APPENDIX Q

Crude Oil Material Safety Data Sheets

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CRUDE OIL MATERIAL SAFETY DATA SHEETS

For planning purposes, the attached Material Safety Data Sheets (MSDS) identify the chemical composition and maximum volumes of those chemicals that would be present in the dilbit or Bakken crude in the event of a release. These MSDS do not represent the actual product that would flow through the proposed Keystone XL pipeline.

In the event of a release, the specific MSDS and exact composition of the product shipped (and released) would be provided to emergency responders, including any federal, state, or local agencies involved in spill response actions, within 1 hour of the release (see Section 4.13.6.2, Safety and Spill Response, for emergency procedures). Keystone would maintain a point of contact (and procedure to contact this point of contact with this hour timeframe) for requests for MSDS and the identification of the exact product composition (both crude and diluents) shipped in the pipeline (when a release occurs) who would be authorized to release the MSDS and chemical composition information (as described above) to first responders.

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Material Safety Data Sheet

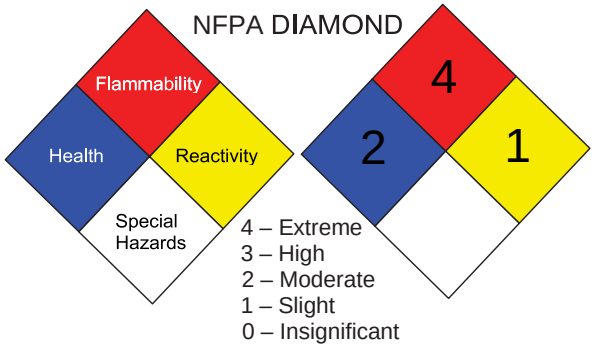
FOR INFORMATIONAL/PLANNING PURPOSES ONLY – NOT FOR USE
THIS DOES NOT REPRESENT AN ACTUAL FORMULATION
Bakken Crude Oil

1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer/Supplier: Various
Product Name: Bakken Crude Oil

Synonyms: Hydrocarbons of Petroleum
Bakken Oil
Bakken Light

General Information: 780-420-5306
Emergency Telephone Number: N/A
Date Prepared: 11/22/2013



2 – PRODUCT COMPOSITION: INFORMATION ON INGREDIENTS

REPRESENTATIONAL Bakken Sweet Crude with 40% volatile fraction

Component	CAS Number	Maximum % * by vol./vol. (estimated)	Occupational Exposure Limits (ppm)		
			OSHA	ACGIH	NIOSH
Petroleum hydrocarbons	68919-39-1	100	N/A	N/A	N/A
Benzene	71-43-2	1.2	1	0.5	0.1
Toluene	108-88-3	1.2	100	20	100
Ethylbenzene	100-41-4	1.2	100	20	100
Xylenes	1330-20-7	1.2	100	100	100
n-butane	106-97-8	6.9	800	1000	800
n-pentane	109-66-0	5.7	600	600	120
n-heptane	142-82-5	7.8	500	400	85
n-hexane	110-54-3	4.5	50	50	50
n-octane	111-65-9	6.9	500	300	75
n-nonane	111-84-2	3.3	None	200	200
Hydrogen sulfide	7783-06-4	<0.01	20 Ceiling	1	10 Ceiling

* Values reflect reasonable potential maximums
N/A - Not available

3 – HAZARDS IDENTIFICATION

Routes of Entry: Skin contact, skin absorption, eye contact, inhalation, ingestion

Overview: Flammable liquid and vapor. Liquid and vapor may cause irritation or burns to eyes, nose, and throat. Inhalation of vapor may cause dizziness and drowsiness. Possible cancer hazard (benzene). Possible asphyxiation hazard (hydrogen sulfide and ethane). Wear personal protective equipment appropriate for the task.

Flammability: Flammable liquid and vapor. Keep away from heat, sparks, flames, or other sources of ignition (such as static electricity, pilot lights, mechanical/electrical equipment).

Stability: Stable under normal conditions. Avoid all sources of ignition.

POTENTIAL HEALTH EFFECTS

Acute Effects

Ingestion: Ingestion may result in nausea, vomiting, diarrhea and central nervous system depression.

Aspiration of liquid into the lungs must be avoided as even small quantities in the lungs can produce chemical pneumonitis, pulmonary edema/hemorrhage, and even death.

Skin Contact: Prolonged and repeated contact may cause defatting and drying of the skin and can lead to irritation and/or dermatitis. Exposure to hot material may cause thermal burns.

Eye Contact: Liquid or vapor contact may cause mild eye irritation, including stinging, watering, redness, and swelling. Hydrogen sulfide (H_2S) may cause burning or tearing and visual disturbances at repeated exposures above the TLV.

Inhalation: Prolonged or excessive exposure may cause irritation to the nose, throat, lungs, and respiratory tract and may lead to headache, nausea, drowsiness, fatigue, pneumonitis, pulmonary edema, CNS depression, coma, and respiratory arrest.

Chronic Effects

Skin and eye irritation. May affect the respiratory and central nervous systems.

Special Toxic Effects

n-Hexane (CAS 110-54-3):
Target Organs – Excess exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesia of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs, and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone. Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) has resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Benzene (CAS 71-43-2):
Carcinogenicity: Benzene is a known animal carcinogen and is known to produce leukemia in humans. Benzene has been identified as a human carcinogen by NTP, IARC, and OSHA.

4 – FIRST AID MEASURES

Ingestion: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe damage. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration.

Skin Contact: Wipe material from skin and remove contaminated clothing. Cleanse affected areas thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser. If irritation or redness develops, seek medical attention.

