
***Normally Pressured Lance Natural Gas
Development Project
Final Environmental Impact Statement***

Appendix F

Hazardous and Non-Hazardous Materials
Management Summary

**NORMALLY PRESSURED LANCE (NPL)
NATURAL GAS DEVELOPMENT PROJECT**

**HAZARDOUS AND NON-HAZARDOUS MATERIALS MANAGEMENT
SUMMARY**



**U.S. Department of the Interior
Bureau of Land Management**

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The BLM manages more land – 253 million acres – than any other Federal agency. This land, known as the National System of Public Lands, is primarily located in 12 Western States, including Alaska. The Bureau, with a budget of about \$1 billion, also administers 700 million acres of sub-surface mineral estate throughout the nation. The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

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ACRONYMS AND ABBREVIATIONS

bbbl	barrels
BLM	Bureau of Land Management
bpd	barrels per day
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
gal	gallon
kg	kilogram
lbs	pounds
mmcf/d	million cubic feet per day
n/a	not applicable
NPL	Normally Pressured Lance
OVM	organic vapor meter
PAHs	polynuclear aromatic hydrocarbons
POM	polycyclic organic matter
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RGF	Regional Gathering Facility
SARA	Superfund Amendments and Reauthorization Act
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
TPH	total petroleum hydrocarbons
unk	unknown
WDEQ	Wyoming Department of Environmental Quality
WOGCC	Wyoming Oil and Gas Conservation Commission

1.0 INTRODUCTION

This Hazardous and Non-Hazardous Materials Management Summary is provided pursuant to Bureau of Land Management (BLM) Instruction Memoranda Numbers WO-93-344 and WY-94-059, which require that all documents prepared pursuant to the National Environmental Policy Act list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. The document serves as a supplement to the Normally Pressured Lance (NPL) Natural Gas Development Project Environmental Impact Statement.

Materials are considered hazardous if they contain chemicals or substances listed in the U.S. Environmental Protection Agency's (EPA's) Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). Extremely hazardous materials are those identified in the EPA's List of Extremely Hazardous Substances (*40 Code of Federal Regulations [CFR] 355*).

The project proponent (Jonah Energy) has reviewed 1) the EPA's Consolidated List of Chemicals Subject to Reporting Under Title III of SARA (as amended) to identify any hazardous substances proposed for production, use, storage, transport, or disposal by the NPL Project; and 2) the EPA's List of Extremely Hazardous Substances as defined in 40 CFR 355 (as amended). Based on this review, Jonah Energy has determined that various materials listed as hazardous and/or extremely hazardous would be used or generated by the NPL Project. All known non-hazardous, hazardous, and extremely hazardous materials potentially produced, used, stored, transported, and/or disposed of as a result of the NPL Project are presented in Table F-1 through Table F-6.

2.0 HAZARDOUS AND NON-HAZARDOUS MATERIALS

Hazardous materials anticipated to be used or produced during implementation of the NPL Project are included in the following categories: drilling materials, cementing and plugging materials, fracturing materials, production products, fuels, pipeline materials, emissions, compressor station materials, and miscellaneous materials. Two types of drilling mud scenarios (water- and oil-based) and two types of hydraulic fracturing scenarios (slickwater and gel) are expected to be used on the NPL Project, and information on materials for each scenario is presented below (Tables F-1 through F-5). Information on other hazardous and extremely hazardous materials is presented in Table F-6. Where possible, the quantities of hazardous materials or non-hazardous materials have been estimated on a per-well basis in all tables.

**Table F-1. Hazardous and Non-Hazardous Materials Potentially Utilized or Produced
During the
Water-Based Drilling Mud Scenario for the NPL Project**

