDG

UN1813, Potassium Hydroxide, Solid, 8, II
RQ (Potassium hydroxide - 454 kg)
EmS F-A, S-B

Other Transportation Information

Labels: Corrosive

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	EPA Reportable Spill Quantity is 1000 Pounds based on Potassium hydroxide (CAS: 1310-58-3).
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	E Corrosive Material

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

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*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **POTASSIUM CHLORIDE**

Revision Date: 25-Jul-2013

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: POTASSIUM CHLORIDE
Synonyms: None
Chemical Family: Inorganic Salt
Application: Brine

Manufacturer/Supplier
Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Potassium chloride	7447-40-7	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media	All standard firefighting media.
Special Exposure Hazards	Not applicable.
Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.
NFPA Ratings:	Health 1, Flammability 0, Reactivity 0
HMIS Ratings:	Health 1, Flammability 0, Physical Hazard 0 , PPE: B

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	Prevent from entering sewers, waterways, or low areas.
Procedure for Cleaning / Absorption	Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions	Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid breathing vapors.
Storage Information	Store in a cool, dry location. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use in a well ventilated area.
Respiratory Protection	Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Dust proof goggles.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	White to gray
Odor:	Odorless

pH:	~7
Specific Gravity @ 20 C (Water=1):	1.99
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	72.8
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	771
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	25.5
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	74.55

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	None known.
Hazardous Decomposition Products	None known.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.

Sympotoms related to exposure

Inhalation	May cause respiratory irritation.
Skin Contact	May cause skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	May cause abdominal pain, vomiting, nausea, and diarrhea. Irritation of the mouth, throat, and stomach.
Aggravated Medical Conditions	Skin disorders.
Chronic Effects/Carcinogenicity	No data available to indicate product or components present at greater than 1% are chronic health hazards.
Other Information	None known.

Toxicity Tests

Oral Toxicity:	LD50: > 5000 mg/kg (Rat)
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Not determined
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not determined

Ecotoxicological Information

Acute Fish Toxicity:	Not determined
Acute Crustaceans Toxicity:	TLM96: 100-330 ppm (Crangon crangon)
Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.
Contaminated Packaging	Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels:	None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D2B Toxic Materials

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **SODA ASH**

Revision Date: 24-Mar-2014

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: SODA ASH
Synonyms: None
Chemical Family: Carbonate
Application: Buffer

Manufacturer/Supplier
Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Sodium carbonate	497-19-8	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Lower (oz./ft3):	
Flammability Limits in Air - Upper (%):	Not Determined
Flammability Limits in Air - Upper (oz./ft3):	

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 2, Flammability 0, Reactivity 0
HMIS Ratings: Health 2, Flammability 0, Physical Hazard 0 , PPE: B

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from acids. Store in a cool, dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Localized ventilation should be used to control dust levels.

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Dust proof goggles.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	White
Odor:	Odorless
pH:	11.5
Specific Gravity @ 20 C (Water=1):	2.5
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	48- 62
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Partially soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	105.99

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid None anticipated

Incompatibility (Materials to Avoid) Strong acids.

Hazardous Decomposition Products Carbon monoxide and carbon dioxide.

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation	May cause respiratory irritation.
Eye Contact	May cause eye irritation
Skin Contact	Prolonged or repeated contact may cause skin irritation.
Ingestion	Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 1% are chronic health hazards.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium carbonate	497-19-8	4090 mg/kg (Rat) 2800 mg/kg (Rat)	2210 mg/kg (Mouse) > 2000 mg/kg (Rabbit)	LC50: 2.3 mg/L (Rat) 2h

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: TLM24: 385 mg/l (Lepomis macrochirus)
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium carbonate	497-19-8	EC50: 242 mg/L (Nitzschia)	TLM24: 385 mg/l (Lepomis macrochirus) LC50: 310-1220 mg/L (Pimephales promelas) LC50(96h): 300 mg/L (Lepomis macrochirus)	No information available	EC50: 265 mg/L (Daphnia magna) EC50(48h): 200 – 227 mg/L (Ceriodaphnia sp.)

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

Substances	Persistence and Degradability
Sodium carbonate	The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Does not bioaccumulate

Substances	Log Pow
Sodium carbonate	0

12.4 Mobility in soil

No information available

12.5 Results of PBT and vPvB assessment

No information available.

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels:	None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

SAFETY DATA SHEET

Soltex® Additive

Version 2.10 Revision Date 2015-11-25

according to GB/T 16483 and GB/T 17519

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Product information

Product Name	:	Soltex® Additive
Material	:	1079530, 1016807
Use	:	Drilling Mud Additive
Company	:	Chevron Phillips Chemical Company LP Drilling Specialties Company LLC 10001 Six Pines Drive The Woodlands, TX 77380
Local	:	See Company Address

Emergency telephone:

Health:
866.442.9628 (North America)
1.832.813.4984 (International)
Transport:
CHEMTREC 1.800.424.9300 (within USA and Canada) or 703.527.3887 (outside USA and Canada)
Asia: +800 CHEMCALL (+800 2436 2255) China:+86-21-22157316
EUROPE: BIG +32.14.584545 (phone) or +32.14583516 (telefax)
South America SOS-Cotec Inside Brazil: 0800.111.767 Outside Brazil: +55.19.3467.1600

Responsible Department	:	Product Safety and Toxicology Group
E-mail address	:	SDS@CPChem.com
Website	:	www.CPChem.com

SECTION 2: Hazards identification

Classification of the substance or mixture
GHS Classification and Labeling: Follow GB 13690, GB 15258 and GB 30000.2 to GB 30000.29 (GHS 2011)

Emergency Overview

Danger

Form: Powder **Physical state**: Solid **Color**: Black **Odor**: No odor

Hazards : May cause cancer by inhalation.

Classification

: Carcinogenicity, Category 1A, Inhalation

Labeling

Symbol(s) :

Signal Word : Danger

Hazard Statements : H350i: May cause cancer by inhalation.

Precautionary Statements : **Prevention:**
P261: Avoid breathing dust.
P281: Use personal protective equipment as required.

SECTION 3: Composition/information on ingredients

Synonyms : Drilling Mud Additive

Molecular formula : Mixture

Chemical Name	CAS-No. / EINECS-No.	Concentration [wt%]
Crystalline Silica	14808-60-7	0.1 - 1

SECTION 4: First aid measures

General advice : Move out of dangerous area. Show this material safety data sheet to the doctor in attendance.

If inhaled : If unconscious place in recovery position and seek medical advice. If symptoms persist, call a physician.

In case of eye contact : Flush eyes with water as a precaution. Remove contact lenses. Protect unharmed eye. Keep eye wide open while rinsing. If eye irritation persists, consult a specialist.

If swallowed : Keep respiratory tract clear. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician. Take victim immediately to hospital.

SECTION 5: Firefighting measures

Flash point	:	Not applicable
Autoignition temperature	:	Not applicable
Unsuitable extinguishing media	:	High volume water jet.
Specific hazards during fire fighting	:	Risks of ignition followed by flame propagation or secondary explosions can be caused by the accumulation of dust, e.g. on floors and ledges.
Special protective equipment for fire-fighters	:	Wear self-contained breathing apparatus for firefighting if necessary.
Further information	:	Standard procedure for chemical fires. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Fire and explosion protection	:	Avoid dust formation. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Provide appropriate exhaust ventilation at places where dust is formed.
Hazardous decomposition products	:	Carbon oxides. Sulfur oxides.

SECTION 6: Accidental release measures

Personal precautions	:	Use personal protective equipment. Avoid dust formation. Avoid breathing dust.
Environmental precautions	:	Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods for cleaning up	:	Pick up and arrange disposal without creating dust. Clean up promptly by sweeping or vacuum. Keep in suitable, closed containers for disposal.
Additional advice	:	Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air).

SECTION 7: Handling and storage

Handling

Advice on safe handling	:	Avoid formation of respirable particles. Do not breathe vapors/dust. Avoid exposure - obtain special instructions before use. Avoid contact with skin and eyes. For personal

protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Dispose of rinse water in accordance with local and national regulations.
Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary, but may not by themselves be sufficient.

Advice on protection against fire and explosion : Avoid dust formation. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Provide appropriate exhaust ventilation at places where dust is formed.

Storage

Requirements for storage areas and containers : Keep container tightly closed in a dry and well-ventilated place. Electrical installations / working materials must comply with the technological safety standards.

SECTION 8: Exposure controls/personal protection

Ingredients with workplace control parameters

CN

Ingredients	Basis	Value	Control parameters	Note
Crystalline Silica	GBZ 2.1-2007	PC-TWA	0.7 mg/m3	G1, Respirable
	GBZ 2.1-2007	PC-TWA	1 mg/m3	G1, Total
	GBZ 2.1-2007	PC-TWA	0.2 mg/m3	G1, Respirable
	GBZ 2.1-2007	PC-TWA	0.5 mg/m3	G1, Total
	GBZ 2.1-2007	PC-TWA	0.3 mg/m3	G1, Respirable
	GBZ 2.1-2007	PC-TWA	0.7 mg/m3	G1, Total
	GBZ 2.1-2007	PC-TWA	0.5 mg/m3	G1, Total dust
	GBZ 2.1-2007	PC-TWA	0.2 mg/m3	G1, (respirable dust)
	GBZ 2.1-2007	PC-TWA	0.7 mg/m3	G1, Total dust
	GBZ 2.1-2007	PC-TWA	0.3 mg/m3	G1, (respirable dust)
	GBZ 2.1-2007	PC-TWA	1 mg/m3	G1, Total dust
	GBZ 2.1-2007	PC-TWA	0.7 mg/m3	G1, (respirable dust)

G1 G1 - Carcinogenic to humans

Engineering measures

Adequate ventilation to control airborned concentrations below the exposure guidelines/limits. Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Personal protective equipment

Respiratory protection : Wear a supplied-air NIOSH approved respirator unless ventilation or other engineering controls are adequate to maintain minimal oxygen content of 19.5% by volume under normal atmospheric pressure. Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as:. Air-Purifying Respirator for Dusts and Mists / P100. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not

known, or other circumstances where air-purifying respirators may not provide adequate protection.

Hand protection	:	The suitability for a specific workplace should be discussed with the producers of the protective gloves. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Eye protection	:	Eye wash bottle with pure water. Safety glasses.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. Wear as appropriate:. Protective suit. Safety shoes.
Hygiene measures	:	When using do not eat or drink. When using do not smoke. Wash hands before breaks and at the end of workday. When using do not eat or drink. When using do not smoke. Wash hands before breaks and at the end of workday.

SECTION 9: Physical and chemical properties

Information on basic physical and chemical properties

Appearance

Form	:	Powder
Physical state	:	Solid
Color	:	Black
Odor	:	No odor
Odor Threshold	:	Not applicable

Safety data

Flash point	:	Not applicable
Lower explosion limit	:	No data available
Upper explosion limit	:	No data available
Oxidizing properties	:	No
Autoignition temperature	:	Not applicable
Molecular formula	:	Mixture
Molecular weight	:	No data available
pH	:	7 - 10
Pour point	:	Not applicable
Boiling point/boiling range	:	Not applicable

Vapor pressure	:	Not applicable
Relative density	:	Not applicable
Density	:	1.54 g/cm3
Water solubility	:	Partly soluble
Partition coefficient: n-octanol/water	:	No data available
Viscosity, kinematic	:	Not applicable
Relative vapor density	:	Not applicable
Evaporation rate	:	Not applicable

SECTION 10: Stability and reactivity

Chemical stability	:	This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions

Conditions to avoid	:	Generation of Dusts.
Hazardous decomposition products	:	Carbon oxides Sulfur oxides
Other data	:	No decomposition if stored and applied as directed.

SECTION 11: Toxicological information

CMR effects

Crystalline Silica	:	Carcinogenicity: Human carcinogen.

Soltex® Additive

Further information	:	Chronic Health Hazard.

SECTION 12: Ecological information

Elimination information (persistence and degradability)

Biodegradability	:	This material is not expected to be readily biodegradable.

Ecotoxicology Assessment

Additional ecological information	:	This material is not expected to be harmful to aquatic organisms.

SECTION 13: Disposal considerations

The information in this SDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

Product	:	Do not dispose of waste into sewer. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.
Contaminated packaging	:	Empty remaining contents. Dispose of as unused product. Do not re-use empty containers.

SECTION 14: Transport information

The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the SDS and the bill of lading.