Eye Contact: Move victim away from exposure and into fresh air. Flush eyes with clean water for 15 minutes, with eyelids held open. If irritation persists, seek medical attention.

Inhalation: Ensure own safety. If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, qualified personnel should administer oxygen. Seek immediate medical attention.

Notes to Physician: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for development of cardiac arrhythmias.

5 – FIRE FIGHTING MEASURES

Flash point °C:	< 22	Lower explosive limit %v/v:	0.8 (estimated)
Auto ignition temperature °C:	Not established	Upper explosive limit %v/v:	Not established
Combustion products:	Carbon monoxide, sulfur oxides, nitrogen oxides		

Overview: Material will ignite at normal temperature. Foam, carbon dioxide (CO_2), dry chemical can be used as a mean to extinguish fire. Explosive accumulation can build in areas of poor ventilation. Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited.

Basic Fire Fighting Procedures: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant. Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

Extinguishing Media: Any extinguisher capable of handling Class B fires is recommended, including extinguishing media such as CO_2, dry chemical, foam, or water as a fog. Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Firefighting should be attempted only by those who are adequately trained and equipped with proper personal protective equipment.

Unusual Fire and Explosion Hazards: This material is flammable and may be ignited by heat, sparks, flames or other sources of ignition (such as static electricity, pilot lights, or mechanical/electrical equipment). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

6 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

Eye Protection: Safety glasses or goggles are recommended when there is a possibility of splashing or spraying.

Skin Protection: The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. Depending on conditions, the use of an apron, chemical protective clothing, and rubber boots may be necessary. When hot material is present, wear thermal resistant gloves, arm protection, and face shield.

Respiratory Protection: A NIOSH-certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations of hydrocarbons are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is a potential for an uncontrolled release, exposure levels are not known or any other circumstances where air purifying respirators may not provide adequate protection. A respiratory protection program that meets U.S. OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed when workplace conditions warrant a respirator's use.

Engineering Controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Hygiene Measures: Wash hands and face after handling and before eating, drinking, or smoking. Take off contaminated clothing and wash before re-use.

7 – ACCIDENTAL RELEASE MEASURES

Personal Precautions: Appropriately trained personnel should respond to uncontrolled release. Avoid direct contact with material; use the personal protective equipment specified in SDS for a specific spill event because the characteristics could vary for those herein. Stay upwind of release; isolate the immediate hazard area; and keep unnecessary and unprotected people away. Use water spray to cool containers. Eliminate all sources of ignition. Provide explosion-proof clearing ventilation, if possible.

Environmental Precautions: Prevent material from entering soil, waterways, drains, sewers, or confined areas.

Spill Management: Wear appropriate breathing apparatus (if applicable) and protective clothing. A vapor suppressing foam may be used to reduce vapors. Try to work upwind of spill. Dike and contain land spills; contain water spills by booming. For large spills remove by mechanical means such as vacuuming or pumping and place in containers. All equipment used when handling the product must be grounded. Recover and return free product to proper containers. Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. Do not wash spills into sewers or other public water systems.

Reporting: Report spills to local or federal authorities as appropriate or required.

8 – HANDLING AND STORAGE

The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Do not enter confined spaces such as tanks or pits without following proper entry procedures. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.

Use appropriate grounding and bonding practices. Store recovered material and exposed PPE in properly closed containers that are appropriately labeled and in a cool well-ventilated area. Do not expose to heat, open flames, strong oxidizers, or other sources of ignition. Do not cut, drill, grind, or weld on empty containers since they may contain explosive residues.

Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. Stay upwind and vent open hatches before uploading.

Avoid skin contact. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear to brown liquid
Physical form:	Liquid
Substance type (pure/mixture):	Mixture
Boiling temperature:	<33ºC
Melting temperature:	Not determined
Vapor pressure:	about 380 mm Hg
Vapor density:	1.0 - 3.9
Evaporation rate(ethyl ether =1):	>1
Specific gravity:	0.82
Water solubility:	Negligible
pH:	Not determined
Viscosity:	5.43 mm^2/s
Color:	Clear to brown
Odor:	Rotten egg, petroleum-like odor
Percent volatiles, (v/v)	15-40 (estimated)

10 – STABILITY AND REACTIVITY

Conditions to avoid: Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity.

Chemical stability: Stable at <18°C (estimated), 760 mmHg pressure.

Hazardous decomposition products: Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons.

Hazardous polymerization: Will not occur.

Incompatibility: Strong oxidizers such as nitrates, chlorates, peroxides.

11 – TOXICOLOGICAL INFORMATION– CHRONIC AND ACUTE HEALTH HAZARDS

This product contains benzene at a level of 1.2% v/v. Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from aplastic anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex, or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects, and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen sulfide gas (H_2S) is toxic by inhalation. Prolonged breathing of 50 to 100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250 to 600 ppm) for 15 to 30 minutes

can produce headache, dizziness, nervousness, nausea, and pulmonary edema or bronchial pneumonia. Concentrations of >1,000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hr/day, 5 days/week for 10 weeks did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75 to 80 ppm or 150 ppm H_2S, respectively. Over the years, a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained, causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors, or brain damage are possible.

This product may contain hexane. Studies in laboratory animals have produced systemic toxicity in blood, spleen, and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long-term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

This product may contain xylenes. Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart, and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart, and adrenals, Exposure of pregnant rats, mice, and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal, and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and humans. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

12 – DISPOSAL INFORMATION

Material should be properly containerized for disposal and must be disposed with care and in full compliance with federal, state, and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities. This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by USEPA RCRA (40 CFR 261), or other state and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of “toxicity” (D018) as determined by the toxicity characteristic leaching procedure (TCLP). This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). It is the responsibility of the user to consult federal, state, and local waste regulations to determine appropriate disposal options.