Product Description	Amount per Well ¹	Ingredients	CAS No.
Caustic Soda	750 lbs	Sodium Hydroxide Solid*	1310-73-2
Desco	25 lbs	Proprietary	
		Ferrous Sulfate*	17375-41-6
		Crystalline Silica	14808-60-7
Corrosion Inhibitor	50 gal	Methanol*	67-56-1
Polyglycol	30 gal	Polyglycol	
	25 lbs	Fatty acid derivative	
Glyoxal		Glyoxal	107-22-2
		Xanthan Gum	11138-66-2
Modified Tannin Extract	50 lbs	Modified Tannin Extract	
		Oxidized Organic Material	
		Silica, crystalline, quartz	14808-60-7
Bentonite Extender	34 lbs	Polyacrylate/polyacrylamide blend*	9003-04-7/9003-05-8
Lime	400 lbs	Calcium Hydroxide	1305-62-0
Bentonite Gel	14,400 lbs	Bentonite	1302-78-9
		Silica, crystalline, quartz	14808-60-7
		Calcium sulfate (gypsum)	13397-24-5 (or 7778-18-9)
		Silica, crystalline, tridymite	15468-32-3
Drilling Mud	103 ton	Barite	7727-43-7
		Silica, crystalline, quartz	14808-60-7
		Mica	12001-26-2
Mica Coarse	950 lbs	Mica	12001-26-2
		Quartz, Crystalline Silica	14808-60-7
Mica Medium	2,600 lbs	Mica	12001-26-2
		Quartz, Crystalline Silica	14808-60-7
Anionic acrylamide copolymer	20 gal	Anionic acrylamide copolymer*	25987-30-8
Poly Anionic Cellulose	1,100 lbs	Poly Anionic Cellulose	9004-32-4
Gilsonite	600 lbs	Gilsonite	12002-43-6
Calcium Carbonate	4,100 lbs	Calcium Carbonate	471-34-1
		Quartz, Crystalline Silica	14808-60-7
Calcium Carbonate	3,850 lbs	Calcium Carbonate	471-34-1
		Quartz, Crystalline Silica	14808-60-7
SAPP	100 lbs	Disodium Dihydrogenpyrophosphate	7758-16-9
Sawdust	225 lbs	Wood particulates	
Soda Ash	400 lbs	Sodium Carbonate	497-19-8
Tannathin	600 lbs	Lignite	1415-93-6
		Quartz, crystalline Silica	14808-60-7
Sodium Carboxymethyl Starch	1,800 lbs	Sodium Carboxymethyl Starch	9063-38-1
Walnut Nut Plug Medium	350 lbs	Ground walnut particulates	

¹ lbs = pounds; gal = gallons

*Hazardous materials defined as constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986, as amended.

**Table F-2. Hazardous and Non-Hazardous Materials Potentially Utilized or Produced
During the
Oil-Based Drilling Mud Scenario for the NPL Project**

Product Description	Amount per Well ¹	Ingredients	CAS No. ²
Calcium Chloride Powder	750 lbs	Calcium chloride, dihydrate	10035-04-8
Potassium hydroxide	50 gal	Potassium hydroxide*	1310-58-3
Xanthan gum	375 lbs	Xanthan gum	11138-66-2
			107-22-2
Lost Circulation Material	1,250 kg	Carbon	7440-44-0
		Graphite	7782-42-5
Bentonite Extender	10 lbs	Polyacrylate/polyacrylamide blend*	9003-04-7/9003-05-8
Lime	12,500 lbs	Calcium hydroxide	215-137-3
Bentonite Gel	3,000 lbs	Bentonite	1302-78-9
		Silica, crystalline, quartz	14808-60-7
		Calcium sulfate (gypsum)	13397-24-5 (or 7778-18-9)
		Silica, crystalline, tridymite	15468-32-3
Barite	95 tons	Barite	7727-43-7
		Silica, crystalline, quartz	14808-60-7
		Mica	12001-26-2
Oil Based Drilling Mud	1,400 bbl	Diesel oil, petroleum distillates	688476-34-6
		Barite	7727-43-7
		Calcium chloride	10043-52-4
		Water	7732-18-5
		Calcium hydroxide	1305-62-0
		Fatty acid reaction products with amines	
		Silica, crystalline, quartz	14808-60-7
		Bentonite	1302-78-9
		Tannin	1401-55-4
		Naphthalene*	91-20-3
		Mica	12001-26-2
		Fatty acid	
Mica (Fine)	2,500 lbs	Silica, crystalline, quartz	14808-60-7
		Mica	12001-26-2
Biocide	10 gal	Water	7732-18-5
		Glutaral	111-30-8
Anionic polyacrylamide	5 gal	Anionic polyacrylamide*	25987-30-8
		Petroleum distillates, hydrotreated light	647-47-8
Polymer Drilling Additive	2,000 lbs	Carboxymethylcellulose sodium salt	9004-32-4
Calcium carbonate	9,500 lbs	Calcium carbonate	471-34-1
		Quartz, crystalline, silica	238-876-4
Sodium Bicarbonate	500 lbs	Sodium bicarbonate	144-55-8
Oil Based Mud Additive	330 gal	Polyalkylamidoamine	unk
		Petroleum distillates, hydrotreated light	64742-47-8
		Dipropylene glycol methyl ether	34590-94-8

Table F-2. Hazardous and Non-Hazardous Materials Potentially Utilized or Produced During the Oil-Based Drilling Mud Scenario for the NPL Project

Product Description	Amount per Well ¹	Ingredients	CAS No. ²
Oil Based Mud Additive	220 gal	Tall oil, polymerized, oxidized	68815-17-8
Salt Gel	1,750 lbs	Organophilic clay	
		Silica, crystalline, quartz	14808-60-7
		Inorganic salt	
		Silica, crystalline, tridymite	15468-32-3
Walnut Nut Plug	1,500 lbs	Walnut nut plug coarse	n/a

¹ lbs = pounds; gal = gallons; kg = kilograms; bbl = barrels

² unk = unknown; n/a = not applicable

*Hazardous materials defined as constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986, as amended.