US DOT (UNITED STATES DEPARTMENT OF TRANSPORTATION)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

IMO / IMDG (INTERNATIONAL MARITIME DANGEROUS GOODS)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

IATA (INTERNATIONAL AIR TRANSPORT ASSOCIATION)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

ADR (AGREEMENT ON DANGEROUS GOODS BY ROAD (EUROPE))

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

RID (REGULATIONS CONCERNING THE INTERNATIONAL TRANSPORT OF DANGEROUS GOODS (EUROPE))

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

ADN (EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE

OF DANGEROUS GOODS BY INLAND WATERWAYS)
NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SECTION 15: Regulatory information

Notification status

Europe REACH	:	On the inventory, or in compliance with the inventory
United States of America TSCA	:	On the inventory, or in compliance with the inventory
Canada DSL	:	On the inventory, or in compliance with the inventory
Australia AICS	:	On the inventory, or in compliance with the inventory
New Zealand NZIoC	:	On the inventory, or in compliance with the inventory
Japan ENCS	:	On the inventory, or in compliance with the inventory
Korea KECI	:	On the inventory, or in compliance with the inventory
Philippines PICCS	:	On the inventory, or in compliance with the inventory
China IECSC	:	On the inventory, or in compliance with the inventory

Other regulations : Law on Prevention and Control of Environment Pollution by Solid Waste, Regulation on the Safety Management of Hazardous Chemicals, Provisions on the Safe Use of Chemicals at Workplace, Rules for Classification and Labelling of Chemicals (GB 30000), Law on the Prevention and Control of Occupational Diseases

SECTION 16: Other information

Further information

Legacy SDS Number : 59370

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this SDS pertains only to the product as shipped.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Key or legend to abbreviations and acronyms used in the safety data sheet			
ACGIH	American Conference of Government Industrial Hygienists	LD50	Lethal Dose 50%
AICS	Australia, Inventory of Chemical Substances	LOAEL	Lowest Observed Adverse Effect Level

DSL	Canada, Domestic Substances List	NFPA	National Fire Protection Agency
NDSL	Canada, Non-Domestic Substances List	NIOSH	National Institute for Occupational Safety & Health
CNS	Central Nervous System	NTP	National Toxicology Program
CAS	Chemical Abstract Service	NZIoC	New Zealand Inventory of Chemicals
EC50	Effective Concentration	NOAEL	No Observable Adverse Effect Level
EC50	Effective Concentration 50%	NOEC	No Observed Effect Concentration
EGEST	EOSCA Generic Exposure Scenario Tool	OSHA	Occupational Safety & Health Administration
EOSCA	European Oilfield Specialty Chemicals Association	PEL	Permissible Exposure Limit
EINECS	European Inventory of Existing Chemical Substances	PICCS	Philippines Inventory of Commercial Chemical Substances
MAK	Germany Maximum Concentration Values	PRNT	Presumed Not Toxic
GHS	Globally Harmonized System	RCRA	Resource Conservation Recovery Act
>=	Greater Than or Equal To	STEL	Short-term Exposure Limit
IC50	Inhibition Concentration 50%	SARA	Superfund Amendments and Reauthorization Act.
IARC	International Agency for Research on Cancer	TLV	Threshold Limit Value
IECSC	Inventory of Existing Chemical Substances in China	TWA	Time Weighted Average
ENCS	Japan, Inventory of Existing and New Chemical Substances	TSCA	Toxic Substance Control Act
KECI	Korea, Existing Chemical Inventory	UVCB	Unknown or Variable Composition, Complex Reaction Products, and Biological Materials
<=	Less Than or Equal To	WHMIS	Workplace Hazardous Materials Information System
LC50	Lethal Concentration 50%		

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **STEELSEAL®**

Revision Date: 02-Jan-2013

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: STEELSEAL®
Synonyms: None
Chemical Family: Graphite
Application: Loss Circulation Material

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Calcined petroleum coke	64743-05-1	60 - 100%	Not applicable	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview
May cause eye and respiratory irritation. May cause delayed injury to lungs. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation
If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin
Wash with soap and water. Get medical attention if irritation persists.

Eyes
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion
Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician
Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	> 673
Flash Point/Range (C):	> 356
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Lower (oz./ft3):	0.07 - 0.12
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1, Flammability 0, Physical Hazard 0 , PPE: B

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust. Avoid dust accumulations. Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and dark procedures for low oxygen levels should be taken to ensure ample oxygen availability.

Storage Information Store away from oxidizers. Store in a dry location. Keep from heat, sparks, and open flames. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls A well ventilated area to control dust levels.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Dark gray
Odor:	Odorless
pH:	Not Determined
Specific Gravity @ 20 C (Water=1):	1.75
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	38-45
Boiling Point/Range (F):	7592
Boiling Point/Range (C):	4200
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	1
Vapor Density (Air=1):	0.4
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None known.
Incompatibility (Materials to Avoid)	Strong acids. Strong alkalis.
Hazardous Decomposition Products	Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation	May cause mild respiratory irritation.
Eye Contact	May cause eye irritation
Skin Contact	May cause mild skin irritation.
Ingestion	May cause mild gastric distress.

Chronic Effects/Carcinogenicity	Prolonged, excessive exposure to dust may cause pneumoconiosis, a lung disease caused by inhaling dust particles less than 0.5 micrometers into the lungs.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcined petroleum coke	64743-05-1	No data available	No data available	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Calcined petroleum coke	64743-05-1	ErL50(96h): > 1000 mg/L (Selenastrum capricornutum) NOELR(96h): > 1000 mg/L (Selenastrum capricornutum)	LL50(96h): > 1000 mg/L (Pimephales promelas)	No information available	EL50(48h): > 1000 mg/L (Daphnia magna)

12.2 Persistence and degradability
No information available

Substances	Persistence and Degradability
Calcined petroleum coke	The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential
Does not bioaccumulate

12.4 Mobility in soil
No information available

12.5 Results of PBT and vPvB assessment
No information available.

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Transportation Information

Labels:	None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	None
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	Does not apply.
NJ Right-to-Know Law	Does not apply.
PA Right-to-Know Law	Does not apply.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	Un-Controlled

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **TORQ-TRIM® II**

Revision Date: 04-Jan-2011

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: TORQ-TRIM® II
Synonyms: None
Chemical Family: Blend
Application: Lubricant

Manufacturer/Supplier
Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Isopropanol	67-63-0	30 - 60%	200 ppm	400 ppm
Diethanolamine	111-42-2	5 - 10%	2 mg/m^3	Not applicable

3. HAZARDS IDENTIFICATION

Hazard Overview
May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed. May be absorbed through the skin. Repeated overexposure may cause liver and kidney effects. Flammable.

4. FIRST AID MEASURES

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

Skin
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes
In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion
Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician
Not Applicable

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	65
Flash Point/Range (C):	18
Flash Point Method:	PMCC
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media Carbon Dioxide, Dry Chemicals, Foam.

Special Exposure Hazards May be ignited by heat, sparks or flames. Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 3, Reactivity 0
HMIS Ratings: Health 1, Flammability 3, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Remove ignition sources and work with non-sparking tools. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse. Ground and bond containers when transferring from one container to another.

Storage Information Store away from oxidizers. Keep from heat, sparks, and open flames. Keep container closed when not in use. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.
In high concentrations, supplied air respirator or a self-contained breathing apparatus.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Color:	Amber
Odor:	Alcohol
pH:	7-9 (1%1 IPA:3 H20)
Specific Gravity @ 20 C (Water=1):	0.89
Density @ 20 C (lbs./gallon):	7.4
Bulk Density @ 20 C (lbs/ft3):	Not Determined
Boiling Point/Range (F):	185
Boiling Point/Range (C):	85
Freezing Point/Range (F):	-5
Freezing Point/Range (C):	-21
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	2.4
Solubility in Water (g/100ml):	Partially soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	0.8
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	2.48
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	Keep away from heat, sparks and flame.
Incompatibility (Materials to Avoid)	Strong oxidizers.
Hazardous Decomposition Products	Oxides of nitrogen. Hydrocarbons. Carbon monoxide and carbon dioxide.
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Skin Contact	May cause skin irritation. May be absorbed through the skin and contribute to the symptoms listed under ingestion. May cause skin defatting with prolonged exposure.
Eye Contact	May cause eye irritation.
Ingestion	May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression.

Aggravated Medical Conditions Skin disorders. Central nervous system disorders.

Chronic Effects/Carcinogenicity Repeated overexposure may cause liver and kidney effects.

Other Information None known.

Toxicity Tests

Oral Toxicity: Not determined

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability BOD(28 Day): 98% of COD

Bio-accumulation Not determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 1600-3200 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: TLM48: 16.07 mg/l (Acartia tonsa)
Acute Algae Toxicity: EC50: 24 mg/l (Skeletonema costatum)

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

UN1219,Isopropanol Solution, 3, II, (18.3 C)
NAERG 128

Canadian TDG
Isopropanol Solution, 3, UN1219, II, (18.3 C)

ADR

UN1219,Isopropanol Solution, 3, II

Air Transportation

ICAO/IATA

UN1219,Isopropanol Solution, 3, II

Sea Transportation

IMDG

UN1219,Isopropanol Solution, 3, II, (18.3 C)
EmS F-E, S-D

Other Shipping Information

Labels:	Flammable Liquid

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard Fire Hazard
EPA SARA (313) Chemicals	This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Isopropanol//67-63-0
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does meet the criteria of a hazardous waste as defined by the US EPA, because of: Ignitability D001
California Proposition 65	All components listed do not apply to the California Proposition 65 Regulation.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.

WHMIS Hazard Class B2 Flammable Liquids
D2B Toxic Materials

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

NATIONAL OILWELL VARCO

Material Safety Data Sheet

Walnut Shells (All Grades)

I. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Walnut Shells (All Grades) **Date Revised:** 7/2010
Chemical Description: Nut Shell - Organic **CAS#:**

Supplier:

NOV FluidControl

4310 N Sam Houston Parkway East
Houston, Texas 77032 USA
Office: (713) 482-0500
Fax: (713) 482-0695
Company website: www.nov.com

Emergency Telephone Number:

CHEMTREC: 1-800-424-9300 or International +1-703-527-3887

II. COMPOSITION INFORMATION/HAZARDOUS INGREDIENTS

Composition Information:

Chemical Name	CAS Number	EINECS Number	Weight %	EU Classification
Walnut Shells				

Hazardous Ingredients:

Name	OSHA PEL	ACGIHTLV	Other Limits	% (Optional)
Nuisance Dust	15 mg/m3			.5%

III. PHYSICAL/CHEMICAL PROPERTIES

Boiling Point:	N/A
Specific Gravity (H2O = 1):	1.2
Vapor Pressure (mm Hg.):	N/A
Melting Point:	N/A
Vapor Density (AIR = 1):	N/A
Evaporation Rate (Buryl Acetate = 1):	N/A
Solubility in water:	Not water soluble
Appearance:	Light brown in color
Odor:	No odor

IV. FIRE & EXPLOSION HAZARD DATA

Flash Point: 380° F
Flammable Limits: 470° F LEL: N/A UEL: N/A
Extinguishing Media: Water
Special Fire Fighting Procedures: None other than source of water.
Unusual Fire & Explosion Hazards: If improperly handled, stored, and/or exposed to an ignition source, this material may burn.

V. STABILITY & REACTIVITY

Stability:
Stable under normal conditions.

Hazardous Polymerization:
Will not occur

VI. HEALTH HAZARD DATA

Routes of Entry: Inhalation

Health Hazard (Acute & Chronic):
No acute hazards known.

Carcinogenicity:
Nut shell is not listed as a carcinogen.

Signs & Symptoms of Exposure:
N/A

Medical Conditions Aggravated by Exposure:
N/A

Emergency & First Aid Procedures:

Flush eyes with water for at least 15 minutes to remove dust particles.

VII. SPILL & DISPOSAL PROCEDURES

Steps to be taken in case material is released/spilled:
Treat as any non-hazardous material.

Waste Disposal Method:
No special requirements.

VIII. HANDLING & STORAGE

Precautions to be Taken in Handling and Storing:
No special requirements.

Other Precautions:
No special requirements.

IX. CONTROL MEASURES

Respiratory Protection: N/A
Ventilation: Local exhaust: nuisance dust levels
Protective Gloves: Not required
Eye Protection: Safety glasses with side shields
Other protective clothing or equipment: None required
Work/Hygienic Practices: Vacuum, sweep or shovel up.

Hazard Ratings: Health = 1 Fire = 0 Reactivity = 0 Special/Equipment = 0

DISCLAIMER:
Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, NOV FluidControl, makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the person receiving this MSDS will make own determination as to its suitability for their intended purpose prior to use. Since the product is within the exclusive control of the user, it is the user's obligation to determine the conditions of safe use of this product. Such conditions should comply with all Federal Regulations concerning the Product. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER NATURE ARE MADE HERUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

For further information contact:

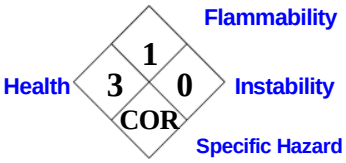
NOV FluidControl
4310 N Sam Houston Parkway East
Houston, Texas 77032 USA
Office: (713) 482-0500
Fax: (713) 482-0695
Company website: www.nov.com

Material Safety Data Sheet

Section 1. Chemical Product and Company Identification

Product Name	**X-CIDE® 207 INDUSTRIAL MICROBIOCIDE**	**Code**	XC207
Supplier	Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. (77478) P.O. Box 5050 Sugar Land, TX 77487-5050 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400	**Version**	3.0
Material Uses	Microbiocide	**Effective Date**	**4/24/2006**
24 Hour Emergency Numbers	CHEMTREC 800-424-9300 (U.S. 24 hour) Baker Petrolite 800-231-3606 (001)281-276-5400 CANUTEC 613-996-6666 (Canada 24 hours) CHEMTREC Int'l 01-703-527-3887 (International 24 hour)	**Print Date**	4/24/2006
			® a trademark of Baker Hughes, Inc.

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



Section 2. Hazards Identification

Physical State and Appearance	State: Granular. Solid., Color: Tan. Red., Odor: Mild.
CERCLA Reportable Quantity	Not applicable.
Hazard Summary	DANGER. May cause chronic effects. May be corrosive to eyes, skin and respiratory tract. Contains a component that may cause cancer. May cause skin sensitization (allergic reaction).
Routes of Exposure	Skin (Contact), Eyes, Inhalation.
Potential acute health effects	
Eyes	May be corrosive to the eyes. May cause eye burns and permanent eye injury.
Skin	May be corrosive. Skin contact may produce burns. Skin sensitizer. May cause allergic skin reactions with repeated exposure.
Inhalation	May be irritating to lungs.
Ingestion	Not considered a likely route of exposure, however, may be corrosive if swallowed.
Medical Conditions aggravated by Exposure	Exposure to this product may aggravate medical conditions involving the following: respiratory tract, skin/epithelium, eyes.
See Toxicological Information (section 11)	
Additional Hazard Identification Remarks	Not available.

Continued on Next Page

Section 3. Composition and Information on Ingredients

Name	CAS #	% by Weight
Diatomaceous earth, calcined	91053-39-3	30 - 60
Magnesium nitrate	10377-60-3	5 - 10
5-chloro-2-methyl-4-isothiazolin-3-one	26172-55-4	5 - 10
Magnesium chloride	7786-30-3	1 - 5
2-Methyl-4-isothiazolin-3-one	2682-20-4	1 - 5
Crystalline silica: cristobalite	14464-46-1	0.1 - 1
Crystalline silica: Quartz (SiO2)	14808-60-7	0.1 - 1

See Section 8 for information on permissible exposure limits and threshold limit values.