13 – ENVIRONMENTAL INFORMATION

Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended. Stay upwind and away from spill/release. Notify persons downwind of spill/release, isolate immediate hazard area and keep unauthorized personnel out. Product may release large amounts of flammable vapors (e.g., methane, ethane, and propane) at or below ambient temperature depending on source and process conditions. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory equipment as conditions warrant. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment drainage systems, and natural waterways. Use foam on spills to minimize vapors. Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state (provincial) and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount into navigable waters, notify appropriate federal, state, and local agencies.

Sara Title III Information: This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Chemical	CAS No.	Weight %
Toluene	108-88-3	0 – 3%
n-hexane	110-54-3	up to 11%
Benzene	71-43-2	0 – 3%

14 – REGULATORY INFORMATION

USA: All of the components of this product are on the Toxic Substances Control Act (TSCA) Chemical Inventory.

USEPA Reportable Quantity: The estimated reportable quantity (RQ) for this material is based on the weight % shown below:

- RQ based on benzene: The RQ for benzene is 10 pounds, which equals 46 gallons of crude oil. The RQ is based on 3 wt. % benzene.
- RQ based on n-hexane: The RQ for n-hexane is 5,000 pounds, which equals 8,300 gallons of crude oil. The RQ is based on 11 wt. % n-hexane.
- RQ based on toluene: The RQ for toluene is 1,000 pounds, which equals 4,600 gallons of crude. The RQ is based on 3 wt. % toluene.

15 – SPECIAL PRECAUTIONS AND SUPPLEMENTAL INFORMATION

Before working on or in pipe, fittings, or tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated operations.

16 – TRANSPORTATION REQUIREMENTS

General Transportation Information:

DOT proper shipping name (49 CFR 172.101):	Petroleum crude oil
DOT hazard classes (49 CFR 172.101):	3
UN/NA code (49 CFR 172.101):	UN1267
Packing group (49 CFR 172.101):	I or II
Bill of lading description (49 CFR 172.202):	Petroleum crude oil
DOT labels required (49 CFR 172.101):	Flammable liquid
Prepared by:	N/A

DISCLAIMER

The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet (MSDS). However, MSDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
IARC	International Agency for Research on Cancer
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
SARA	Superfund Amendments and Reauthorization Act
TLV	threshold limit value
TSCA	Toxic Substance Control Act

Material Safety Data Sheet

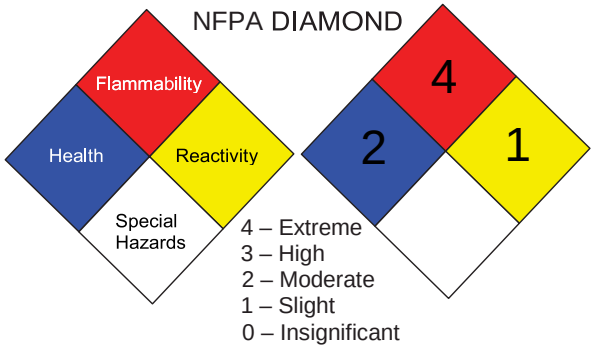
FOR INFORMATIONAL/PLANNING PURPOSES ONLY – NOT FOR USE
THIS DOES NOT REPRESENT AN ACTUAL FORMULATION
Diluted Bitumen

1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer/Supplier: Various
Product Name: Diluted bitumen

Synonyms: Diluted bitumen (DILBIT)
with 60% diluent mix

General Information: 780-420-5306
Emergency Telephone Number: N/A
Date Prepared: 11/22/2013



2 – PRODUCT COMPOSITION: INFORMATION ON INGREDIENTS

REPRESENTATIONAL Diluted bitumen with 60% light naphtha as diluent

Component	CAS Number	Maximum % * by vol./vol. (estimated)	Occupational Exposure Limits (ppm)		
			OSHA	ACGIH	NIOSH
Bitumen	8052-42-4	40	N/A	N/A	N/A
Diluent (light naphtha)[1]	8032-32-4	60	N/A	400	100
Light naphtha: benzene	71-43-2	1.9	1	0.5	0.1
Light naphtha: toluene	108-88-3	7.6	100	20	100
Light naphtha: ethylbenzene	100-41-4	2.7	100	20	100
Light naphtha: xylenes	1330-20-7	13.4	100	100	100
Light naphtha: n-hexane	110-54-3	13.4	50	50	50
Light naphtha: cyclohexane	110-82-7	7.6	300	100	300
Light naphtha: heptane (and isomers)	142-82-5	5.7	500	400	85
Light naphtha: pentane	109-66-0	7.6	600	600	120
Nickel	7440-02-0	57.4 ppm	500	300	75
Vanadium	7440-62-2	137.7 ppm	None	200	200
Sulfur[2]	7704-34-9	3.49	20 Ceiling [2]	1	10 Ceiling

[1] General composition ranges shown and vary greatly by source.
[2] Exposure limit is for hydrogen sulfide.
* Values reflect reasonable potential maximums.
N/A = Not available