Table F-3. Additives Potentially Utilized During the Gel-Based Hydraulic Fracturing Scenario for the NPL Project, Sublette County, Wyoming

Additive/ Product Code	Additive Description	Amount per Well ¹	Ingredient	CAS #
B315	Friction Reducer	78.333 gal	Petroleum Distillates, hydrotreated light	64742-47-8
			Aliphatic alcohol glycol ether*	Proprietary
H005	Acid	145 gal	Hydrochloric acid*	7647-01-0
J218	Breaker #1	142.5 lbs	Diammonium peroxodisulfate	7727-54-0
J475	Breaker #2	674.583 lbs	Diammonium peroxodisulfate	7727-54-0
J579	Additive	7067.083 lbs	Synthetic organic polymer	Proprietary
J580	Gelling Agent	9249.583 lbs	Carbohydrate polymer derivative	Proprietary
J941	Crosslinker	1397.5 gal	Aliphatic polyol	Proprietary
			Sodium tetraborate decahydrate	1303-96-4
			Sodium hydroxide*	1310-73-2
L071	Clay Control Agent	1130.417 gal	Cholinium chloride	67-48-1
M298L	Bactericide	36.25 gal	Tetrakis (hydroxymethyl) phosphonium sulfate	55566-30-8
S012-3050	Propping Agent	658032.5 lbs	Crystalline silica	14808-60-7
W054	Demulsifier	534.583 gal	Methanol*	67-56-1
			Oxyalkylated alcohol (2)	Proprietary
			Oxyalkylated alkyl alcohol (1)	Proprietary
			Heavy aromatic naphtha	64742-94-5
			Oxyalkylated alcohol (1)	Proprietary
			Quaternary ammonium compounds	Proprietary
Naphtalene* (impurity)	91-20-3			

Table F-3. Additives Potentially Utilized During the Gel-Based Hydraulic Fracturing Scenario for the NPL Project, Sublette County, Wyoming

Additive/ Product Code	Additive Description	Amount per Well ¹	Ingredient	CAS #
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¹ lbs = pounds; gal = gallons.

*Hazardous materials defined as constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986, as amended.

Table F-4. Additives Potentially Utilized During the Slickwater-Based Hydraulic Fracturing Scenario for the NPL Project

Additive/ Product Code	Additive Description	Amount per Well ¹	Ingredient	CAS #
A264	Corrosion Inhibitor	12.5 gal	Methanol*	67-56-1
			Aliphatic acids	Proprietary
			Prop-2-yn-10-ol*	107-19-7
			Aliphatic alcohols, ethoxylated #1	Proprietary
B315	Friction Reducer	762.143 gal	Petroleum Distillates, hydrotreated light	64742-47-8
			Aliphatic alcohol glycol ether*	Proprietary
H015	Acid	2498.929 gal	Hydrochloric acid*	7647-01-0
L058	Iron Control Agent	25 lbs	Sodium erytorbate	6381-77-7
L068	Clay Control Agent	1933.214 gal	Calcium chloride	10043-52-4
M298L	Bactericide	61.429 gal	Tetrakis (hydroxymethyl) phosphonium sulfate	55566-30-8
S012-4070	Propping Agent	596053.571 lbs	Crystalline silica	14808-60-7
W054	Demulsifier	946.786 gal	Methanol*	67-56-1
			Oxyalkylated alcohol (2)	Proprietary
			Oxyalkylated alkyl alcohol (1)	Proprietary
			Heavy aromatic naphtha	64742-94-5
			Oxyalkylated alcohol (1)	Proprietary
			Quaternary ammonium compounds	Proprietary
	Naphtalene* (impurity)	91-20-3		

¹ lbs = pounds; gal = gallons.

*Hazardous materials defined as constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986, as amended.

Table F-5. Materials Potentially Utilized or Produced During Cementing and Plugging Activities for the NPL Project

Source	Approximate Quantities Used or Produced per Well ¹	Substance ²	CAS No.
CEMENTING AND PLUGGING MATERIALS			
Fluid Loss	78 lbs	Sodium Formate	141-53-7
Cement Retarder	663 lbs	Modified lignosulfonate	
Dispersant	140 lbs	Sodium Formate	141-53-7
		Sulfonic Acid Salt	
Sand	20,398 lbs	Crystalline silica, quartz	14808-60-7
Accelerator	1,400 lbs	Calcium chloride	10043-52-4
Fly Ash	109,928 lbs	Fly ash	681-74-8
		Crystalline silica, cristobalite	14464-46-1
		Crystalline silica, quartz	14808-60-7
Weighting Agent	16,400 lbs	Bentonite	1302-78-9
		Crystalline silica, cristobalite	14464-46-1
		Crystalline silica, tridymite	15468-32-3
		Crystalline silica, quartz	14808-60-7
Sodium Metasilicate	519 lbs	Sodium metasilicate, anhydrous	6834-92-0
Fluid Loss	255 lbs	Modified acrylamide copolymer	
Cement Retarder	223 lbs	Modified lignosulfonate	
Suspending Agent	41 lbs		
Silica	3,720 lbs	Silica, amorphous	7631-86=9
Weighting Agent	5,900 lbs	Barium sulfate	7727-43-7
		Crystalline silica, quartz	14808-60-7
Cement Spacer	40 bbl	Ethoxylated nonylphenol	
Cement Pre-Flush	40 bbl	Modified lignosulfonate	