Section 4. First Aid Measures

Eye Contact	Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 20-60 minutes while holding the eyelid(s) open. Get medical attention immediately.
Skin Contact	Remove contaminated clothing and shoes immediately. Wash affected area with soap and mild detergent and large amounts of lukewarm, gently flowing water until no evidence of chemical remains (for at least 20-60 minutes). Get medical attention if irritation occurs.
Inhalation	Remove to fresh air. Oxygen may be administered if breathing is difficult. If not breathing, administer artificial respiration and seek medical attention. Get medical attention if symptoms appear.
Ingestion	Get medical attention immediately. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Wash out mouth with water if person is conscious. Never induce vomiting or give anything by mouth to a victim who is unconscious or having convulsions.
Notes to Physician	Not available.
Additional First Aid Remarks	Not available.

Section 5. Fire Fighting Measures

Flammability of the Product	Not regulated as flammable or combustible.
OSHA Flammability Class	IIIB
Products of Combustion	These products are carbon oxides (CO, CO_2), Hydrogen chloride fumes, nitrogen oxides (NO, NO_2 etc.), Oxides of silicon, Oxides of magnesium, sulfur oxides (SO_2, SO_3 etc.), Aluminum oxides (AlOx), Oxides of iron..
Fire Hazards in Presence of Various Substances	Open Flames/Sparks/Static. Heat.
Fire Fighting Media and Instructions	In case of fire, use foam, dry chemicals, or CO2 fire extinguishers. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and public waterways.
Protective Clothing (Fire)	Do not enter fire area without proper personal protective equipment, including NIOSH approved self-contained breathing apparatus.
Special Remarks on Fire Hazards	Avoid temperature extremes. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Hazardous combustion products may include hydrogen chloride, carbon monoxide, carbon dioxide and oxides of nitrogen and sulfur.

Continued on Next Page

Section 6. Accidental Release Measures

Spill	Put on appropriate personal protective equipment. Evacuate surrounding areas, if necessary. Vacuum or carefully scoop up spilled materials and place in an appropriate container for disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.
Other Statements	Not applicable.
Additional Accidental Release Measures Remarks	Not available.

Section 7. Handling and Storage

Handling and Storage	Put on appropriate personal protective equipment. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors or dusts. Use only with adequate ventilation. Store in a dry, cool and well ventilated area. Keep away from incompatibles. Keep container tightly closed and dry.
Additional Handling and Storage Remarks	Not available.

Section 8. Exposure Controls/Personal Protection

Exposure Limits	Diatomaceous earth, calcined	**ACGIH (United States).** TWA: 10 mg/m^3 TWA: 3 mg/m^3 **OSHA (United States).** TWA: 15 mg/m^3 TWA: 5 mg/m^3
	Magnesium nitrate	Not available.
	5-chloro-2-methyl-4-isothiazolin-3-one	**Manufacturer. (United States).** TWA: 0.076 mg/m^3 STEL: 0.23 mg/m^3
	Magnesium chloride	Not available.
	2-Methyl-4-isothiazolin-3-one	**Manufacturer. (United States).** TWA: 1.5 mg/m^3 STEL: 4.5 mg/m^3
	Crystalline silica: cristobalite	**ACGIH (United States). Notes: Respirable** TWA: 0.025 mg/m^3 8 hour/hours. **OSHA PEL 1989 (United States).** TWA: 0.05 mg/m^3 8 hour/hours.
	Crystalline silica: Quartz (SiO2)	**ACGIH (United States). Notes: Respirable** TWA: 0.025 mg/m^3 8 hour/hours. **OSHA PEL 1989 (United States).** TWA: 0.1 mg/m^3 8 hour/hours.

Continued on Next Page

Additional Information on Exposure Limits	The OSHA Exposure Limit for cristobalite has been revoked. The OSHA Exposure Limit for quartz has been revoked. The OSHA permissible exposure levels shown above are the OSHA 1989 levels or from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Petrolite Corporation recommends that these lower exposure levels be observed as reasonable worker protection.
Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors or particles below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection

Personal Protective Equipment recommendations are based on anticipated known manufacturing and use conditions. These conditions are expected to result in only incidental exposure. A thorough review of the job tasks and conditions by a safety professional is recommended, however, to determine the level of personal protective equipment appropriate for these job tasks and conditions.

Eyes	Chemical safety goggles. Use full face shield if splashes could occur.
Body	Wear long sleeves and chemical resistant apron to prevent repeated or prolonged skin contact.
Respiratory	Respirator use is not expected to be necessary under normal conditions of use. In poorly ventilated areas, emergency situations or if exposure levels are exceeded, use NIOSH approved full face respirator.
Hands	Chemical resistant gloves. Nitrile gloves. Butyl rubber gloves.
Feet	Chemical resistant boots or overshoes.
Other information	Not available.

Additional Exposure Control Remarks	Substance may be harmful if swallowed. In extreme cases (ingestion) may cause liver and/or kidney damage.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Granular. Solid.	**Odor**	Mild.
pH	Not available.	**Color**	Tan. Red.

Specific gravity	0.714 - 0.726
Density	5.95 - 6.05 lbs/gal
Flash Points	Closed cup: >93.4°C (200°F). (SFCC)
Flammable Limits	L.E.L. Not available. U.E.L. Not available.
Autoignition Temperature	Not available.
Initial Boiling Point	Not available.
Boiling Point	Not available.
Vapor Density	>1 (Air = 1)
Vapor Pressure	15.8 - mm Hg @ 21°C (70°F) Calculated Value for all Components.
Evaporation Rate	Not Available or Not Applicable for Solids.
VOC	Not available.
Viscosity	Not available.
Pour Point	-20ºF (-29ºC)
Solubility (Water)	Dispersible
Physical Chemical Comments	Not available.

Continued on Next Page

Section 10. Stability and Reactivity

Stability and Reactivity	The product is stable.
Conditions of Instability	Not available.
Incompatibility with Various Substances	Oxidizing material.
Hazardous Decomposition Products	Not applicable.
Hazardous Polymerization	Hazardous polymerization is not expected to occur.
Special Stability & Reactivity Remarks	Not available.

Section 11. Toxicological information

Component Toxicological Information

Acute Animal Toxicity

Diatomaceous earth, calcined	Not available.
Magnesium nitrate	ORAL (LD50): Acute: 500 to 5000 mg/kg [Human].
5-chloro-2-methyl-4-isothiazolin-3-one	Not available.
Magnesium chloride	ORAL (LD50): Acute: 4700 mg/kg [Mouse]. 2800 mg/kg [Rat].
2-Methyl-4-isothiazolin-3-one	Not available.
Crystalline silica: cristobalite	Not available.
Crystalline silica: Quartz (SiO2)	Not available.

Chronic Toxicity Data

1) Diatomaceous earth, calcined

Not available.

2) Magnesium nitrate

Repeated small oral doses of nitrate may cause weakness, depression, headache and mental impairment. Magnesium nitrate is a methemoglobin-forming agent, chronic exposure may effect the ability of the blood carry oxygen causing the lips and skin to turn blue. Magnesium nitrate has not been evaluated for its carcinogenicity in humans or animals. Generally, nitrates can be reduced to nitrites, under anaerobic conditions (without oxygen), and nitrites can react with amines to form carcinogenic N-nitrosamines (Reprotext).

3) 5-chloro-2-methyl-4-isothiazolin-3-one

Not available.

4) Magnesium chloride

Continued on Next Page

Magnesium chloride is a component of this product. Magnesium chloride has caused chromosome abberrations in human cells, but was not mutagenic in mouse or hamster cells. Magnesium chloride was inactive for inducing DNA damage in the B. subtillis rec assay. (Micromedex)

5) 2-Methyl-4-isothiazolin-3-one

Not available.

6) Crystalline silica: cristobalite

Silica crystalline as Cristobalite is a component of this product. Cristobalite is listed by NTP as a suspect carcinogen, by OSHA as a possible carcinogen, and by IARC as a possible carcinogen. Silica exists in several forms, but only the crystalline materials produce the chronic pulmonary condition termed specifically silicosis. Chronic inhalation of airborne crystalline silica dust may lead to fibrotic lung disease, silicosis or cancer (based on animal studies and limited evidence of carcinogenicity in humans).

An inhalation study in humans at a dose of 16 mppcf/8H/17.9Y intermittent produced toxic effects to the lungs, thorax, or respiration resulting in fibrosis, focal (pneumoconiosis), cough and dyspnea (RTECS).

An intratracheal (inside the airway tube between the voice box and chest cavity) dose of 200 mg/kg in rats produced lung, thorax, or respiration effects resulting in fibrosis, focal (pneumoconiosis).(RTECS) An intrapleural (inside the membrane lining of the lung cavity) dose of 90, and 100 mg/kg in rats produced tumors, and blood lymphomas (malignant but treatable cancer) including Hodgkin's disease (a type of lymphoma cancer). (RTECS)

7) Crystalline silica: Quartz (SiO_2)

Crystalline silica as quartz is a component of this product. Prolonged inhalation of respirable crystalline quartz may cause delayed chronic lung injury - silicosis. Silicosis is a form of disabling pulmonary fibrosis which can be progressive and may lead to death. Silicosis may progress without further exposure to silica (Hathaway et al, 1991). Chronic inhalation of silica dust suppressed the immune response in mice (Scheuchenzuber et al, 1985), and a decreased immune response has also been shown in silicotics (Barlogova et al, 1981). The effect of silica on the immune mechanism may be mediated by its toxicity to pulmonary macrophages, a critical component of the immune response, and may have implications for the increased susceptibility of silicotics to respiratory infections, particularly tuberculosis. Inhaled crystalline silica particles induced several signs of pulmonary injury and inflammation in rats exposed to an airborne concentration of 50 mg/m3 for 6 hours per day for 5 days (Driscoll et al, 1991).

IARC (International Agency for Research on Cancer) rates crystalline silica as a "Probable Human Carcinogen" (Group 2A). The US NTP (National Toxicology Program) rates respirable crystalline silica as an "Anticipated Carcinogen".

Silica has been inactive for inducing DNA damage in the B. subtilis rec assay (Kanematsu et al, 1980), chromosome damage or sister chromatid exchanges in hamster cells (Price-Jones et al, 1980), chromosome damage in human cells (Oshimura et al, 1984), in vitro oncogenic transformation of hamster cells into cancer cells (Oshimura et al, 1984), and induction of micronuclei in mouse bone marrow (Vanchugova et al, 1985). Crystalline silica has caused DNA strand breaks in vitro; etching the surface with hydrofluoric acid reduced this activity.

At the time of this review, no reproductive studies were found for silica in humans. Few reproductive data are available for silica. As a component of welding fume, it caused infertility and fetal death in rats (Dabrowski et al, 1966). Intratracheal instillation of silica prolonged the estrus cycle in rats (Parsadanian, 1967). So-called "soluble silica" was tested for reproductive effects in rats, but the results were not available at the time of this review (Smith et al, 1973).

Product Toxicological Information

Acute Animal Toxicity	DERMAL (LD50): Acute: >5000 mg/kg [Rabbit].
Target Organs	respiratory tract, skin/epithelium, eyes.

Continued on Next Page

Other Adverse Effects	Eye Irritation Score = 4 (Extreme Irritant/Corrosive). Skin Irritation Score = 4 (Extreme Irritant/Corrosive). Prolonged exposure to silica may cause a lung disease called silicosis. Symptoms of silicosis include pain in the chest, coughing and tiring after slight excursions.

Section 12. Ecological Information

Ecotoxicity	X-CIDE® 207 INDUSTRIAL MICROBIOCIDE	Sheepshead minnow (LC50)	96 hour/hours 9.2 mg/l
BOD5 and COD	Not available.		
Biodegradable/OECD	Not available.		
Toxicity of the Products of Biodegradation	Not available.		
Special Remarks	An EcoTox™ Report, and/or the material's environmental fate is available upon request at the following number: 1-800-235-4249, then press 4.		

Section 13. Disposal Considerations

Responsibility for proper waste disposal rests with the generator of the waste. Dispose of any waste material in accordance with all applicable federal, state and local regulations. Note that these regulations may also apply to empty containers, liners and rinsate. Processing, use, dilution or contamination of this product may cause its physical and chemical properties to change.

Additional Waste Remarks	Not available.

Section 14. Transport Information

DOT Classification	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (Contains: 5-Chloro-2-methyl-4-isothiazolin-3-one, 2-Methyl-4-isothiazolin-3-one), 8, UN3261, II	
DOT Reportable Quantity	Not applicable.	
Marine Pollutant	Not applicable.	
Additional DOT Information	Not available.	
Emergency Response Guide Page Number	154	

Section 15. Regulatory Information

HCS Classification	Target organ effects. Corrosive. Sensitizer. Contains a component that may cause cancer..
U.S. Federal Regulations	

Continued on Next Page

Environmental Regulations	Extremely Hazardous Substances: Not applicable to any components in this product. SARA 313 Toxic Chemical Notification and Release Reporting: Magnesium nitrate; SARA 302/304 Emergency Planning and Notification substances: Not applicable to any components in this product. Hazardous Substances (CERCLA 302): Not applicable to any components in this product. SARA 311/312 MSDS distribution - chemical inventory - hazard identification: immediate health hazard; delayed health hazard; Clean Water Act (CWA) 307 Priority Pollutants: Not applicable to any components in this product. Clean Water Act (CWA) 311 Hazardous Substances: Not applicable to any components in this product. Clean Air Act (CAA) 112(r) Accidental Release Prevention Substances: Not applicable to any components in this product.
Threshold Planning Quantity (TPQ)	Not applicable.
TSCA Inventory Status	All components are included or are exempted from listing on the US Toxic Substances Control Act Inventory. This product contains the following components that are subject to the reporting requirements of TSCA Section 12(b) if exported from the United States: 5-chloro-2-methyl-4-isothiazolin-3-one; 2-Methyl-4-isothiazolin-3-one.
State Regulations	State specific information is available upon request from Baker Petrolite.
International Regulations	
Canada	All components are compliant with or are exempted from listing on the Canadian Domestic Substance List.
WHMIS (Canada)	D-2A, E
European Union	All components are included or are exempted from listing on the European Inventory of Existing Commercial Chemical Substances or the European List of Notified Chemical Substances.
	International inventory status information is available upon request from Baker Petrolite for the following countries: Australia, China, Korea (TCCL), Philippines (RA6969), or Japan.
Other Regulatory Information	This product is subject to regulation under the US Federal Insecticide, Fungicide and Rodenticide ACT (FIFRA) and is therefore exempt from US Toxic Substance Control Act (TSCA) Inventory listing requirements. EPA Registration No. 10707-44. Offshore Chemical Notification Scheme (OCNS) rating: Group A O-VII

Section 16. Other Information

Other Special Considerations	File 59 07/16/03 - Change to Section 15. 04/12/06 - Changes to Sections 2, 3, 5, 8, 9 and 15 04/24/06 - Change to Section 8.