REPRESENTATIONAL Diluted bitumen with 60% natural gas condensate as diluent

Component	CAS Number	Maximum % * by vol./vol. (estimated)	Occupational Exposure Limits (ppm)		
			OSHA	ACGIH	NIOSH
Bitumen	8052-42-4	40	N/A	N/A	N/A
Diluent (natural gas condensate)[1]		60	N/A	N/A	N/A
Propane	74-98-6	19.8	1,000	2,500	1,000
Ethane	74-84-0	19.8	N/A	N/A	N/A
n-pentane	109-66-0	8.3	600	600	120
n-hexane	110-54-3	4.3	50	50	50
Heptane (and isomers)	142-82-5	3.3	500	400	85
Octane	111-65-9	3.3	500	75	300
Other hydrocarbons (including BTEX)	N/A	1.7	1	0.5	0.1
Nickel	7440-02-0	57.4 ppm	500	300	75
Vanadium	7440-62-2	137.7 ppm	None	200	200
Sulfur[2]	7704-34-9	3.49	$20^{Ceiling}$	1	$10^{Ceiling}$

[1] General composition ranges shown and vary greatly by source.
[2] Exposure limit is for hydrogen sulfide.
* Values reflect reasonable potential maximums.
N/A = Not available.

3 – HAZARDS IDENTIFICATION

Routes of Entry: Skin contact, skin absorption, eye contact, inhalation, ingestion

Overview: Flammable liquid and vapor. Liquid and vapor may cause irritation or burns to eyes, nose, and throat. Inhalation of vapor may cause dizziness and drowsiness. Possible cancer hazard (benzene). Possible asphyxiation hazard (hydrogen sulfide and ethane). Wear personal protective equipment appropriate for the task.

Flammability: Flammable liquid and vapor. Keep away from heat, sparks, flames, or other sources of ignition (such as static electricity, pilot lights, mechanical/electrical equipment).

Stability: Stable under normal conditions. Avoid all sources of ignition.

POTENTIAL HEALTH EFFECTS

Acute Effects

Ingestion: Ingestion may result in throat burning, gastrointestinal irritation, abdominal pain, nausea, vomiting, and diarrhea. Aspiration of liquid into the lungs must be avoided as even small quantities in the lungs can produce chemical pneumonitis and even death.

Skin Contact: Low toxicity through skin contact. Exposure to hot material may cause thermal burns. Signs of irritation include localized redness, swelling, and itching. Prolonged and repeated contact may cause drying of the skin and can lead to irritation and/or dermatitis.

Eye Contact: Hot splashes may cause mild eye irritation to eye damage. Exposure commonly includes stinging, watering, redness, swelling, light sensitivity. Hydrogen sulfide (H_2S) may cause burning or tearing and visual disturbances at repeated exposures above the TLV.

Inhalation: Prolonged or excessive exposure may cause irritation to the nose, throat, lungs, and respiratory tract and may lead to headache, nausea, drowsiness, fatigue, peculiar skin sensations, digestive upset, pulmonary edema, CNS depression, coma, and respiratory arrest.

Chronic Effects

Skin and eye irritation. May affect the respiratory and central nervous systems.

Special Toxic Effects

n-Hexane (CAS 110-54-3):
Target Organs – Excess exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesia of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs, and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone. Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) has resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Benzene (CAS 71-43-2):
Carcinogenicity: Benzene is a known animal carcinogen and is known to produce leukemia in humans. Benzene has been identified as a human carcinogen by NTP, IARC, and OSHA.

4 – FIRST AID MEASURES

Ingestion: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe damage. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration.

Skin Contact: Wipe material from skin and remove contaminated clothing including shoes. Cleanse affected areas thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser. If irritation or redness develops, seek medical attention. For hot material, immediately immerse in or flush affected area with large amounts of cold water to dissipate heat. Cover with clean cotton sheeting or gauze and get prompt medical attention.

Eye Contact: Move victim away from exposure and into fresh air. Flush eyes with clean water for 15 minutes, with eyelids held open. If irritation persists, seek medical attention.

Inhalation: Ensure own safety. If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, qualified personnel should administer oxygen. Seek immediate medical attention.

Notes to Physician: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for development of cardiac arrhythmias.

5 – FIRE FIGHTING MEASURES

Flash point °C:	< 35	Lower explosive limit %v/v:	0.8 (estimated)
Auto ignition temperature °C:	250 (estimated)	Upper explosive limit %v/v:	Not established
Combustion products:	Carbon monoxide, carbon dioxide, sulfur oxides		

Overview: Material will ignite at normal temperature. Foam, carbon dioxide (CO_2), dry chemical can be used as a mean to extinguish fire. Explosive accumulation can build in areas of poor ventilation. Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited.

Basic Fire Fighting Procedures: Long-duration fires involving diluent stored in tanks may result in a boil-over. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boil-over is anticipated (reference NFPA 11). For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant. Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

Extinguishing Media: Any extinguisher capable of handling Class B fires is recommended, including extinguishing media such as CO_2, dry chemical, foam, or water as a fog. Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Firefighting should be attempted only by those who are adequately trained and equipped with proper personal protective equipment.

Unusual Fire and Explosion Hazards: This material is flammable and may be ignited by heat, sparks, flames or other sources of ignition (such as static electricity, pilot lights, or mechanical/electrical equipment). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, outdoors, or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

6 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

Eye Protection: Safety glasses or goggles are recommended when there is a possibility of splashing or spraying.

Skin Protection: The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. Depending on conditions, the use of an apron or chemical protective and flame resistant clothing and rubber boots may be necessary. When hot material is present, wear thermal resistant gloves, arm protection, and face shield.

Respiratory Protection: A NIOSH-certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations of hydrocarbons are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is a potential for an uncontrolled release, exposure levels are not known or any other circumstances where air purifying respirators may not provide adequate

protection. A respiratory protection program that meets U.S. OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed when workplace conditions warrant a respirator's use.