¹ lbs = pounds; bbl = barrels.

² Hazardous substances are those constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), as amended. All substances utilized or produced during cementing and plugging activities are listed in this table; none of the substances listed in this table are subject to reporting under Title III of SARA and all are therefore considered non-hazardous substances

Table F-6. Hazardous and Extremely Hazardous Materials Potentially Utilized or Produced During Construction, Production, and Reclamation Operations by the NPL Project

Source	Approximate Quantities Used or Produced per Well ¹	Hazardous Substances ²	Extremely Hazardous Substances ³	CAS No.
PRODUCTION PRODUCTS				
Liquid hydrocarbons	<5-36 bpd	Benzene		71-43-2
		Ethyl benzene		100-41-4
		n-Hexane		110-54-3
		PAHs		--
		POM		--
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
Natural gas	0.5->4.0 mmcf/d	n-Hexane		110-54-3
		PAHs		--
		POM		--
Produced water/cuttings	1.0–20.0 bpd water and an unknown quantity of cuttings	Arsenic		7440-38-2
		Barium		7440-39-3
		Cadmium		7440-43-9
		Chromium		7440-47-3
		Lead		7439-92-1
		Manganese		7439-96-5
		Mercury		7439-97-6
		Radium 226		--
		Selenium		7782-49-2
		Uranium		--
Other radionuclides		--		
FUELS				
Natural gas	Unk	n-Hexane		110-54-3
		PAHs		--
		POM		--
Propane	Unk	Propylene		115-07-1
PIPELINE MATERIALS				
Coating	Unk	Aluminum oxide		1334-28-1
Cupric sulfate solution	Unk	Cupric sulfate		7758-98-7
		Sulfuric acid		7664-93-9
Diethanolamine	Unk	Diethanolamine		111-42-2
LP Gas	Unk	Benzene		71-43-2
		n-Hexane		110-54-3
		Propylene		115-07-1
Molecular sieves	Unk	Aluminum oxide		1344-28-1

Table F-6. Hazardous and Extremely Hazardous Materials Potentially Utilized or Produced During Construction, Production, and Reclamation Operations by the NPL Project

Source	Approximate Quantities Used or Produced per Well ¹	Hazardous Substances ²	Extremely Hazardous Substances ³	CAS No.
Pipeline primer	Unk	Naphthalene		91-20-3
		Toluene		108-88-3
Potassium hydroxide solution	Unk	Potassium hydroxide		1310-58-3
Rubber resin coatings	Unk	Acetone		67-64-1
		Coal tar pitch		68187-57-5
		Ethyl acetate		141-78-6
		Methyl ethyl ketone		78-93-3
		Toluene		108-88-3
		Xylene		1330-20-7
EMISSIONS				
Gases	Unk	Formaldehyde		50-00-0
			Nitrogen dioxide	10102-44-0
			Ozone	10028-15-6
			Sulfur dioxide	7446-09-5
			Sulfur trioxide	7446-11-9
Hydrocarbons	Unk	Benzene		71-43-2
		Ethylbenzene		100-41-4
		n-Hexane		100-54-3
		PAHs		--
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
Particulate matter	Unk	Barium		7440-39-3
		Cadmium		7440-43-9
		Copper		7440-50-8
		Fine mineral fibers		--
		Lead		7439-92-1
		Manganese		7439-96-5
		Nickel		7440-02-0
		POM		--
		Zinc		7440-66-6
COMPRESSOR STATION MATERIALS				
Coolants	Unk	Ethylene glycol		107-21-1
Crude Oil	Unk	Benzene		71-43-2
		PAHs		-
		POM		-
Grease	Unk	Zinc compounds		-
Heat Transfer Fluid	Unk	Benzene		71-43-2

Table F-6. Hazardous and Extremely Hazardous Materials Potentially Utilized or Produced During Construction, Production, and Reclamation Operations by the NPL Project