In April, 2005, a number of format changes were made. The most notable of these were switching Sections 2 and 3, moving the exposure limits to Section 8, and moving the flash point from Section 5 to Section 9.

Baker Petrolite Disclaimer

Continued on Next Page

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Petrolite, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

EXHIBIT C

Toxicity Estimate Spreadsheets

2% KCL/BDF-499™/GEM™ GP
Toxicity Estimate

	Test concentration (lb/bbl)	Proposed Max Concentration (lb/bbl)	Proposed Max Concentration (ppm)	96 Hour LC50 (ppm SPP)[1,2]	Proposed Max Concentration (ppm) / LC50	Specific Gravity[2]	Notes
2% KCL/BDF-499™/GEM™ GP							
2% KCL/BDF-499™/GEM™ GP (Whole mud system)	567.64[1]	567.64[1]	1,000,000	1,000,000	1.00E+00	N/A	
Base Mud Total				**1,000,000**	**1.00E+00**		
Contingency Additives[3]							
CON DET® PREMIX	10	0.5% volume	5,300	196,200	2.70E-02	1.06	Tested in generic mud #7
STEELSEAL®	10	20.0	99,969	1,000,000	1.00E-01	1.75	Tested in generic mud #7
BARACARB®	20	20.0	13,500	328,300	4.11E-02	2.70	Tested in 11.5ppg PETROFREE LE
BARO-TROL® PLUS	8	4.0	16,224	577,500	2.81E-02	1.42	Tested in 15% NaCl HYDRO-GUARD
SOLTEX®	4	2.0	7,700	250,000	3.08E-02	1.54	Tested in 2% KCl/BDF-499/GEM GP
TORQ-TRIM® II	1% volume	1% volume	8,900	87,400	1.02E-01	0.89	Tested in KCl-Polymer
DESCO®[4]	N/A	15	8,000	30,000	2.67E-01	1.60	No test results available, so 30,000 ppm SPP used
Wallnut M	10	15.0	51,413	1,000,000	5.14E-02	1.20	Tested in generic mud #7
Extra additives included in additive component bioassay tests							
ADD NEW BIOASSAY DATA HERE							
ADD NEW BIOASSAY DATA HERE							
Additive Total[5]				**1,000,000**	**6.47E-01**		
Fluid System Total[6]				**607,199**	**1.65E+00**		

Notes:

[1] Concentration is the whole system (0.905 bbl freshwater X 42 gal/bbl X 8.5 lbs/gal plus the weight [lbs/bbl]of each component).

[2] For conversion of lb/bbl to ppm. Obtained from material safety data sheets; averaged if range provided.

[3] Furie does not anticipate the use of all contingency additives at the same time but has assumed such for a worst-case toxicity analysis.

[4] LC50 test results currently unavailable for DESCO®. A conservative 30,000 ppm SPP LC50 was entered for calcuation of system toxicity.

[5] The additive total exceeded 1,000,000 because the proposed concentrations were significantly less than the LC50 concentrations for all additives. The "Additive Total" value was amended to 1,000,000 to maintain a conservative calcuation for the Fluid System Total

[6] Total LC50 for system is calculated using Standard Equation A:

1000000 / X (estimated LC50 of total system in ppm) = mud concentration(ppm) / mud LC50(ppm) + additive concentration (ppm) / LC50 additive (ppm)

Acronyms

LC50: median lethal concentration
lb/bbl: pounds per barrel
gal/bbl: gallons per barrel
ppm: parts per million
SPP: suspended particulate phase

Updates for additional additives per Section 5.1:

Date: _____

Initials: _____

AQUAGEL® /Freshwater Spud Mud
Toxicity Estimate

	Test concentration (lb/bbl)	Proposed Max Concentration (lb/bbl)	Proposed Max Concentration (ppm)	96 Hour LC50 (ppm SPP)	Proposed Max Concentration (ppm) / LC50	Specific Gravity[2]	Notes
AQUAGEL® /Freshwater Spud Mud							
AQUAGEL®Freshwater Spud Mud (Whole mud system)	415.74[1]	415.74[1]	1,000,000	1,000,000	1.00E+00	N/A	
Base Mud Total				**1,000,000**	**1.00E+00**		
Contingency Additives[3]							
CON DET® PREMIX	10	0.5% volume	5,300	196,200	2.70E-02	1.06	Tested in generic mud #7
BARACARB®	20	50.0	385,596	328,300	1.17E+00	2.70	Tested in 11.5ppg PETROFREE LE
BARO-TROL® PLUS	8	2.0	8,112	577,500	1.40E-02	1.42	Tested in 15% NaCl HYDRO-GUARD
SOLTEX®	4	2.0	8,797	250,000	3.52E-02	1.54	Tested in 2% KCl/BDF-499/GEM GP
TORQ-TRIM® II	1% volume	1% volume	8,900	87,400	1.02E-01	0.89	Tested in KCl-Polymer
DESCO®[4]	1	1.0	4,570	30,000	1.52E-01	1.60	No test results available, so 30,000 ppm SPP used
Extra additives included in additive component bioassay tests							
ADD NEW BIOASSAY DATA HERE							
ADD NEW BIOASSAY DATA HERE							
Additive Total				**664,479**	**1.50E+00**		
Fluid System Total[5]				**399,211**	**2.50E+00**		

Notes:

[1] Concentration is the whole system (0.905 bbl freshwater X 42 gal/bbl X 8.5 lbs/gal plus the weight [lbs/bbl]of each component).

[2] For conversion of lb/bbl to ppm. Obtained from material safety data sheets; averaged if range provided.

[3] Furie does not anticipate the use of all contingency additives at the same time but has assumed such for a worst-case toxicity analysis.

[4] LC50 test results currently unavailable for DESCO®. A conservative 30,000 ppm SPP LC50 was entered for calcuation of system toxicity.

[5] Total LC50 for system is calculated using Standard Equation A:

1000000 / X (estimated LC50 of total system in ppm) = mud concentration(ppm) / mud LC50(ppm) + additive concentration (ppm) / LC50 additive (ppm)

Acronyms

LC50: median lethal concentration
lb/bbl: pounds per barrel
gal/bbl: gallons per barrel
ppm: parts per million
SPP: suspended particulate phase

Updates for additional additives per Section 5.1:

Date: _____

Initials: _____

Laboratory Report of Analysis

To: Furie Operating Alaska, LLC (Escopeta)
1029 West 3rd Ave, Suite 500
Anchorage, AK 99501
409-370-5624

Report Number: **1162534**

Client Project: **05DK1602**

Dear Leslie Martin,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Stephen at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Stephen Ede Date
Project Manager
Stephen.Ede@sgs.com

Print Date: 05/27/2016 4:26:38PM

Case Narrative

SGS Client: **Furie Operating Alaska, LLC (Escopeta)**
SGS Project: **1162534**
Project Name/Site: **05DK1602**
Project Contact: **Leslie Martin**

Refer to sample receipt form for information on sample condition.

1162534002MSD (1326263) MSD

300.0 - Anions - MSD recovery for fluoride is outside of QC criteria (111%). Refer to LCS for accuracy requirements.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

Print Date: 05/27/2016 4:26:39PM

Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
D	The analyte concentration is the result of a dilution.
DF	Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
F	Indicates value that is greater than or equal to the DL
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
JL	The analyte was positively identified, but the quantitation is a low estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
M	A matrix effect was present.
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
Q	QC parameter out of acceptance range.
R	Rejected
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

SGS North America Inc. 200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

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Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
Effluent	1162534001	05/20/2016	05/20/2016	Water (Surface, Eff., Ground)
PIWA	1162534002	05/20/2016	05/20/2016	Drinking Water

Method	Method Description
SM21 2320B	Alkalinity as CaCO3 w/ PIWA
SM21 5210B	Biochemical Oxygen Demand SM21 5210B
SM21 2510B	Conductivity SM2510B w/ PIWA
SM21 2340B	Hardness as CaCO3 by ICP-MS
EPA 300.0	Ion Chromatographic Analysis w/ PIWA
EP200.8	Metals in Water by ICP-MS PIWA
SM21 4500-H B	pH Analysis w/ PIWA
SM21 2540C	Total Dissolved Solids SM182540C w/PIWA
SM21 2540D	Total Suspended Solids SM20 2540D

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Detectable Results Summary

Client Sample ID: **Effluent**
Lab Sample ID: 1162534001
Microbiology Laboratory
Waters Department

Parameter	Result	Units
Biochemical Oxygen Demand	57.0	mg/L
Total Suspended Solids	107	mg/L

Client Sample ID: **PIWA**
Lab Sample ID: 1162534002
Metals by ICP/MS
Private Individual Analysis

Parameter	Result	Units
Hardness as CaCO3	84.7	mg/L
Alkalinity	78.8	mg/L
Aluminum	16.1J	ug/L
Arsenic	5.81	ug/L
Barium	25.9	ug/L
Calcium	22800	ug/L
Chloride	27.3	mg/L
Conductivity	271	umhos/cm
Copper	17.2	ug/L
Fluoride	0.0910J	mg/L
HCO3 Alkalinity	78.8	mg/L
Iron	266	ug/L
Lead	0.250	ug/L
Magnesium	6720	ug/L
Manganese	214	ug/L
Nickel	1.40J	ug/L
pH	7.80	pH units
Sodium	18000	ug/L
Sulfate	10.0	mg/L
Zinc	29.2	ug/L

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200 West Potter Drive, Anchorage, AK 99518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

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Results of **Effluent**

Client Sample ID: **Effluent**
Client Project ID: **05DK1602**
Lab Sample ID: 1162534001
Lab Project ID: 1162534

Collection Date: 05/20/16 06:58
Received Date: 05/20/16 12:29
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Microbiology Laboratory**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Biochemical Oxygen Demand	57.0		2.00	2.00	mg/L	1		05/20/16 17:10

Batch Information

Analytical Batch: BOD5449
Analytical Method: SM21 5210B
Analyst: K.W
Analytical Date/Time: 05/20/16 17:10
Container ID: 1162534001-A

Print Date: 05/27/2016 4:26:45PM

J flagging is activated

Results of **Effluent**

Client Sample ID: **Effluent**
Client Project ID: **05DK1602**
Lab Sample ID: 1162534001
Lab Project ID: 1162534

Collection Date: 05/20/16 06:58
Received Date: 05/20/16 12:29
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by **Waters Department**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Suspended Solids	107		10.0	3.10	mg/L	1		05/24/16 16:06

Batch Information

Analytical Batch: STS5045
Analytical Method: SM21 2540D
Analyst: MBS
Analytical Date/Time: 05/24/16 16:06
Container ID: 1162534001-B

Print Date: 05/27/2016 4:26:45PM

J flagging is activated

Results of **PIWA**

Client Sample ID: **PIWA**
Client Project ID: **05DK1602**
Lab Sample ID: 1162534002
Lab Project ID: 1162534

Collection Date: 05/20/16 07:10
Received Date: 05/20/16 12:29
Matrix: Drinking Water
Solids (%):
Location:

Results by

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Total Dissolved Solids	170		10.0	3.10	mg/L	1	(<500)	05/25/16 10:05

Batch Information

Analytical Batch: STS5046
Analytical Method: SM21 2540C
Analyst: MBS
Analytical Date/Time: 05/25/16 10:05
Container ID: 1162534002-A

Print Date: 05/27/2016 4:26:45PM

J flagging is activated

Results of **PIWA**

Client Sample ID: **PIWA**
Client Project ID: **05DK1602**
Lab Sample ID: 1162534002
Lab Project ID: 1162534

Collection Date: 05/20/16 07:10
Received Date: 05/20/16 12:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Hardness as CaCO3	84.7		5.00	5.00	mg/L	1		05/26/16 10:41

Batch Information

Analytical Batch: MMS9371
Analytical Method: SM21 2340B
Analyst: VDL
Analytical Date/Time: 05/26/16 10:41
Container ID: 1162534002-C

Prep Batch: MXX29775
Prep Method: E200.2
Prep Date/Time: 05/23/16 09:45
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 05/27/2016 4:26:45PM

J flagging is activated

Results of **PIWA**

Client Sample ID: **PIWA**
Client Project ID: **05DK1602**
Lab Sample ID: 1162534002
Lab Project ID: 1162534

Collection Date: 05/20/16 07:10
Received Date: 05/20/16 12:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Private Individual Analysis**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Aluminum	16.1	J	20.0	6.20	ug/L	1		05/26/16 10:41
Antimony	0.500	U	1.00	0.310	ug/L	1	(<6)	05/26/16 10:41
Arsenic	5.81		5.00	1.50	ug/L	1	(<10)	05/26/16 10:41
Barium	25.9		3.00	0.940	ug/L	1	(<2000)	05/26/16 10:41
Cadmium	0.250	U	0.500	0.150	ug/L	1	(<5)	05/26/16 10:41
Calcium	22800		500	150	ug/L	1		05/26/16 10:41
Chromium	1.00	U	2.00	0.620	ug/L	1	(<100)	05/26/16 10:41
Copper	17.2		1.00	0.310	ug/L	1	(<1000)	05/26/16 10:41
Iron	266		250	78.0	ug/L	1	(<300)	05/26/16 10:41
Lead	0.250		0.200	0.0620	ug/L	1	(<15)	05/26/16 10:41
Magnesium	6720		50.0	15.0	ug/L	1		05/26/16 10:41
Manganese	214	*	1.00	0.310	ug/L	1	(<50)	05/26/16 10:41
Nickel	1.40	J	2.00	0.620	ug/L	1	(<100)	05/26/16 10:41
Selenium	2.50	U	5.00	1.50	ug/L	1	(<50)	05/26/16 10:41
Silver	0.500	U	1.00	0.310	ug/L	1	(<100)	05/26/16 10:41
Sodium	18000		500	150	ug/L	1	(<250000)	05/26/16 10:41
Thallium	0.500	U	1.00	0.310	ug/L	1	(<2)	05/26/16 10:41
Zinc	29.2		5.00	2.50	ug/L	1	(<5000)	05/26/16 10:41