Engineering Controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Hygiene Measures: Wash hands and face after handling and before eating, drinking, or smoking. Take off contaminated clothing and wash before re-use.

7 – ACCIDENTAL RELEASE MEASURES

Personal Precautions: Appropriately trained personnel should respond to uncontrolled release. Avoid direct contact with material; use the personal protective equipment specified in SDS for a specific spill event because the characteristics could vary for those herein. Stay upwind of release; isolate the immediate hazard area; and keep unnecessary and unprotected people away. Use water spray to cool containers. Eliminate all sources of ignition. Provide explosion-proof clearing ventilation, if possible.

Environmental Precautions: Prevent material from entering soil, waterways, drains, sewers, or confined areas.

Spill Management: Wear appropriate breathing apparatus (if applicable) and protective clothing. A vapor suppressing foam may be used to reduce vapors. Try to work upwind of spill. Dike and contain land spills; contain water spills by booming. For large spills remove by mechanical means such as vacuuming or pumping and place in containers. All equipment used when handling the product must be grounded. Recover and return free product to proper containers. Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. Do not wash spills into sewers or other public water systems.

Reporting: Report spills to local or federal authorities as appropriate or required.

8 – HANDLING AND STORAGE

The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Do not enter confined spaces such as tanks or pits without following proper entry procedures. Using appropriate respiratory protection is advised when concentrations exceed any established exposure limits.

Use appropriate grounding and bonding practices. Store recovered material and exposed PPE in properly closed containers that are appropriately labeled and in a cool well-ventilated area. Do not expose to heat, open flames, strong oxidizers, or other sources of ignition. Do not cut, drill, grind, or weld on empty containers since they may contain explosive residues.

Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. Stay upwind and vent open hatches before uploading.

Avoid skin contact. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Petroleum / amber to black color
Physical form:	Liquid
Substance type (pure/mixture):	Mixture
Boiling temperature:	>34ºC
Melting temperature:	Not determined
Vapor pressure:	> 150 mm Hg
Vapor density:	>1
Evaporation rate:	Not available
Specific gravity:	< 1
Water solubility:	Not measured
pH:	Not determined
Viscosity:	Estimated at 70 centistokes at 40ºC
Color:	Amber to black
Odor:	Petroleum odor and associated smell of “rotten eggs”

10 – STABILITY AND REACTIVITY

Conditions to avoid: Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity.

Chemical stability: Stable

Hazardous decomposition products: Oxides of carbon, hydrogen sulfide

Hazardous polymerization: Will not occur.

Incompatibility: Heat, ignition sources, oxidizing agents

11 – TOXICOLOGICAL INFORMATION – CHRONIC AND ACUTE HEALTH HAZARDS

This product contains benzene at a level of up to 1.9% v/v. Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from aplastic anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex, or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects, and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen sulfide gas (H_2S) is toxic by inhalation. Prolonged breathing of 50 to 100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250 to 600 ppm) for 15 to 30 minutes can produce headache, dizziness, nervousness, nausea, and pulmonary edema or bronchial pneumonia. Concentrations of >1,000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hr/day, 5 days/week for 10 weeks did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75 to 80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors, or brain damage are possible.

This product may contain hexane. Studies in laboratory animals have produced systemic toxicity in blood, spleen, and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long- term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

This product may contain xylenes. Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart, and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart, and adrenals. Exposure of pregnant rats, mice, and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal, and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and humans. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

12 – DISPOSAL INFORMATION

Material should be properly containerized for disposal and must be disposed with care and in full compliance with federal, state, and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities. This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by USEPA RCRA (40 CFR 261), or other state and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of “toxicity” (D018) as determined by the toxicity characteristic leaching procedure (TCLP). This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). It is the responsibility of the user to consult federal, state, and local waste regulations to determine appropriate disposal options.

13 – ENVIRONMENTAL INFORMATION

Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended. Stay upwind and away from spill/release. Notify persons downwind of spill/release, isolate immediate hazard area and keep unauthorized personnel out. Product may release large amounts of flammable vapors (e.g., methane, ethane, and propane) at or below ambient temperature depending on source and process conditions. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory equipment as conditions warrant. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment drainage systems, and natural waterways. Use foam on spills to minimize vapors. Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state (provincial) and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount into navigable waters, notify appropriate federal, state, and local agencies.

Sara Title III Information: This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Chemical	CAS No.	Weight %
Benzene	71-43-2	0 – 5%
n-hexane	110-54-3	up to 35%
Toluene	108-88-3	0 – 22%

14 – REGULATORY INFORMATION

USA: All of the components of this product are on the Toxic Substances Control Act (TSCA) Chemical Inventory.

USEPA Reportable Quantity: The estimated reportable quantity (RQ) for this material is based on the weight % shown below:

- RQ based on benzene: The RQ for benzene is 10 pounds, which equals 27 gallons of crude oil. The RQ is based on 5 wt. % benzene.
- RQ based on n-hexane: The RQ for n-hexane is 5,000 pounds, which equals 2,600 gallons of crude oil. The RQ is based on 35 wt. % n-hexane.
- RQ based on toluene: The RQ for toluene is 1,000 pounds, which equals 630 gallons of crude. The RQ is based on 22 wt. % toluene.

15 – SPECIAL PRECAUTIONS AND SUPPLEMENTAL INFORMATION

Before working on or in pipe, fittings, or tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated operations.