Source	Approximate Quantities Used or Produced per Well ¹	Hazardous Substances ²	Extremely Hazardous Substances ³	CAS No.
Lubricants	Unk	1,2,4-trimethylbenzene		95-63-6
		Barium		7440-39-3
		Cadmium		7440-43-9
		Copper		7440-50-8
		n-Hexane		110-54-3
		Lead		7439-92-1
		Manganese		7439-96-5
		Nickel		7440-02-0
		PAHs		--
		POM		--
		Zinc		7440-66-6
Methanol	Unk	Methanol		67-56-1
Natural Gas Liquids	Unk	Benzene		71-43-2
		Hexane		110-54-3
			Hydrogen Sulfide ⁶	7783-06-4
Marking Paints	Unk	Hexane		110-54-3
		Naphthalene		91-20-3
		Toluene		108-88-3
		Xylene		1330-20-7
		Acetone		67-64-1
		Cyclohexane		110-82-7
Primers	Unk	Acetone		67-64-1
		Methanol		67-56-1
		Methyl Ethyl Ketone		78-93-3
		Napthalene		91-20-3
		Toluene		108-88-3
		Xylene		1330-20-7
		Zinc		7440-66-6
Plant Condensate	Unk	Benzene		71-43-2
		Ethyl benzene		100-41-4
		n-Hexane		110-54-3
		PAHs		--
		POM		--
		Toluene		108-88-3
		m-Xylene		108-38-3
		o-Xylene		95-47-6
		p-Xylene		106-42-3
Silicone Seal	Unk	Silane		3037-72-7

Table F-6. Hazardous and Extremely Hazardous Materials Potentially Utilized or Produced During Construction, Production, and Reclamation Operations by the NPL Project

Source	Approximate Quantities Used or Produced per Well ¹	Hazardous Substances ²	Extremely Hazardous Substances ³	CAS No.
MISCELLANEOUS MATERIALS				
Acids	Unk	Acetic anhydride		108-24-7
		Formic acid		64-18-6
		Sodium chromate		777-11-3
		Sulfuric acid		7664-93-9
Antifreeze, heat control, and dehydration agents	300 gal	Acrolein		107-02-8
		Cupric sulfate		7758-38-7
		Ethylene glycol		107-21-1
		Phosphoric acid		766-38-2
		Potassium hydroxide		1310-58-3
		Sodium hydroxide		1310-73-2
		Triethylene glycol		112-27-6
Batteries	Unk	Cadmium		7440-43-9
		Cadmium oxide		1306-19-0
		Lead		7439-92-1
		Nickel hydroxide		7440-02-0
		Potassium hydroxide		1310-58-3
		Sulfuric acid		7664-93-9
Biocides	Unk	Formaldehyde		50-00-0
		Isopropyl alcohol		67-63-0
		Methanol		67-56-1
Cleaners	Unk	Hydrochloric acid		7647-01-0
Corrosion inhibitors	Unk	4-4' methylene dianiline		101-77-9
		Acetic acid		64-19-7
		Ammonium bisulfite		10192-30-0
		Basic zinc carbonate		3486-35-9
		Diethylamine		109-89-7
		Dodecylbenzenesulfonic acid		27176-87-0
		Ethylene glycol		107-21-1
		Isobutyl alcohol		78-83-1
		Isopropyl alcohol		67-63-0
		Methanol		67-56-1
		Napthalene		91-20-3
		Sodium nitrite		7632-00-0
		Toluene		108-88-3
Xylene		1330-20-7		

Table F-6. Hazardous and Extremely Hazardous Materials Potentially Utilized or Produced During Construction, Production, and Reclamation Operations by the NPL Project

Source	Approximate Quantities Used or Produced per Well ¹	Hazardous Substances ²	Extremely Hazardous Substances ³	CAS No.
Emulsion breakers	Unk	Acetic acid		64-19-7
		Acetone		67-64-1
		Ammonium chloride		12125-02-9
		Benzoic acid		65-85-0
		Isopropyl alcohol		67-63-0
		Methanol		67-56-1
		Napthalene		91-20-3
		Toluene		108-88-3
		Xylene		1330-20-7
		Zinc chloride		7646-85-7
Fertilizers	Unk	Unk		--
Herbicides	Unk	Unk		--
Lead-free thread compound	25 gal	Copper		7440-50-8
		Zinc		7440-66-6
Lubricants	Unk	1,2,4-trimethylbenzene		95-63-6
		Barium		7440-39-3
		Cadmium		7440-43-9
		Copper		7440-50-8
		n-Hexane		110-54-3
		Lead		7439-92-1
		Manganese		7439-96-5
		Nickel		7440-02-0
		PAHs		--
		POM		--
		Zinc		7440-66-6
Methanol	200 gal	Methanol		67-56-1
Motor oil	220 gal	Zinc compounds		--
Paints	Unk	Aluminum		7429-90-5
		Barium		7440-39-3
		n-Butyl alcohol		71-36-3
		Cobalt		7440-48-4
		Lead		7439-92-1
		Manganese		7439-96-5
		PAHs		--
		POM		--
		Sulfuric acid		7664-93-9
		Toluene		108-88-3
		Triethylamine		121-44-8
		Xylene		1330-20-7