Batch Information

Analytical Batch: MMS9371
Analytical Method: EP200.8
Analyst: VDL
Analytical Date/Time: 05/26/16 10:41
Container ID: 1162534002-C

Prep Batch: MXX29775
Prep Method: E200.2
Prep Date/Time: 05/23/16 09:45
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Chloride	27.3		0.100	0.0310	mg/L	1	(<250)	05/24/16 20:10
Fluoride	0.0910	J	0.100	0.0310	mg/L	1	(<2)	05/24/16 20:10
Sulfate	10.0		0.100	0.0310	mg/L	1	(<250)	05/24/16 20:10

Batch Information

Analytical Batch: WIC5541
Analytical Method: EPA 300.0
Analyst: ACF
Analytical Date/Time: 05/24/16 20:10
Container ID: 1162534002-A

Prep Batch: WXX11508
Prep Method: METHOD
Prep Date/Time: 05/24/16 15:13
Prep Initial Wt./Vol.: 10 mL
Prep Extract Vol: 10 mL

Print Date: 05/27/2016 4:26:45PM

J flagging is activated

Results of **PIWA**

Client Sample ID: **PIWA**
Client Project ID: **05DK1602**
Lab Sample ID: 1162534002
Lab Project ID: 1162534

Collection Date: 05/20/16 07:10
Received Date: 05/20/16 12:29
Matrix: Drinking Water
Solids (%):
Location:

Results by **Private Individual Analysis**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Alkalinity	78.8		10.0	3.10	mg/L	1		05/20/16 18:36
CO3 Alkalinity	5.00	U	10.0	3.10	mg/L	1		05/20/16 18:36
HCO3 Alkalinity	78.8		10.0	3.10	mg/L	1		05/20/16 18:36
OH Alkalinity	5.00	U	10.0	3.10	mg/L	1		05/20/16 18:36

Batch Information

Analytical Batch: WTI4456
Analytical Method: SM21 2320B
Analyst: ACF
Analytical Date/Time: 05/20/16 18:36
Container ID: 1162534002-A

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Conductivity	271		1.00	0.477	umhos/cm	1		05/20/16 18:36

Batch Information

Analytical Batch: WTI4455
Analytical Method: SM21 2510B
Analyst: ACF
Analytical Date/Time: 05/20/16 18:36
Container ID: 1162534002-A

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
pH	7.80		0.100	0.100	pH units	1	(6.5-8.5)	05/20/16 18:36

Batch Information

Analytical Batch: WTI4454
Analytical Method: SM21 4500-H B
Analyst: ACF
Analytical Date/Time: 05/20/16 18:36
Container ID: 1162534002-A

Print Date: 05/27/2016 4:26:45PM

J flagging is activated

Method Blank

Blank ID: MB for HBN 1734489 [BOD/5449]
Blank Lab ID: 1325477

QC for Samples:
1162534001

Matrix: Water (Surface, Eff., Ground)

Results by **SM21 5210B**

Parameter	Results	LOQ/CL	DL	Units
Biochemical Oxygen Demand	2.00U	2.00	2.00	mg/L

Batch Information

Analytical Batch: BOD5449
Analytical Method: SM21 5210B
Instrument:
Analyst: K.W
Analytical Date/Time: 5/20/2016 5:10:00PM

Print Date: 05/27/2016 4:26:47PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1162534 [BOD5449]
Blank Spike Lab ID: 1325478
Date Analyzed: 05/20/2016 17:10

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162534001

Results by **SM21 5210B**

	Blank Spike (mg/L)			
Parameter	Spike	Result	Rec (%)	CL
Biochemical Oxygen Demand	198	192	97	(84.6-115.4

Batch Information

Analytical Batch: **BOD5449**
Analytical Method: **SM21 5210B**
Instrument:
Analyst: **K.W**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 198 mg/L Extract Vol: 300 mL
Dupe Init Wt./Vol.: Extract Vol:

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Method Blank

Blank ID: MB for HBN 1734696 [MXX/29775]
Blank Lab ID: 1325591

QC for Samples:
1162534002

Matrix: Water (Surface, Eff., Ground)

Results by **EP200.8**

Parameter	Results	LOQ/CL	DL	Units
Aluminum	10.0U	20.0	6.20	ug/L
Antimony	0.500U	1.00	0.310	ug/L
Arsenic	2.50U	5.00	1.50	ug/L
Barium	1.50U	3.00	0.940	ug/L
Cadmium	0.250U	0.500	0.150	ug/L
Calcium	250U	500	150	ug/L
Chromium	1.00U	2.00	0.620	ug/L
Copper	0.500U	1.00	0.310	ug/L
Iron	125U	250	78.0	ug/L
Lead	0.100U	0.200	0.0620	ug/L
Magnesium	25.0U	50.0	15.0	ug/L
Manganese	0.500U	1.00	0.310	ug/L
Nickel	1.00U	2.00	0.620	ug/L
Selenium	2.50U	5.00	1.50	ug/L
Silver	0.500U	1.00	0.310	ug/L
Sodium	250U	500	150	ug/L
Thallium	0.500U	1.00	0.310	ug/L
Zinc	2.50U	5.00	2.50	ug/L

Batch Information

Analytical Batch: MMS9371
Analytical Method: EP200.8
Instrument: Perkin Elmer Nexlon P5
Analyst: VDL
Analytical Date/Time: 5/26/2016 9:47:27AM

Prep Batch: MXX29775
Prep Method: E200.2
Prep Date/Time: 5/23/2016 9:45:48AM
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 05/27/2016 4:26:51PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1162534 [MXX29775]
Blank Spike Lab ID: 1325592
Date Analyzed: 05/26/2016 09:50

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162534002

Results by **EP200.8**

	Blank Spike (ug/L)			
Parameter	Spike	Result	Rec (%)	CL
Aluminum	1000	1070	107	(85-115)
Antimony	1000	1000	100	(85-115)
Arsenic	1000	1020	102	(85-115)
Barium	1000	989	99	(85-115)
Cadmium	100	103	103	(85-115)
Calcium	10000	10300	103	(85-115)
Chromium	400	417	104	(85-115)
Copper	1000	1020	102	(85-115)
Iron	5000	5070	101	(85-115)
Lead	1000	1030	103	(85-115)
Magnesium	10000	11400	114	(85-115)
Manganese	500	510	102	(85-115)
Nickel	1000	1020	102	(85-115)
Selenium	1000	992	99	(85-115)
Silver	100	91.7	92	(85-115)
Sodium	10000	11300	113	(85-115)
Thallium	10	10.0	100	(85-115)
Zinc	1000	1020	102	(85-115)

Batch Information

Analytical Batch: **MMS9371**
Analytical Method: **EP200.8**
Instrument: **Perkin Elmer Nexlon P5**
Analyst: **VDL**

Prep Batch: **MXX29775**
Prep Method: **E200.2**
Prep Date/Time: **05/23/2016 09:45**
Spike Init Wt./Vol.: 1000 ug/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 05/27/2016 4:26:52PM

Matrix Spike Summary

Original Sample ID: 1325598
MS Sample ID: 1325599 MS
MSD Sample ID:

QC for Samples: 1162534002

Analysis Date: 05/26/2016 11:58
Analysis Date: 05/26/2016 12:01
Analysis Date:
Matrix: Drinking Water

Results by **EP200.8**

		Matrix Spike (ug/L)			Spike Duplicate (ug/L)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Aluminum	10.0U	1000	969	97				70-130		
Antimony	0.500U	1000	1030	103				70-130		
Arsenic	2.50U	1000	1010	101				70-130		
Barium	1.50U	1000	1000	100				70-130		
Cadmium	0.250U	100	104	104				70-130		
Calcium	250U	10000	10300	103				70-130		
Chromium	1.00U	400	411	103				70-130		
Copper	21.1	1000	1020	100				70-130		
Iron	230J	5000	5320	102				70-130		
Lead	0.601	1000	1050	105				70-130		
Magnesium	25.0U	10000	10800	108				70-130		
Manganese	0.314J	500	491	98				70-130		
Nickel	1.00U	1000	1010	101				70-130		
Selenium	2.50U	1000	1010	101				70-130		
Silver	0.500U	100	106	106				70-130		
Sodium	60900	10000	71900	110				70-130		
Thallium	0.500U	10.0	10	100				70-130		
Zinc	3.87J	1000	997	99				70-130		

Batch Information

Analytical Batch: MMS9371
Analytical Method: EP200.8
Instrument: Perkin Elmer NexIon P5
Analyst: VDL
Analytical Date/Time: 5/26/2016 12:01:54PM

Prep Batch: MXX29775
Prep Method: DW Digest for Metals on ICP-MS
Prep Date/Time: 5/23/2016 9:45:48AM
Prep Initial Wt./Vol.: 20.00mL
Prep Extract Vol: 50.00mL

Print Date: 05/27/2016 4:26:53PM

Method Blank

Blank ID: MB for HBN 1734844 [STS/5045]
Blank Lab ID: 1326006

QC for Samples:
1162534001

Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2540D**

Parameter	Results	LOQ/CL	DL	Units
Total Suspended Solids	0.500U	1.00	0.310	mg/L

Batch Information

Analytical Batch: STS5045
Analytical Method: SM21 2540D
Instrument:
Analyst: MBS
Analytical Date/Time: 5/24/2016 4:06:15PM

Print Date: 05/27/2016 4:26:56PM

Duplicate Sample Summary

Original Sample ID: 1162519005
Duplicate Sample ID: 1326009
QC for Samples:

Analysis Date: 05/24/2016 16:06
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2540D**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Suspended Solids	7800	7750	mg/L	0.64	(< 5)

Batch Information

Analytical Batch: STS5045
Analytical Method: SM21 2540D
Instrument:
Analyst: MBS

Print Date: 05/27/2016 4:26:57PM

Duplicate Sample Summary

Original Sample ID: 1162519006
Duplicate Sample ID: 1326010
QC for Samples:
1162534001

Analysis Date: 05/24/2016 16:06
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2540D**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Suspended Solids	8850	8800	mg/L	0.57	(< 5)

Batch Information

Analytical Batch: STS5045
Analytical Method: SM21 2540D
Instrument:
Analyst: MBS

Print Date: 05/27/2016 4:26:57PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1162534 [STS5045]
Blank Spike Lab ID: 1326007
Date Analyzed: 05/24/2016 16:06

Spike Duplicate ID: LCSD for HBN 1162534 [STS5045]
Spike Duplicate Lab ID: 1326008
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162534001

Results by **SM21 2540D**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Suspended Solids	50	48.8	98	50	49.3	99	(75-125)	1.00	(< 5)

Batch Information

Analytical Batch: **STS5045**
Analytical Method: **SM21 2540D**
Instrument:
Analyst: **MBS**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 50 mg/L Extract Vol: 1000 mL
Dupe Init Wt./Vol.: 50 mg/L Extract Vol: 1000 mL

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Method Blank

Blank ID: MB for HBN 1734871 [STS/5046]
Blank Lab ID: 1326152

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1162534002

Results by **SM21 2540C**

Parameter	Results	LOQ/CL	DL	Units
Total Dissolved Solids	5.00U	10.0	3.10	mg/L

Batch Information

Analytical Batch: STS5046
Analytical Method: SM21 2540C
Instrument:
Analyst: MBS
Analytical Date/Time: 5/25/2016 10:05:33AM

Print Date: 05/27/2016 4:26:59PM

Duplicate Sample Summary

Original Sample ID: 1162491001
Duplicate Sample ID: 1326155
QC for Samples:

Analysis Date: 05/25/2016 10:05
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2540C**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Dissolved Solids	303	294	mg/L	3.00	(< 5)

Batch Information

Analytical Batch: STS5046
Analytical Method: SM21 2540C
Instrument:
Analyst: MBS

Print Date: 05/27/2016 4:27:00PM

Duplicate Sample Summary

Original Sample ID: 1162491002
Duplicate Sample ID: 1326156
QC for Samples:
1162534002

Analysis Date: 05/25/2016 10:05
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2540C**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Total Dissolved Solids	518	484	mg/L	6.80*	(< 5)

Batch Information

Analytical Batch: STS5046
Analytical Method: SM21 2540C
Instrument:
Analyst: MBS

Print Date: 05/27/2016 4:27:00PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1162534 [STS5046]
Blank Spike Lab ID: 1326153
Date Analyzed: 05/25/2016 10:05

Spike Duplicate ID: LCSD for HBN 1162534 [STS5046]
Spike Duplicate Lab ID: 1326154
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162534002

Results by **SM21 2540C**

	Blank Spike (mg/L)			Spike Duplicate (mg/L)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Total Dissolved Solids	330	321	97	330	326	99	(75-125)	1.50	(< 5)

Batch Information

Analytical Batch: **STS5046**
Analytical Method: **SM21 2540C**
Instrument:
Analyst: **MBS**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 330 mg/L Extract Vol: 100 mL
Dupe Init Wt./Vol.: 330 mg/L Extract Vol: 100 mL

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Duplicate Sample Summary

Original Sample ID: 1167928002
Duplicate Sample ID: 1325538
QC for Samples:
1162534002

Analysis Date: 05/20/2016 18:11
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	5.00	4.90	pH units	2.00	(< 5)

Batch Information

Analytical Batch: WTI4454
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: ACF

Print Date: 05/27/2016 4:27:04PM

Duplicate Sample Summary

Original Sample ID: 1162534002
Duplicate Sample ID: 1325544
QC for Samples:
1162534002

Analysis Date: 05/20/2016 18:45
Matrix: Drinking Water

Results by **SM21 4500-H B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
pH	7.80	7.80	pH units	0.00	(< 5)

Batch Information

Analytical Batch: WTI4454
Analytical Method: SM21 4500-H B
Instrument: Titration
Analyst: ACF

Print Date: 05/27/2016 4:27:04PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1162534 [WTI4454]
Blank Spike Lab ID: 1325535
Date Analyzed: 05/20/2016 16:58

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162534002

Results by **SM21 4500-H B**

Blank Spike (pH units)