16 – TRANSPORTATION REQUIREMENTS

General Transportation Information:

DOT proper shipping name (49 CFR 172.101):	Petroleum crude oil
DOT hazard classes (49 CFR 172.101):	3
UN/NA code (49 CFR 172.101):	UN1267
Packing group (49 CFR 172.101):	II
Bill of lading description (49 CFR 172.202):	Petroleum crude oil
DOT labels required (49 CFR 172.101):	Flammable liquid
Prepared by:	N/A

DISCLAIMER

The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet (MSDS). However, MSDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
IARC	International Agency for Research on Cancer
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
SARA	Superfund Amendments and Reauthorization Act
TLV	threshold limit value
TSCA	Toxic Substance Control Act

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Final Supplemental Environmental Impact Statement (SEIS)
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Phone visits by Cindy Myers with 3 SD Water treatment plants
April/May 2015

- **I visited with three SD water treatment plants using water from the Missouri River. Two water treatment plants were unaware of response planning to an oil spill affecting the Missouri River, the third did say a spill kit (for water analysis) is available for emergencies.**

- **"DNR usually sends out information, but "haven't heard a word from them" when asked what he knew about tar sands spillage into water.**

- **The Bureau of Reclamation would notify them if an oil spill threatened the water supply.**

- **One plant thought benzene analysis was done quarterly and another plant thought benzene analysis was done yearly.**

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT	:	HP 14-001 TRANSCANADA KEYSTONE PIPELINE, LP'S RESPONSES TO CINDY MYERS' FIRST INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o

Applicant TransCanada makes the following responses to interrogatories pursuant to SDCL § 15-6-33, and responses to requests for production of documents pursuant to SDCL § 15-6-34(a). These responses are made within the scope of SDCL 15-6-26(e) and shall not be deemed continuing nor be supplemented except as required by that rule. Applicant objects to definitions and directions in answering the discovery requests to the extent that such definitions and directions deviate from the South Dakota Rules of Civil Procedure.

GENERAL OBJECTION

Keystone objects to the instructions and definitions contained in Cindy Myers' First Set of Interrogatories and Requests for Production of Documents to the extent that they are inconsistent with the provisions of SDCL Ch. 15-6. *See* ARSD 20:10:01:01.02.

Keystone's answers are based on the requirements of SDCL §§ 15-6-26, 15-6-33, 15-6-34, and 15-6-36.

INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

1. Please identify the person or persons providing each answer to an Interrogatory or portion thereof, giving the full name, address of present residence, date of birth, business address and occupation.

ANSWER: Given the extremely broad scope volume of more than 800 discovery requests received by Keystone in this docket, a range of personnel were involved in answering the interrogatories. Keystone will designate the following witnesses with overall responsibility for the responsive information as related to the Conditions and proposed changes to the Findings of Fact, which are identified in Appendix C to Keystone's Certification Petition: Corey Goulet, President, Keystone Projects, 450 1st Street S.W., Calgary, AB Canada T2P 5H1; Steve Marr, Manager, Keystone Pipelines & KXL, TransCanada Corporation, Bank of America Center, 700 Louisiana, Suite 700, Houston, TX 77002; Meera Kothari, P. Eng., 450 1st Street, S.W., Calgary, AB Canada T2P 5H1; David Diakow, Vice President, Commercial, Liquids Pipeline, 450 1st Street S.W., Calgary, AB Canada T2P 5H1; Jon Schmidt, Vice President, Environmental & Regulatory, exp Energy Services, Inc., 1300 Metropolitan Boulevard, Suite 200,

Tallahassee, FL 32308; Heidi Tillquist, Senior Associate, Stantec Consulting Ltd., 2950 E. Harmony Rd., Suite 290, Fort Collins, CO 80528.

2. Prior to answering these interrogatories, have you made due and diligent search of all books, records, and papers of the Applicant with the view of eliciting all information available in this action?

ANSWER: Yes, to the extent reasonably practicable in attempting to respond to over 800 discovery requests within the time allowed.

2(a). Describe how TransCanada will comply with these Acts as they apply to the project in relation to rivers, ground water and water system crossings in South Dakota.

ANSWER: Keystone will comply with Clean Water Act 404 by permitting the crossing of all jurisdictional waterbodies in South Dakota under the US Army Corps of Engineers Nationwide General Permit (NWP) 12. As part of the permitting process of the Project route in South Dakota, Keystone will submit a NOI to the US Army Corps of Engineers, South Dakota Regulatory Office and will consult as required with the South Dakota Regulatory Office.

No waterbody crossing in South Dakota requires permitting under the Section 10 Rivers and Harbor Act.

2(b). Provide research entailing migration of benzene in watersheds, rivers and ground water.

ANSWER: The fate and transport of benzene and other crude oil constituents is discussed in numerous studies and articles, including those in the Department of State SFEIS Appendix P, 2009 Keystone XL Risk Assessment, such as:

Freeze, R. A. and J. A. Cherry. 1979. Groundwater. Prentice Hall, Inc. Englewood Cliffs, New Jersey. 604 pp.

Minnesota Pollution Control Agency. 2005. Assessment of Natural Attenuation at Petroleum Release Sites. Guidance Document c-prp4-03, Petroleum Remediation Program, Minnesota Pollution Control Agency. April 2005. 11 pp.

Neff, J. M. 1979. Polycyclic aromatic hydrocarbons in the aquatic environment. Applied Science publ. Ltd., London. 262 pp.

Newell, C. J. and J. A. Connor. 1998. Characteristics of Dissolved Petroleum Hydrocarbon Plumes: Results from Four Studies. American Petroleum Institute Soil / Groundwater Technical Task Force. December 1998.