Table F-6. Hazardous and Extremely Hazardous Materials Potentially Utilized or Produced During Construction, Production, and Reclamation Operations by the NPL Project

Source	Approximate Quantities Used or Produced per Well ¹	Hazardous Substances ²	Extremely Hazardous Substances ³	CAS No.
Paraffin control	Unk	Carbon disulfide		75-15-0
		Ethylbenzene		100-41-4
		Methanol		67-56-1
		Toluene		108-88-3
		Xylene		1330-20-7
Photoreceptors	Unk	Selenium		7782-49-2
Scale inhibitors	Unk	Acetic acid		64-19-7
		Ethylene diamine tetra		60-00-4
		Ethylene glycol		107-21-1
		Formaldehyde		50-00-0
		Hydrochloric acid		7647-01-0
		Isopropyl alcohol		67-63-1
		Methanol		67-56-1
		Nitrilotriacetic acid		139-13-9
Sealants	Unk	1,1,1-trichloroethane		71-55-6
		n-Hexane		110-54-3
		PAHs		--
		POM		--
Solvents	Unk	1,1,1-trichloroethane		71-55-6
		Acetone		67-64-1
		t-Butyl alcohol		75-65-0
		Carbontetrachloride		56-23-5
		Isopropyl alcohol		67-63-0
		Methyl ethyl ketone		108-10-1
		Methanol		67-56-1
		PAHs		--
		POM		--
		Toluene		108-88-3
		Xylene		1330-20-7
Starting fluid	Unk	Ethyl ether		60-29-8
Surfactants	Unk	Ethylene diamine		107-15-4
		Isopropyl alcohol		67-56-2
		Petroleum naphtha		8030-30-7

¹ lbs = pounds; gal = gallons; bpd = barrels per day; mmcf = million cubic feet per day; Unk = quantity unknown.

² Hazardous substances are those constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986, as amended.

³ Extremely hazardous substances are those defined in 40 Code of Federal Regulations 355.

⁴ PAHs = polynuclear aromatic hydrocarbons.

⁵ POM = polycyclic organic matter.

⁶ If hydrogen sulfide is present, it occurs at 5 percent or less of liquid gas component.

2.1 Drilling Materials

Two types of drilling mud scenarios are anticipated for the NPL Project: water-based and oil-based.

In most cases, water-based drilling fluids consisting of clays (such as bentonite) and other additives would be utilized by Jonah Energy for drilling each well; however, in certain circumstances, oil-based mud may be required to address unique geological conditions or wellbore design requirements. Drilling fluid additives for the water-based and oil-based scenarios potentially containing hazardous materials are listed in Table F-1 and Table F-2, respectively. Drilling-related equipment and materials would be transported, usually as part of a supply run, at the start of each new well. Drilling fluid additives would be stored onsite in bulk, or in original manufacturers' containers, and handled according to methods prescribed in the Safety Data Sheets provided for each product.

A closed-loop system would be used to process drilling mud and cuttings. Only clean, dried cuttings would be placed in earthen cuttings vaults. Any oil-contaminated mud or cuttings would be removed from the site and processed using appropriate handling procedures.

Oil-based drilling fluids would be reused for drilling other wells or, as with other potentially hazardous materials, hauled for disposal at an authorized offsite facility.

2.2 Cementing and Plugging Materials

Well completion and abandonment operations include cementing and plugging various segments of the wellbore to protect freshwater aquifers and other down-hole resources. Wells would be cased and cemented as approved by the BLM (for Federal minerals) and Wyoming Oil and Gas Conservation Commission (WOGCC) (for state minerals). Materials utilized or produced during cementing and plugging activities are listed in Table F-5. All casing and plugging materials would be transported in bulk or in manufacturers' containers to each well site. Small quantities may be transported and stored onsite in appropriate containers.

2.3 Hydraulic Fracturing Materials

Hydraulic fracturing would be performed at all proposed wells to enhance gas flow rates. Two types of hydraulic fracturing scenarios are expected to be used on the NPL Project: gel-based and slickwater-based. Fracturing fluids would consist primarily of fresh water and sand, but would contain some additives with hazardous constituents as shown in Table F-3 and Table F-4. Fracturing materials would be transported to well locations in bulk or in manufacturers' containers. Residual fracturing fluids would be used at another well or disposed of at an authorized facility. Proppant sand returned during flow-back would be combined with drill cuttings and stored onsite in existing cuttings vaults. Any proppant sand containing hydrocarbons would be hauled for disposal at an authorized facility.

2.4 Production Products

Comingled well product would include natural gas, condensates, and produced water.