Parameter	Spike	Result	Rec (%)	CL
pH	7	7.03	100	(99-101)

Batch Information

Analytical Batch: **WTI4454**
Analytical Method: **SM21 4500-H B**
Instrument: **Titration**
Analyst: **ACF**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 7 pH units Extract Vol: 1 mL
Dupe Init Wt./Vol.: Extract Vol:

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Method Blank

Blank ID: MB for HBN 1734502 [WTI/4455]
Blank Lab ID: 1325545

QC for Samples:
1162534002

Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2510B**

Parameter	Results	LOQ/CL	DL	Units
Conductivity	0.500U	1.00	0.477	umhos/cm

Batch Information

Analytical Batch: WTI4455
Analytical Method: SM21 2510B
Instrument: Titration
Analyst: ACF
Analytical Date/Time: 5/20/2016 7:40:17PM

Print Date: 05/27/2016 4:27:07PM

Duplicate Sample Summary

Original Sample ID: 1162534002
Duplicate Sample ID: 1325548
QC for Samples:
1162534002

Analysis Date: 05/20/2016 18:45
Matrix: Drinking Water

Results by **SM21 2510B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Conductivity	271	270	umhos/cm	0.26	(< 20)

Batch Information

Analytical Batch: WTI4455
Analytical Method: SM21 2510B
Instrument: Titration
Analyst: ACF

Print Date: 05/27/2016 4:27:08PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1162534 [WTI4455]
Blank Spike Lab ID: 1325546
Date Analyzed: 05/20/2016 17:21

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162534002

Results by **SM21 2510B**

	Blank Spike (umhos/cm)			
Parameter	Spike	Result	Rec (%)	CL
Conductivity	9.65	9.50	98	(90-110)

Batch Information

Analytical Batch: **WTI4455**
Analytical Method: **SM21 2510B**
Instrument: **Titration**
Analyst: **ACF**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 9.65 umhos/cm Extract Vol: 1 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 05/27/2016 4:27:09PM

Method Blank

Blank ID: MB for HBN 1734503 [WTI/4456]
Blank Lab ID: 1325551

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1162534002

Results by **SM21 2320B**

Parameter	Results	LOQ/CL	DL	Units
Alkalinity	5.00U	10.0	3.10	mg/L

Batch Information

Analytical Batch: WTI4456
Analytical Method: SM21 2320B
Instrument: Titration
Analyst: ACF
Analytical Date/Time: 5/20/2016 7:40:17PM

Print Date: 05/27/2016 4:27:11PM

Duplicate Sample Summary

Original Sample ID: 1167928002
Duplicate Sample ID: 1325553
QC for Samples:
1162534002

Analysis Date: 05/20/2016 18:11
Matrix: Water (Surface, Eff., Ground)

Results by **SM21 2320B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Alkalinity	ND	5.00U	mg/L	0.00	(< 25)

Batch Information

Analytical Batch: WTI4456
Analytical Method: SM21 2320B
Instrument: Titration
Analyst: ACF

Print Date: 05/27/2016 4:27:12PM

Duplicate Sample Summary

Original Sample ID: 1162534002
Duplicate Sample ID: 1325554
QC for Samples:
1162534002

Analysis Date: 05/20/2016 18:45
Matrix: Drinking Water

Results by **SM21 2320B**

NAME	Original	Duplicate	Units	RPD (%)	RPD CL
Alkalinity	78.8	79.5	mg/L	0.86	(< 25)

Batch Information

Analytical Batch: WTI4456
Analytical Method: SM21 2320B
Instrument: Titration
Analyst: ACF

Print Date: 05/27/2016 4:27:12PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1162534 [WTI4456]
Blank Spike Lab ID: 1325552
Date Analyzed: 05/20/2016 18:19

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162534002

Results by **SM21 2320B**

	Blank Spike (mg/L)			
Parameter	Spike	Result	Rec (%)	CL
Alkalinity	250	222	89	(85-115)

Batch Information

Analytical Batch: **WTI4456**
Analytical Method: **SM21 2320B**
Instrument: **Titration**
Analyst: **ACF**

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 250 mg/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 05/27/2016 4:27:13PM

Method Blank

Blank ID: MB for HBN 1734901 [WXX/11508]
Blank Lab ID: 1326260

QC for Samples:
1162534002

Matrix: Water (Surface, Eff., Ground)

Results by **EPA 300.0**

Parameter	Results	LOQ/CL	DL	Units
Chloride	0.0500U	0.100	0.0310	mg/L
Fluoride	0.0500U	0.100	0.0310	mg/L
Sulfate	0.0500U	0.100	0.0310	mg/L

Batch Information

Analytical Batch: WIC5541
Analytical Method: EPA 300.0
Instrument: Metrohm 733 DX2
Analyst: ACF
Analytical Date/Time: 5/24/2016 7:26:25PM

Prep Batch: WXX11508
Prep Method: METHOD
Prep Date/Time: 5/24/2016 3:13:00PM
Prep Initial Wt./Vol.: 10 mL
Prep Extract Vol: 10 mL

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 **f** 907.561.5301 www.us.sgs.com

Member of SGS Group

Blank Spike Summary

Blank Spike ID: LCS for HBN 1162534 [WXX11508]
Blank Spike Lab ID: 1326261
Date Analyzed: 05/24/2016 19:48

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162534002

Results by **EPA 300.0**

	Blank Spike (mg/L)			
Parameter	Spike	Result	Rec (%)	CL
Chloride	10	10.5	105	(90-110)
Fluoride	10	11.0	110	(90-110)
Sulfate	10	10.0	100	(90-110)

Batch Information

Analytical Batch: **WIC5541**
Analytical Method: **EPA 300.0**
Instrument: **Metrohm 733 DX2**
Analyst: **ACF**

Prep Batch: **WXX11508**
Prep Method: **METHOD**
Prep Date/Time: **05/24/2016 15:13**
Spike Init Wt./Vol.: 10 mg/L Extract Vol: 10 mL
Dupe Init Wt./Vol.: Extract Vol:

Print Date: 05/27/2016 4:27:17PM

Matrix Spike Summary

Original Sample ID: 1162534002
MS Sample ID: 1326262 MS
MSD Sample ID: 1326263 MSD

QC for Samples: 1162534002

Analysis Date: 05/24/2016 20:10
Analysis Date: 05/24/2016 20:33
Analysis Date: 05/24/2016 20:55
Matrix: Drinking Water

Results by **EPA 300.0**

		Matrix Spike (mg/L)			Spike Duplicate (mg/L)						
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)		CL	RPD (%)	RPD CL
Chloride	27.3	10.0	36.9	96	10.0	37.0	98		90-110	0.44	
Fluoride	0.0910J	10.0	11	109	10.0	11.2	111	*	90-110	1.30	
Sulfate	10.0	10.0	20.5	104	10.0	20.6	106		90-110	0.88	

Batch Information

Analytical Batch: WIC5541
Analytical Method: EPA 300.0
Instrument: Metrohm 733 DX2
Analyst: ACF
Analytical Date/Time: 5/24/2016 8:33:15PM

Prep Batch: WXX11508
Prep Method: EPA 300.0 Extraction Waters/Liquids
Prep Date/Time: 5/24/2016 3:13:00PM
Prep Initial Wt./Vol.: 10.00mL
Prep Extract Vol: 10.00mL

Print Date: 05/27/2016 4:27:19PM

SGS

SGS North America Inc.
CHAIN OF CUSTODY RECC

1162534

Locations Nationwide
Alaska, Maryland, New Jersey, New York, North Carolina, Indiana, West Virgina, Kentucky
www.us.sgs.com

Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.

Page ____ of ____

Section 1

CLIENT: Furie	
CONTACT: Leslie Martin	PHONE #: 281.957.9812
PROJECT NAME: 05DK1602	Project/ PWSID/ PERMIT#:
REPORTS TO: Leslie Martin	E-MAIL: l.martin@furiealaska.com
INVOICE TO:	QUOTE #: P.O. #:

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	# CONTAINERS	Pres: Type: Comp Grab MI (Multi-incre-mental)	SM5210B - BOD (None)	SM2540D - TSS (None)	PIWA							REMARKS/ LOC ID
	Effluent #1	5/20/16	06:58	WI	1	G	X									
	Effluent #2	5/20/16	06:58	WI	1	G		X								
	PIWA	5/20/16	07:10	DW	1	G			X							

Section 3 — Preservative

Section 5

	Date	Time	
Relinquished By: (1)	5/20/16	7:30am	Received By:
Relinquished By: (2)			Received By:
Relinquished By: (3)			Received By:
Relinquished By: (4)	5/20/16	12:27	Received For Laboratory By:

Section 4

DOD Project? Yes No

Cooler ID: _____

Data Deliverable Requirements:

Requested Turnaround Time and/or Special Instructions:

Temp Blank °C: 2.4 23.8

or Ambient [ ]

LIMS profile #:

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT
(See attached Sample Receipt Form)

[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

http://www.sgs.com/terms-and-conditions

F083-Blank_COC_Templates_2015-03-19

SGS

1162534

1 1 6 2 5 3 4

SAMPLE RECEIPT FORM

Review Criteria:	Yes	N/A	No	Comments/Action Taken:
Were **custody seals** intact? Note # & location, if applicable. COC accompanied samples?	✓ ✓	☐ ☐	☐ ☐	***Exemption permitted if sampler hand carries/delivers.*** 1B
Temperature blank compliant* (i.e., 0-6°C after CF)? *If >6°C, were samples collected <8 hours ago?* *If <0°C, were all sample containers ice free?* Cooler ID: [1] _____ @ 2.4 _____ w/ Therm.ID: 238 _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ If samples are received without a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "**COOLER TEMP**" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled."	✓ ☐ ☐	☐ ✓ ✓	☐ ☐ ☐	***Exemption permitted if chilled & collected <8 hrs ago.*** ***Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.***
Delivery method (specify all that apply): ☑Client (hand carried) ☐USPS ☐Lynden ☐AK Air ☐Alert Courier ☐UPS ☐FedEx ☐RAVN ☐C&D Delivery ☐Carlile ☐Pen Air ☐Warp Speed ☐Other: _____ → *For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?*	☐	✓	☐	
	Yes	N/A	No	
Were samples received within hold time? Do samples **match COC*** (i.e., sample IDs, dates/times collected)? Were analyses requested unambiguous?	✓ ✓ ✓	☐ ☐ ☐	☐ ☐ ☐	***Note: Refer to form F-083 "Sample Guide" for hold times.*** ***Note: If times differ <1hr, record details and login per COC.***
Were samples in **good condition** (no leaks/cracks/breakage)? Packing material used (specify all that apply): ☐Bubble Wrap ☐Separate plastic bags ☐Vermiculite ☐Other:	✓	☐	☐	
Were **proper containers** (type/mass/volume/preservative*) used? Were **Trip Blanks** (i.e., VOAs, LL-Hg) in cooler with samples? Were all VOA vials **free of headspace** (i.e., bubbles ≤6 mm)? Were all soil VOAs **field extracted** with MeOH+BFB?	✓ ☐ ☐ ☐	☐ ✓ ✓ ✓	☐ ☐ ☐ ☐	☐ ***Exemption permitted for metals (e.g., 200.8/6020A).***
For preserved waters (other than VOA vials, LL-Mercury or microbiological analyses), was **pH verified and compliant**? If pH was adjusted, were bottles flagged (i.e., stickers)?	☐ ☐	✓ ✓	☐ ☐	
For **special handling** (e.g., "MI" soils, foreign soils, lab filter for dissolved…, lab extract for volatiles, Ref Lab, limited volume), were bottles/paperwork flagged (e.g., sticker)?	☐	✓	☐	
For **RUSH/SHORT Hold Time**, were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?	✓	☐	☐	
For **SITE-SPECIFIC QC, e.g. BMS/BMSD/BDUP**, were containers / paperwork flagged accordingly?	☐	✓	☐	
For any question answered "No," has the PM been notified and the problem resolved (or paperwork put in their bin)?	☐	✓	☐	SRF Completed by: CRH PM notified:
Was **PEER REVIEW** of ***sample numbering/labeling completed?***	☐	☐	☐	Peer Reviewed by:

Additional notes (if applicable):

Note to Client: *Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.*

F102_eSRF_2015_03_31

Dependable Products From People You Trust

Static Sheen Test Kit

Part No. 295-50

Instruction Manual

Updated 6/1/2009
Ver. 2.0

OFI Testing Equipment, Inc.
11302 Steeplecrest Dr. · Houston, Texas · 77065 · U.S.A.
Tele: 832.320.7300 · Fax: 713.880.9886 · www.ofite.com

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Table of Contents

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Test Procedure.....4

Components

#153-12	Glass Graduated Cylinder; 100 mL × 1 mL
#153-40-5	Disposable Pipette; 25 mL; Qty: 24
#153-51-5	1,000 mL Beaker; Glass
#153-51-6	1,000 mL Beaker; Polyethylene
#153-68	Disposable Weight Boat; Medium; 78 × 78 mm; Qty: 24
#154-50	4" Spatula
#295-50-1	Dishpan; 18 qt
#295-50-2	Trashbag; 30 gal
#297-28	5-Gallon Pail with Lid

Optional:

#153-53	Magnetic Stirrer with Stir Bars; 6" Diameter × 3" Height; 200 - 2,500 RPM; 120 Volt
#166-06	Triple Beam Balance

Sample Collection

Sampling containers must be thoroughly washed with detergent, rinsed a minimum of 3 times with fresh water, and allowed to air dry before samples are collected.

For each type of sample, fill 1 sample container half way. Samples must be tested within 1 hour of collection.

Liquid Samples:

- Drilling Fluid – Collect once per day at the shale shaker after the cuttings have been removed.
- Deck Drainage – Collect from the holding facility prior to discharge.
- Well Treatment Fluids – Collect from the holding facility prior to discharge.

Solid Samples:

- Drill Cuttings – Collect from the shale shaker screens prior to the addition of any washdown water. Collect one sample each day that drill cutting discharge occurs.
- Produced Sand – Collect from each type of solids control equipment prior to the addition of any washdown water. Collect one sample each day that produced sand discharge occurs.