Spence, L. R., K. T. O'Reilly, R. I. Maagaw, and W. G. Rixey. 2001. Chapter 6 – Predicting the fate and transport of hydrocarbons in soil and groundwater. in: risk-based decision-making or assessing petroleum impacts at exploration and production sites. Edited by S. McMillen, R. Magaw, R. Carovillano, Petroleum Environmental Research Forum and US Department of Energy.

United States Geological Service (USGS). 1998. Groundwater Contamination by Crude Oil near Bemidji, Minnesota. US Geological Survey Fact Sheet 084-98, September 1998.

Additional references on this subject from the FSEIS include:

American Petroleum Institute (API). 1992. Review of Natural Resource Damage Assessments in Freshwater Environments: Effects of Oil Release into Freshwater Habitats. API Publ. No. 4514.

API. 1997. Petroleum in the Freshwater Environment: An annotated Bibliography 1946-1993. API Publ. No. 4640.

Grimaz, S., S. Allen, J. Steward, and G. Dolcetti. 2007. Predictive evaluation of the extent of the surface spreading for the case of accidental spillage of oil on ground. Selected Paper IcheaP8, AIDIC Conference series, Vol. 8, 2007, pp. 151-160.

Hult, M.F. 1984. Groundwater Contamination by Crude Oil at the Bemidji, Minnesota, Research Site: U.S. Geological Survey Toxic Waste—Ground-Water Contamination Study. Papers presented at the Toxic-Waste Technical Meeting, Tucson, Arizona, March 20-22. USGS Water Investigations Report 84-4188.

Weaver, J.W., R.J. Charbeneau, J.D. Tauxe, B.K. Lien, and J.B. Provost. 1994. The hydrocarbon spill screening model (HSSM) Volume 1: User's guide. USEPA/600/R-94/039a.U.S. Environmental Protection Agency, Office of Research and Development, Robert S. Kerr, Environmental Research Laboratory, Ada, OK.

8(a). Explain what changes have been made in the Emergency Response Plan and Integrity Management Plan since 2010.

OBJECTION: To the extent that this request seeks production of the Emergency Response Plan, the request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan and the integrity management plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan

to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

8(b). Provide the Emergency Response Plan.

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

8(c). Provide the Integrity Management Plan.

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also

seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the integrity management plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Integrity Management Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation.

18(a). Where will fuel storage facilities be located within 200 feet of private wells and 400 feet of municipal wells?

ANSWER: The locations of the fuel storage facilities have not been determined at this point in the planning process. The fuel storage facility locations will be determined at the time of construction. Refer to Section 2.1.5.3, Fuel Transfer Stations of the DOS FSEIS (2014). Wells will be identified prior to the fuel storage facility final locations and will adhere to HP 09-001, Condition 18.

18(b). How will minimizing and exercising vigilance be enforced?

ANSWER: Keystone will minimize and exercise vigilance by providing adequate training and supervision of its contractors with respect to this provision.

21(a). Define "frac-out."

ANSWER: "Frac-out" is addressed in the FSEIS in Section 4.3.3.2 at page 4.3-21, which provides:

> In some instances, pressurized fluids and drilling lubricants used in the HDD process have the potential to escape the active HDD bore, migrate through the sills, and come to the surface at or near the crossing construction site, an event commonly known as a frac-out. Measures identified in a required HDD contingency plan would be implemented, including monitoring of the directional drill bore, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur.

21(b). What are concerns and safety issues related to a "frac-out."

ANSWER: This question is addressed at page 4.8-20 of the FSEIS:

> The HDD method avoids direct disturbance to the river, channel bed, or banks. While the HDD method poses a small risk of frac-out (i.e., release of bentonite-based drilling fluids), potential releases would be contained by best management practices that would be described within the HDD Contingency Plans required for drilled crossings. Most leaks of HDD fluids occur near the entry, exit locations for the drill, and are quickly contained and cleaned up. Frac-outs that may release drilling fluids into aquatic environments are difficult to contain primarily because bentonite readily disperses I flowing water and quickly settles in standing water. Should this type of release occur, bentonite is non-toxic but in sufficient concentration may physically inhibit respiration of adult fish and eggs.

It is also addressed at pages 4.7-11 to -12 of Section 4.7.3.2 of the FSEIS:

> The HDD method for crossing waterbodies would be used to minimize disturbance to aquatic habitat, stream banks, and recreational or commercial fisheries. Impacts could occur if there is an unintended release of drilling fluids (i.e., a frac out) during the HDD operation. A frac out could release bentonitic drilling mud into the aquatic environment. The released drilling mud would readily disperse in flowing water or eventually settle in standing

water. Although bentonite is non-toxic, suspended bentonite may produce short-term impacts to the respiration of fish and aquatic invertebrates due to fouled gills. Longer-term effects could result if larval fish are covered and suffocate due to fouled gills and/or lack of oxygen. If the frac out occurred during a spawning period, egg masses of fish could be covered, thus inhibiting the flow of dissolved oxygen to the egg masses. Benthic invertebrates and the larval stages of pelagic organisms could also be covered and suffocate.

To minimize the potential for these impacts to occur, a contingency plan would be implemented to address an HDD frac out. This plan would include preventive and response measures to control the inadvertent release of drilling fluids. The contingency plan would also include instructions for downstream monitoring for any signs of drilling fluid during drilling operations, and would describe the response plan and impact reduction measures in the event a release of drilling fluids occurred. Drill cuttings and drilling mud would be disposed of according to applicable regulations; disposal/management options may include spreading over the construction ROW in an upland location or hauling to an approved off-site, licensed landfill or other approved sites.

21(c). Provide "frac-out plan."

ANSWER: Keystone currently has no contractors retained to undertake construction. When Keystone employs a pipeline contractor, that contractor will develop the plan. *See* Section 7.4.5 and Appendix G.