2.4.1 Natural Gas

Produced natural gas would primarily contain methane, ethane, and carbon dioxide. Hazardous substances potentially present in the gas stream are listed in Table F-6. No extremely hazardous materials are anticipated to be present in the produced natural gas. Jonah Energy would conduct well-completion operations using flareless flow-back technology in an effort to eliminate or significantly reduce emissions from completion operations; in rare cases, flaring may be required for safety reasons. The comingled well product (natural gas, condensates, and produced water) would be transported by a three-phase pipeline gathering system from well pads to the nearest Regional Gathering Facility (RGF), where the liquids from the natural gas stream would be separated and stored. No natural gas would be stored onsite.

2.4.2 Liquid Hydrocarbons

Condensates would be produced in association with the gas stream from productive wells. Hazardous materials potentially present in the liquid hydrocarbons are listed in Table F-6. No extremely hazardous materials are known to be present in these liquid hydrocarbons.

Liquid hydrocarbons would be stored in tanks at RGFs and periodically transported by truck to condensate sales points. All necessary authorizing actions for the production, storage, and transport of liquid hydrocarbons would be addressed prior to the initiation of production activities.

2.4.3 Produced Water

Hazardous materials potentially present in trace amounts in produced water are listed in Table F-6. No extremely hazardous materials are expected in the produced water.

Produced water would be disposed via subsurface injection at wells near each operational RGF. Produced water would also be treated and reused in drilling and completions operations, as needed.

Necessary authorizing actions that must be met prior to the disposal of produced water include the following:

- BLM approval of disposal methodologies;
- Resource Conservation and Recovery Act (RCRA) compliance, as necessary; certain oil and gas exploration and production wastes are exempt from regulation as hazardous wastes under Subtitle C of the RCRA (EPA 2002);
- Wyoming State Engineer's Office dewatering permits (Form U.W. 5); and
- Underground Injection Control, in accordance with Water Quality Rules and Regulations (Chapters 3, 8, 11, and 16), Wyoming Department of Environmental Quality (WDEQ).

2.5 Fuel

Natural gas and propane would be used as fuel sources for the NPL Project. Natural gas and propane both contain hazardous materials (see Table F-6). Natural gas would power drill rigs that would be used to drill wells directionally from the multi-well pads. Propane would be utilized for miscellaneous heating purposes. Additional vehicle traffic (i.e., worker traffic) would use traditional gasoline, diesel fuel, and compressed natural gas-equipped vehicles only.

2.5.1 Natural Gas

Certain hazardous materials may, at times, be present in natural gas (see Table F-6). No extremely hazardous materials are known to exist in the natural gas from the Project Area.

2.5.2 Propane

The only hazardous material known to be present in propane is propylene. No extremely hazardous materials are known to be present. Propane would be purchased from regional vendors and would be stored and transported in appropriate propane tanks. No large-scale storage of propane is anticipated.

2.6 Pipeline Materials

A three-phase pipeline gathering system, and additional pipelines as needed, would be constructed for transporting the comingled well product of produced gas, condensate, and produced water from the well pads to the nearest RGF. Whenever possible, pipelines would be located adjacent to new or existing access roads within the standard 100-foot-wide right-of-way corridor and at a depth of six feet to protect pipelines from surface freeze conditions. Jonah Energy would test all new pipelines for hydrostatic integrity and structural soundness using approved testing procedures to ensure full compliance with the mandatory BLM pipeline requirements. Releases of hydrostatic pipeline test waters would be in accordance with WDEQ discharge requirements.

Industry-standard pipeline equipment, materials, techniques, and procedures in conformance with all applicable regulatory requirements would be employed during construction, testing, operation, and maintenance of the project to ensure pipeline safety and efficiency. All necessary authorizing actions for natural gas pipelines would be addressed prior to installation. These actions may include the following:

- Sublette County special use permits;
- BLM right-of-way grants;
- BLM Sundry Notices;
- Conformance with Department of Transportation pipeline regulations (49 CFR 191-192); and
- Wyoming Public Service Commission Certificates to act as common carrier for natural gas.

Materials utilized for pipeline construction, operation, and maintenance that may contain hazardous materials are listed in Table F-6. Hazardous materials associated with pipeline construction, operation, and maintenance would be handled in accordance with applicable state and Federal regulations.

2.7 Emissions

Jonah Energy would conduct well-completion operations using flareless flow-back technology in an effort to eliminate or significantly reduce emissions from completion operations. In rare cases, flaring may be required for safety reasons.

Emissions from combustion engines and condensate flashing; well construction, completion, and production; and pipeline construction, operation, and maintenance would occur as a result of the NPL Project (Table F-6); however, combustion emissions would not be expected to exceed Wyoming Ambient Air Quality Standards or National Ambient Air Quality Standards. Hazardous and extremely

hazardous materials are known to be released directly or formed secondarily (e.g., ozone) from the construction and operation of natural gas wells and associated pipelines (Table F-6); however, any releases would be expected to be within the quantities allowed in Prevention of Significant Deterioration Class II areas of the WDEQ Air Quality Division Implementation Plan. Particulate matter emissions and larger, unburned hydrocarbons would eventually settle out on the ground surface, whereas gaseous emissions would react with other air constituents as components of the nitrogen, sulfur, and carbon cycles.