Test Procedure

Test Container:

Line the test container with a disposable liner and then fill the test container to within ½" of the top with ambient receiving water. The temperature of the test water should be maintained as close as possible to the temperature in the receiving water, not room temperature. Dispose of the liner after each test.

Sample Preparation:

Liquid Samples – Fill and then discharge a disposable 25 mL pipette with the well-mixed sample. Now, refill the pipette and transfer 15 mL of sample to the test container. The sample must be discharged 1 cm below the surface of the ambient receiving water in the test container. Use the pipette to stir the ambient receiving water and sample mixture. Dispose of the pipet after each test.

Solid Samples – Tear a plastic disposable weighing boat. Use the stainless steel spatula to weigh out 15 grams of the well-mixed sample. Now immerse the weighing boat in the ambient receiving water in the test container and scrape the weighing boat with the spatula to transfer any residual material to the test container. Use the spatula to stir the ambient receiving water and sample mixture. Dispose of the weighing boat after each test.

Observations:

Observations must be made no later than 1 hour after the test material (sample) is transferred to the test container. The surface of the test container should be viewed from at least 3 sides at viewing angles of approximately 60° and 30° from the horizontal. Observations should be made in a well-lighted area under fluorescent lighting if possible. The entire surface of the test container must be illuminated. The test container must not be disturbed prior to or during observation.

Demonstration of Free Oil:

Detection of a silvery or metallic sheen, gloss, color, iridescence, increased reflectivity, or an oil slick on the ambient receiving water surface in the test container shows the presence of free oil.

If an oil sheen or slick occurs on less than half of the test container surface area immediately after the sample is added to the ambient receiving water, continue observations for one hour. If the sheen or slick increases in size and covers more than half of the test container surface area within the one-hour observation period, the discharge of the tested material shall cease. Also, analyze a sample of the tested material for total aromatic hydrocarbon content and the presence of diesel oil as required by the permit.

If the sheen or slick does not increase in size to cover more than half of the test container surface area within the one-hour observation period, discharge may continue and additional testing of the material is not required.

If an oil sheen or slick occurs on more than half of the test container surface area immediately or within 1 hour after the sample is added to the ambient receiving water, the discharge of the tested material shall cease. Also, analyze a sample of the tested material for total aromatic hydrocarbon content and the presence of diesel oil as required by the permit. The material causing the sheen or slick may be retested. If subsequent tests do not result in a sheen or slick covering greater than one-half of the surface area of the test container, discharge may be reinitiated.

Static Sheen Test Report Form

Certificate of Analysis

Operator:		**OCS-G Number:**	
Rig Name:		**Area and Block:**	(Surface Location)
Permit Number:		**Method Reference:**	**40 CFR Subpart A, Appendix 1 to Subpart A**

Sample ID Number				
Date of Sampling and Analysis				
Type of Sample				
Time of Sampling				
Location of Sample				
Sample Collector				
Test Location				
Analyst				
Time Test Initiated				
Observations	Time	Pass / Fail	Time	Pass / Fail
1				
2				
3				
4				
5				
6				
Results of Analysis	Pass / Fail		Pass / Fail	

Comments:

Analyst Signature:	Date:

Furie Operating Alaska, LLC
1029 West 3rd Ave., Suite 500
Anchorage, Alaska 99501

Permit Authorization # AKG315102
June 15, 2016

State of Alaska
Department of Environmental Conservation
Division of Water Compliance and Enforcement Program
555 Cordova Street
Anchorage, Alaska 99501

Subject: Discharge Monitoring Reports for May 2016

To Whom It May Concern,

Attached are the Discharge Monitoring Reports (DMR) for the operation of the Yost located in the Cook Inlet of Alaska for the month of May 2016. This is the first report under General Permit Authorization #AKG315102. The Yost arrived onsite on May 6, 2016. No drilling has occurred so the only discharges are 002 deck drainage, 003 domestic wastewater, 009 non-contact cooling water, and 010 uncontaminated ballast water.

The wastewater treatment unit just started running this month. Some sample results were out of compliance. The low salinity is potentially causing the bookcell and the ER reactor to not run as smoothly as expected. Saltwater is being added to keep the voltage down across the treatment elements, which decreases the volume that is available for treatment. A brine injector pump is on order to try to resolve this situation.

In anticipation of development drilling activities at this location, on June 1 activities at this location will be transferred to the individual permit (#AK0053686) for both the Yost and the platform.

Thank you.

Bruce Webb
Vice President
Furie Operating Alaska, LLC

cc: Kristi Neptun – Jacobs Engineering

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 001A Water-based Fluids and Cuttings

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Drilling fluid, end of well, 96-hr IC50	Sample meas.	******	******			******	******				
V - See Comments 04311	Permit reqmt.	******	******		30,000 minimum	******	******	mg/l		See Permit Requirements	Grab
Drilling fluid, toxicity	Sample meas.	******	******			******	******				
V - See Comments 04312	Permit reqmt.	******	******		30,000 minimum	******	******	mg/l		Monthly	Grab
Cadmium, dry weight	Sample meas.	******	******		******						
1 - Final Effluent 46395	Permit reqmt.	******	******		******	3.0 monthly average	3.0 daily maximum	mg/kg		See Permit Requirements	Grab
Fuel, Diesel, #1 Occurrences	Sample meas.	******	******		******	******					
1 - Final Effluent 51560	Permit reqmt.	******	******		******	******	Report daily maximum	occur/mo		Daily	Grab
Free Oil	Sample meas.	******	******		******	******					
1 - Final Effluent 51575	Permit reqmt.	******	******		******	******	Report daily maximum	occur/mo		Daily	Grab

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
BRUCE WEBB VICE PRESIDENT FURIE OPERATING ALASKA, LLC	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	907-277-3726	2016/06/15
TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 001A Water-based Fluids and Cuttings

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Mercury, dry weight	Sample meas.	******	******		******						
1 - Final Effluent 78471	Permit reqmt.	******	******		******	1.0 monthly average	1.0 daily maximum	mg/kg		See Permit Requirements	Grab
Drilling fluids, discharge rate	Sample meas.				******	******	******				
O - See Comments 82592	Permit reqmt.	0 monthly average	0 daily maximum	bbl/hr	******	******	******			Continuous	Estimate
Drilling fluids, discharge rate	Sample meas.				******	******	******				
P - See Comments 82592	Permit reqmt.	500 monthly average	500 daily maximum	bbl/hr	******	******	******			Continuous	Estimate
Drilling fluids, discharge rate	Sample meas.				******	******	******				
Q - See Comments 82592	Permit reqmt.	750 monthly average	750 daily maximum	bbl/hr	******	******	******			Continuous	Estimate
Drilling fluids, discharge rate	Sample meas.				******	******	******				
R - See Comments 82592	Permit reqmt.	1000 monthly average	1000 daily maximum	bbl/hr	******	******	******			Continuous	Estimate

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
BRUCE WEBB VICE PRESIDENT FURIE OPERATING ALASKA, LLC	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	907-277-3726	2016/06/15
TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 001A Water-based Fluids and Cuttings

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Drilling fluids, volume	Sample meas.				******	******	******				
1 - Final Effluent 82594	Permit reqmt.	Report monthly average	Report daily maximum	MGD	******	******	******			Monthly	Estimate

COMMENTS:
O = 0 to 5 meters; P = >5 to 20 meters; Q = >20 to 40 meters; R = >40 meters; V = Suspended Particulate Phase Toxicity (LC50);

Mail this report when completed to ADEC, Division of Water, 555 Cordova Street, Anchorage, AK 99501-2617
Attach an explanation of any violations. Reference all attachments below.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
BRUCE WEBB VICE PRESIDENT FURIE OPERATING ALASKA, LLC	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	907-277-3726	2016/06/15
TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 001B Non-aqueous Fluids

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Drilling Fluids, Discharge Rate Occurrences	Sample meas.	******	******		******	******					
1 - Final Effluent 51559	Permit reqmt.	******	******		******	******	Report total	occur/mo		Daily	Visual

COMMENTS:

Mail this report when completed to ADEC, Division of Water, 555 Cordova Street, Anchorage, AK 99501-2617
Attach an explanation of any violations. Reference all attachments below.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
BRUCE WEBB VICE PRESIDENT FURIE OPERATING ALASKA, LLC	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Bruce Webb SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	907-277-3726	2016/06/15
TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 001C Non-aqueous stock base fluid

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Polynuclear Aromatic Hydrocarbons	Sample meas.	******	******		******	******					
1 - Final Effluent 22456	Permit reqmt.	******	******		******	******	0.00001 maximum	Ratio		Annually	Grab
Cadmium, dry weight	Sample meas.	******	******		******						
1 - Final Effluent 46395	Permit reqmt.	******	******		******	3.0 monthly average	3.0 daily maximum	mg/kg		Annually	Grab
Stock base fluid, sediment toxicity	Sample meas.	******	******		******	******					
1 - Final Effluent 51115	Permit reqmt.	******	******		******	******	1 maximum	Ratio		Annually	Grab
Stock base fluid, biodegredation rate	Sample meas.	******	******		******	******					
1 - Final Effluent 51116	Permit reqmt.	******	******		******	******	1 maximum	Ratio		Annually	Grab
Mercury, dry weight	Sample meas.	******	******		******						
1 - Final Effluent 78471	Permit reqmt.	******	******		******	1.0 monthly average	1.0 daily maximum	mg/kg		Annually	Grab

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
BRUCE WEBB VICE PRESIDENT FURIE OPERATING ALASKA, LLC	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Bruce Webb SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	907-277-3726	2016/06/15
TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 001C Non-aqueous stock base fluid

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Drilling fluids, volume	Sample meas.				******	******	******				
1 - Final Effluent 82594	Permit reqmt.	Report monthly average	Report daily maximum	MGD	******	******	******			Monthly	Estimate

COMMENTS:

Mail this report when completed to ADEC, Division of Water, 555 Cordova Street, Anchorage, AK 99501-2617
Attach an explanation of any violations. Reference all attachments below.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

PERMIT NUMBER: AKG315102
MONITORING PERIOD: 05/01/2016 TO 05/31/2016
OUTFALL / MONITORING POINT: 001D Non-aqueous fluids that adhere to drill cuttings
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Stock base fluid, sediment toxicity	Sample meas.	******	******		******	******					
1 - Final Effluent 51115	Permit reqmt.	******	******		******	******	1 maximum	Ratio		Annually	Grab
Discharge drill cuttings, formation oil	Sample meas.	******	******		******	******					
1 - Final Effluent 51118	Permit reqmt.	******	******		******	******	Report value	yes/no		Daily	Grab
Discharge drill cuttings, base fluids retained	Sample meas.	******	******		******	******					
O - See Comments 51120	Permit reqmt.	******	******		******	******	6.9 maximum	%		Daily	Grab
Discharge drill cuttings, base fluids retained	Sample meas.	******	******		******	******					
W - See Comments 51120	Permit reqmt.	******	******		******	******	9.4 maximum	%		Daily	Grab
Fuel, Diesel, #1 Occurrences	Sample meas.	******	******		******	******					
1 - Final Effluent 51560	Permit reqmt.	******	******		******	******	Report total	occur/mo		Daily	Grab

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

PERMIT NUMBER: AKG315102
MONITORING PERIOD: 05/01/2016 TO 05/31/2016
OUTFALL / MONITORING POINT: 001D Non-aqueous fluids that adhere to drill cuttings
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Drilling fluids, free oil	Sample meas.	******			******	******	******				
1 - Final Effluent 82589	Permit reqmt.	******	Report total	occur/mo	******	******	******			Daily	Grab
Drilling fluids, volume	Sample meas.				******	******	******				
1 - Final Effluent 82594	Permit reqmt.	Report monthly average	Report daily maximum	MGD	******	******	******			Monthly	Estimate

COMMENTS:
O = C16 - C18 internal olefin stock; W = C12 - C14 ester or C8 ester stock;

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 002 Deck Drainage

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE:

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Flow	Sample meas.	******	0	MGD	******	******	******		0	Monthly	Estimate
1 - Final Effluent 50050	Permit reqmt.	******	Report value	MGD	******	******	******			Monthly	Estimate
Free Oil	Sample meas.	******	******		******	******					
1 - Final Effluent 51575	Permit reqmt.	******	******		******	******	Report maximum	yes/no		See Permit Requirements	Grab
Free Oil Visual Sheen	Sample meas.	******	******		******	******	None	No	0	Daily	Visual
1 - Final Effluent 51689	Permit reqmt.	******	******		******	******	Report value	yes/no		Daily	Visual
Toxicity, Chronic	Sample meas.	******	******		******						
S - See Comments TT000	Permit reqmt.	******	******		******	monthly average	daily maximum	TUC		See Permit Requirements	Grab
Toxicity, Chronic	Sample meas.	******	******		******	******					
U - See Comments TT000	Permit reqmt.	******	******		******	******	Report maximum	TUC		See Permit Requirements	24-Hr Composite

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 002 Deck Drainage

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE:

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Toxicity, Chronic	Sample meas.	******	******		******	******					
V - See Comments TT000	Permit reqmt.	******	******		******	******	Report maximum	TUC		See Permit Requirements	24-Hr Composite

COMMENTS:
S = Accelerated Testing Results; U = Invertebrate; V = Vertebrate; Oil water separator is off line for repairs. No deck drainage was discharged and all is being held in isolated tanks until the OWS is repaired. Average daily flow to the holding tank over the month is 0.00046 mgd.