2.8 Compressor Stations

Materials potentially containing hazardous substances to be used at compressor stations are listed in Table F-6. Quantities of these materials are unknown but consist of fuels, lubricants, paints, primers, and combustion products. The extremely hazardous material hydrogen sulfide may be present as a minor component in natural gas liquids.

2.9 Miscellaneous Materials

Miscellaneous materials potentially containing hazardous substances that may be used for the NPL Project are listed in Table F-6. Quantities of these materials are unknown; however, no extremely hazardous substances are known to be present in any of these materials. Miscellaneous materials would be used during well construction and production operations; for well, pipeline, and equipment maintenance; and during reclamation activities.

3.0 MANAGEMENT POLICY AND PROCEDURE

Jonah Energy would be responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of the NPL Project would be in accordance with all applicable existing or hereafter promulgated Federal, state, and local laws, ordinances, regulations, and standards, including the WDEQ Hazardous Waste rules and regulations. All project-related activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials would be conducted to minimize potential environmental impacts.

Jonah Energy would comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances (leaks, spills, etc.) in excess of the Reportable Quantity as established in 40 CFR 117 would be reported to the WDEQ as required by the WDEQ Water Quality Rules and Regulations (Chapter 4) and the National Response Center. The materials for which such notification must be given are the extremely hazardous substances listed under the *Emergency Planning and Community Right to Know Act*, Section 302, and the hazardous substances designated under Section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended. Further, if the release of a hazardous/extremely hazardous substance in a reportable quantity does occur, immediate notice and reporting must be given to the BLM as defined in BLM NTL-3A and BLM Instruction Memorandum No. WY-2009-021, *Guidance and Standards for Response to Oil and Gas-Related Spills and Clean-Up Criteria*. Incidents requiring verbal notification would be reported as soon as possible, but no later than 24 hours after discovery. Verbal notification would be confirmed in writing within 15 days or other timeframe as required by the appropriate regulatory agency.

Jonah Energy would prepare and implement, as necessary, the following plans and/or policies:

- Pursuant to 40 CFR 112, Spill Prevention, Control, and Countermeasure (SPCC) Plans for those sites where SPCC Plans are applicable;
- Spill response plans;
- Plans and inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended;
- Emergency Response Plans; and
- Storm Water Pollution Prevention Plans.

Copies of the above would be maintained with Jonah Energy, as required by regulation, and would be made available upon request.

During the course of routine oil and gas production operations, minor leaks, spills, and other accidental releases of crude oil and condensate may occur, thereby creating hydrocarbon-impacted soils. Jonah Energy would transport, accumulate, and treat these contaminated soils at a bioremediation facility in the Jonah Infill Drilling Project Area or transport such materials to a licensed offsite repository for disposal. In some cases, soils may be remediated on location.

Point sources for hydrocarbon-impacted soils are wellhead and production battery spills and releases, as well as gas and flow line leaks. The typical range of hydrocarbon contamination, expressed as total petroleum hydrocarbons (TPH), is from less than 500 parts per million (ppm) to greater than 20,000 ppm depending on such factors as spill volume, exposure time, commodity, and weather.

Hydrocarbon-impacted soils would be treated at the facility by promoting growth of indigenous bacteria to enhance hydrocarbon degradation or other approved effective treatment method. Impacted soils would be placed in windrows appropriate for the method of treatment. On a scheduled basis, the soil mass in each windrow would be turned to continually expose soil mass layers to oxygen, moisture, and sunlight. No tillage of the soils would occur during periods of high winds or when surface conditions could create fugitive dust emissions.

Hydrocarbon concentrations would be periodically measured with an organic vapor meter (OVM). When OVM readings indicate hydrocarbon concentrations have dropped below 1,000 ppm, a composite sample of the soil mass would be collected for TPH analysis. When TPH concentrations have dropped below WOGCC TPH concentration limits, the soil mass would be removed from the facility for recycling under a variety of beneficial uses approved and stipulated by the WOGCC and coordinated with the BLM. The primary use of remediated soils from this facility would be construction-related (e.g., road grades).

As necessary, development operations would also be in compliance with regulations promulgated under the RCRA, Federal Water Pollution Control Act (the Clean Water Act), Safe Drinking Water Act, Toxic Substances Control Act, Occupational Safety and Health Act, and Federal Clean Air Act. In addition, project operations would comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

4.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 2002. Exemption of Oil and Gas Exploration and Production Wastes from Federal Hazardous Waste Regulations. October.