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 003 Domestic Wastewater (MSD, MSD/BTU)

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE:

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Biochemical Oxygen Demand (BOD5)	Sample meas.	******	******		******		57	mg/l	0	Monthly	Grab
1 - Final Effluent 00310	Permit reqmt.	******	******		******	30 monthly average	60 daily maximum	mg/l		Monthly	Grab
Total Suspended Solids	Sample meas.	******	******		******		107	mg/l	1	Monthly	Grab
1 - Final Effluent 00530	Permit reqmt.	******	******		******	51 monthly average	67 daily maximum	mg/l		Monthly	Grab
Flow	Sample meas.	0.0146	0.0179	MGD	******	******	******		0	Monthly	Estimate
1 - Final Effluent 50050	Permit reqmt.	Report monthly average	Report daily maximum	MGD	******	******	******			Monthly	Estimate
Total Residual Chlorine	Sample meas.	******	******		******	******	1	mg/l	0	Monthly	Grab
1 - Final Effluent 50060	Permit reqmt.	******	******		******	******	1 daily maximum	mg/l		Monthly	Grab
Total Residual Chlorine	Sample meas.	******	******		******	3.4	******	mg/l	0	Monthly	Grab
X - End of Chlorine Contact Chamber	Permit reqmt.	******	******		******	1 minimum	******	mg/l		Monthly	Grab

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 003 Domestic Wastewater (MSD, MSD/BTU)

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE:

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Solids-flotng-visual detrmntn-# days obs	Sample meas.	******	0	d/mo	******	******	******		0	Daily	Visual
1 - Final Effluent 78246	Permit reqmt.	******	Report monthly total	d/mo	******	******	******			Daily	Visual

COMMENTS:
TSS was outside of normal limits. This new system has just begun operation in May 2016. Operators are adjusting salinity across the cell and a brine injector is on order hoping to correct this. Chlorine in the contact chamber ranged from 3.4 to 5. Chlorine ta the outfall was recorded as <1.

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 009 Non-Contact Cooling Water

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE:

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Flow	Sample meas.	******	1.728	MGD	******	******	******		0	Monthly	Estimate
1 - Final Effluent 50050	Permit reqmt.	******	Report value	MGD	******	******	******			Monthly	Estimate
Free Oil Visual Sheen	Sample meas.	******	******		******	******	None	No	0	Daily	Visual
1 - Final Effluent 51689	Permit reqmt.	******	******		******	******	Report value	yes/no		Weekly	Visual
Water treatment additives	Sample meas.	******	******		******	******					
T - See Comments 82391	Permit reqmt.	******	******		******	******	Report value	mg/l		See Permit Requirements	Calculation
Toxicity, Chronic	Sample meas.	******	******		******						
S - See Comments TT000	Permit reqmt.	******	******		******	monthly average	daily maximum	TUC		See Permit Requirements	Grab
Toxicity, Chronic	Sample meas.	******	******		******	******					
U - See Comments TT000	Permit reqmt.	******	******		******	******	Report maximum	TUC		See Permit Requirements	24-Hr Composite

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 009 Non-Contact Cooling Water

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE:

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Toxicity, Chronic	Sample meas.	******	******		******	******					
V - See Comments TT000	Permit reqmt.	******	******		******	******	Report maximum	TUC		See Permit Requirements	24-Hr Composite

COMMENTS:
S = Accelerated Testing Results; T = Chemical Additives - See Permit Subsection 2.6.3; U = Invertebrate; V = Vertebrate; No water treatments are added to the cooling water. Flow is reported from the deep water pump as 1,200 gpm which calculates to 1.728 MGD. The Yost was on site 25 days this month. The max MGD was 1.728 for any given day. The total was 43.2 million gallons for the month.

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 010 Uncontaminated Ballast Water

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE:

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Flow	Sample meas.	******	1.155	MGD	******	******	******		0	Monthly	Estimate
1 - Final Effluent 50050	Permit reqmt.	******	Report value	MGD	******	******	******			Monthly	Estimate
Free Oil	Sample meas.	******	******		******	******					
1 - Final Effluent 51575	Permit reqmt.	******	******		******	******	Report value	yes/no		See Permit Requirements	Grab
Free Oil Visual Sheen	Sample meas.	******	******		******	******	None	No		Weekly	Visual
1 - Final Effluent 51689	Permit reqmt.	******	******		******	******	Report value	yes/no		Weekly	Visual
Water treatment additives	Sample meas.	******	******		******	******					
T - See Comments 82391	Permit reqmt.	******	******		******	******	Report value	mg/l		See Permit Requirements	Calculation
Toxicity, Chronic	Sample meas.	******	******		******						
S - See Comments TT000	Permit reqmt.	******	******		******	monthly average	daily maximum	TUC		See Permit Requirements	Grab

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 010 Uncontaminated Ballast Water

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501
MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE:

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Toxicity, Chronic	Sample meas.	******	******		******	******					
U - See Comments TT000	Permit reqmt.	******	******		******	******	Report maximum	TUC		See Permit Requirements	24-Hr Composite
Toxicity, Chronic	Sample meas.	******	******		******	******					
V - See Comments TT000	Permit reqmt.	******	******		******	******	Report maximum	TUC		See Permit Requirements	24-Hr Composite

COMMENTS:
S = Accelerated Testing Results; T = Chemical Additives - See Permit Subsection 2.6.3; U = Invertebrate; V = Vertebrate; Ballast water (pre-load water) was released once just after the legs were set down. It is assumed all water was released in one 24-hour period so the total is the same as the daily maximum. No sheen was observed. Ballast water is not treated.

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 012 Excess Cement Slurry

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Flow	Sample meas.	******			******	******	******				
1 - Final Effluent 50050	Permit reqmt.	******	Report value	MGD	******	******	******			Monthly	Estimate
Free Oil Visual Sheen	Sample meas.	******	******		******	******					
1 - Final Effluent 51689	Permit reqmt.	******	******		******	******	Report value	yes/no		Weekly	Visual
Water treatment additives	Sample meas.	******	******		******	******					
T - See Comments 82391	Permit reqmt.	******	******		******	******	Report value	mg/l		See Permit Requirements	Calculation

COMMENTS:
T = Chemical Additives - See Permit Subsection 2.6.3;

Mail this report when completed to ADEC, Division of Water, 555 Cordova Street, Anchorage, AK 99501-2617
Attach an explanation of any violations. Reference all attachments below.

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
BRUCE WEBB VICE PRESIDENT FURIE OPERATING ALASKA, LLC	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Bruce Webb SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	907-277-3726	2016/06/15
TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 013 Muds, Cuttings, and Cement at the Seafloor

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Flow	Sample meas.	******			******	******	******				
1 - Final Effluent 50050	Permit reqmt.	******	Report value	MGD	******	******	******			Monthly	Estimate
Free Oil Visual Sheen	Sample meas.	******	******		******	******					
1 - Final Effluent 51689	Permit reqmt.	******	******		******	******	Report value	yes/no		Weekly	Visual
Water treatment additives	Sample meas.	******	******		******	******					
T - See Comments 82391	Permit reqmt.	******	******		******	******	Report value	mg/l		See Permit Requirements	Calculation

COMMENTS:
T = Chemical Additives - See Permit Subsection 2.6.3;

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 019 Test Fluids

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
pH	Sample meas.	******	******				******				
1 - Final Effluent 00400	Permit reqmt.	******	******		6.5 minimum	8.5 maximum	******	S.U.		Once/Event	Grab
Oil and grease	Sample meas.	******	******		******						
1 - Final Effluent 03582	Permit reqmt.	******	******		******	29 monthly average	42 daily maximum	mg/l		Once/Event	Grab
Misc. discharges, free oil	Sample meas.	******			******	******	******				
U - See Comments 49498	Permit reqmt.	******	Report monthly total	occur/mo	******	******	******			Once/Event	Grab
Flow	Sample meas.				******	******	******				
1 - Final Effluent 50050	Permit reqmt.	Report monthly average	Report monthly average	MGD	******	******	******			Daily when Discharging	Estimate
Water Treatment Additives Presence	Sample meas.	******	******		******	******					
T - See Comments 51558	Permit reqmt.	******	******		******	******	value	mg/l		Monthly	Calculation

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Alaska Department of Environmental Conservation Monthly Discharge Monitoring Report (DMR)

CONTACT NAME: Bruce Webb
MAILING ADDRESS: 1029 West 3rd Avenue
Suite 500
Anchorage, AK 99501
PERMIT NUMBER: AKG315102
OUTFALL / MONITORING POINT: 019 Test Fluids

FACILITY: Furie KLU Exploration - Randolph Yost
LOCATION: 1029 West 3rd Ave
Anchorage, AK 99501

MONITORING PERIOD: 05/01/2016 TO 05/31/2016
NO DISCHARGE: X

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
		Average	Maximum		Minimum	Average	Maximum				
Discharge event observation (Visual Monitoring)	Sample meas.	******			******	******	******				
1 - Final Effluent 84165	Permit reqmt.	******	Report total	occur/mo	******	******	******			Once/Event	Visual
Toxicity, Chronic	Sample meas.	******	******		******						
Q - See Comments TT000	Permit reqmt.	******	******		******	monthly average	daily maximum	TUC		Quarterly	Grab
Toxicity, Chronic	Sample meas.	******	******		******						
R - See Comments TT000	Permit reqmt.	******	******		******	monthly average	daily maximum	TUC		Quarterly	Grab
Toxicity, Chronic	Sample meas.	******	******		******						
S - See Comments TT000	Permit reqmt.	******	******		******	monthly average	daily maximum	TUC		See Permit Requirements	Grab

COMMENTS:
Q = Invertebrate; R = Vertebrate; S = Accelerated Testing Results; T = Chemical Inventory - See Permit Subsection 2.2.6.1; U = Free oil to be determined by the static sheen test;

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TYPED OR PRINTED			AREA | NUMBER	Y | M | D

Best Management Practices Plan - *Daily* Compliance Checklist

Completed by:	Joe Fleming	**Date:**	6/24/2016
Operator:	Furie Operating Alaska	**Area/Block:**	KLU #3
Rig Name:	Randolph Yost	**Permit #:**	AK0053686

Area	Daily Inspection	Completion Status			Remedial Actions Necessary
		Yes	No	N/A	
Rig Floor	Inspect equipment susceptible to leaks & spills		X		
	All hoses & lines are in good working order	X			
	Pollution pans empty	X			
	Other:		X		
Cranes	Inspect equipment susceptible to leaks & spills	X			
	Pollution pans empty	X			
	Other:		X		
Upper Pipe Rack	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:	X			Mud ditch to be monitored for blockage
Storage Decks	Inspect containers & equipment susceptible to leaks & spills	X			
		X			
	Other:		X		
Lower Pipe Rack	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:		X		
Oil Water Seperator (under cantilever)	Surface oily waste skimmed to appropriate cuttings box			X	
	Bottom solids removed to appropriate cuttings box			X	
	Influent/effluent lines not plugged	X			
	Visual sheen test completed for OWS effluent			X	No effluent
	Static sheen test completed for OWS effluent (rainfall)			X	No effluent
	Other:		X		
Shale Shakers	Inspect containers & equipment susceptible to leaks & spills	X			
	Drilling fluids & cuttings discharged through shuntline only		X		Zero discharge system in use
	Drilling fluids/cuttings static sheen test conducted		X		Zero discharge system in use
	If in a hydrocarbon zone, all cuttings are containerized			X	
	Other:			X	
Accumulator Room	Inspect equipment susceptible to leaks & spills	X			
	All hoses & lines are in good working order	X			
	Other:		X		
Main Deck	Inspect containers & equipment susceptible to leaks & spills	X			
	Standing water sent to appropriate waste stream			X	
	Containers & Equipment not stored over grating		X		
	Containers properly labeled	X			
	Trash & waste is properly segregated	X			
	Other:		X		
Transfer Areas	Inspect equipment susceptible to leaks & spills	X			
	Hoses are secured during fluid transfers and storage	X			
	Other:		X		
Welding Areas	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:	X			2 drains need to be closed

Best Management Practices Plan - *Daily* Compliance Checklist

Completed by:	Joe Fleming	**Date:**	6/24/2016
Operator:	Furie Operating Alaska	**Area/Block:**	KLU #3
Rig Name:	Randolph Yost	**Permit #:**	AK0053686

Area	Daily Inspection	Completion Status			Remedial Actions Necessary
		Yes	No	N/A	
Paint Locker	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:	X			Aerosol cans containerized pending proper disposal
Deck OmniPure	Inspect containers & equipment susceptible to leaks & spills	X			
	Maintenance status noted in logs	X			
	Chlorinator/dechlorinator operating	X			
	Other:		X		
Anchor Winches	Inspect areas susceptible to leaks & spills	X			
	Other:	X			
Cement Unit Room	Inspect containers & equipment susceptible to leaks & spills	X			
	Drilling fluids & cuttings discharged through shuntline only			X	No effluent
	Pollution pans empty	X			
	Other:		X		
Sack Room	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:		X		
Generator Room	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Pollution pans empty	X			Cleaned as required
	Other:		X		
SCR Room	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:		X		
Mud Pump Room	Inspect containers & equipment susceptible to leaks & spills	X			
	Drilling fluids & cuttings discharged through shuntline only			X	No effluent
	Other:		X		
Pit Room	Area is free of leaks or spills	X			
	Other:		X		
Mechanical Shop	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:		X		
Pump Room/Bilge OWS	Area is free of leaks or spills	X			
	Other:		X		
Electrician Shop	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:		X		
Cement Tank Room	Inspect containers & equipment susceptible to leaks & spills	X			
	Other:		X		
OmniPure Room	Inspect containers & equipment susceptible to leaks & spills	X			
	Maintenance status noted in logs		X		In bypass mode
	Chlorinator/dechlorinators operating		X		Bypass to Deck OmniPure
	Other:		X		

Best Management Practices Plan - *Daily* Compliance Checklist

Completed by:	Joe Fleming	**Date:**	6/24/2016
Operator:	Furie Operating Alaska	**Area/Block:**	KLU #3
Rig Name:	Randolph Yost	**Permit #:**	AK0053686

Area	Daily Inspection	Completion Status			Remedial Actions Necessary
		Yes	No	N/A	
Warehouse	Inspect containers & equipment susceptible to leaks & spills	X			
	Trash & waste is properly segregated	X			
	Other:		X		
Compressor Room	Inspect containers & equipment susceptible to leaks & spills	X			
	Other:		X		
Water Generation/RO Unit	Inspect containers & equipment susceptible to leaks & spills	X			Units non-functional at present
	Other:		X		
Emergency Generator	Inspect containers & equipment susceptible to leaks & spills	X			
	Other:		X		
Life Boats	Area is free of leaks or spills	X			
	Other:		X		
Heliport	Area is free of leaks or spills	X			
	Area free of debris	X			
	Other:		X		
Rain Gauge	Check, record, & empty rainfall gauge	X			0.18" for the previous 24 hours
	Maintenance status noted in logs	X			
	Other:		X		

Signature:	Joe Fleming	Date:	6/24/2016