34(a). Describe what progress has been made in the evaluation and performance assessment activities regarding high consequence areas since 2010.

OBJECTION: To the extent that this request seeks a list of High Consequence Areas, the identity and location of High Consequence Areas is confidential

and Keystone is required by PHMSA to keep this information confidential. To the extent that this request seeks production of the Emergency Response Plan, the request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http:///keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

34(b). Define "high consequence area."

OBJECTION: To the extent that this request seeks a list of High Consequence Areas, the identity and location of High Consequence Areas is confidential and Keystone is required by PHMSA to keep this information confidential. Without waiving the objection, the definition of high consequence area can be found in Department of State SFEIS chapter 3 Section 3.13.4.1 and Code of Federal Regulation 49

CFR 195.450.

34(c). Provide a completed list of high consequence areas.

OBJECTION: The identity and location of High Consequence Areas is confidential and Keystone is required by PHMSA to keep this information confidential.

34(d). Explain how project inhabitants and local communities will be informed and educated about high consequence areas.

ANSWER: TransCanada Public Awareness Program is designed to increase awareness of pipeline safety to protect the public, environment and TransCanada facilities. The PA Program reaches out to affected public, excavators/contractors, emergency officials and local public to ensure they are engaged and education about living and working safely near TransCanada facilities. This includes awareness of areas that have been defined as high consequence areas.

34(c). Provide a copy of the Emergency Response Plan. (Requested above with #8.)

OBJECTION: To the extent that this request seeks production of the Emergency Response Plan, the request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of the U.S. Department of Transportation, Pipeline and Hazardous Materials

Safety Administration (PHMSA). The PUC's jurisdiction over the emergency response plan is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan could commercially disadvantage Keystone.

34(f). Provide Integrity Management Plan. (Requested above with #8.)

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the integrity management plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Integrity Management Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation.

19. Explain what has been discussed with the SD Geological Survey, the Dept. of Game Fish and Parks, local landowners and govt. officials.

ANSWER: Keystone referenced publicly available data/reports from the SD Geological Survey. Discussion between Keystone and the South Dakota Dept. of Game, Fish, and Parks focused on the identification of the potential biological resources that may

be impacted by the Project route in South Dakota and the potential mitigation measures that could be implemented to minimize impacts.

The following is a summary of Keystone consultation history with SD Game, Fish, and Parks as documented in the USFWS issued May 2013 Biological Opinion (Appendix H of the of the Department of State FSEIS (2014))

- June 10, 2008: Keystone met with staff from USFWS and South Dakota Department of Game, Fish, and Parks (SDGFP), at the SDGFP office in Pierre, South Dakota, to discuss issues pertaining to wildlife, special status species, and sensitive habitat that could potentially occur in the Project area. The goal of the meeting was to gather input on agency recommendations based on the information sent to them in April 2008 for species occurrence, habitat assessments, and future field surveys. Keystone incorporated comments from the meeting into survey protocols and BMPs for future agency verification.

- January/February 2009: Keystone initiated section 7 consultation with the USFWS. Keystone continued discussions with BLM, and state wildlife agency offices for South Dakota that included state-specific special status species survey protocols and BMPs for the species identified as potentially occurring during the 2008 meetings. A summary of the findings from the 2008 biological field surveys was included in the discussions.

- January 27, 2009: Keystone met with staff from the USFWS and SDGFP at the SDGFP office in Pierre, South Dakota, to discuss issues pertaining to special status species surveys. The goals of the meeting were to verify Keystone's survey approach, BMPs, discuss required field surveys, and review the information that was sent to the USFWS in the January/February 2009, informal consultation package. The USFWS and SDGFP provided additional recommendations to Keystone's sensitive species mitigation approach to be updated prior to final agency concurrence.

- October 23, 2012: A meeting was held between the USFWS, Department, SDGFP, BLM, and Keystone regarding the greater sage–grouse and a compensatory mitigation plan for the species in South Dakota. Discussions included a management plan and avoidance, minimization, and mitigation strategies.

35(a). Provide the Integrity Management and Emergency Response Plans. (Requested above.)

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency

response plan and the integrity management plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit these documents to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

35(b). Define "Unusually Sensitive Areas."

ANSWER: Unusually Sensitive Areas are defined by U.S. federal pipeline safety regulations (49 CFR 195.6) as:

> As used in this part, a USA means a drinking water or ecological resource area that is unusually sensitive to environmental damage from a hazardous liquid pipeline release.
>
> (a) An USA drinking water resource is:
>
> (1) The water intake for a Community Water System (CWS) or a Non-transient Non-community Water System (NTNCWS) that obtains its water supply primarily from a surface water source and does not have an adequate alternative drinking water source;
>
> (2) The Source Water Protection Area (SWPA) for a CWS or a NTNCWS that obtains its water supply from a Class I or Class IIA aquifer and does not have an adequate alternative drinking water

source. Where a state has not yet identified the SWPA, the Wellhead Protection Area (WHPA) will be used until the state has identified the SWPA; or

(3) The sole source aquifer recharge area where the sole source aquifer is a karst aquifer in nature.

(b) An USA ecological resource is:

(1) An area containing a critically imperiled species or ecological community;

(2) A multi-species assemblage area;

(3) A migratory waterbird concentration area;

(4) An area containing an imperiled species, threatened or endangered species, depleted marine mammal species, or an imperiled ecological community where the species or community is aquatic, aquatic dependent, or terrestrial with a limited range; or

(5) An area containing an imperiled species, threatened or endangered species, depleted marine mammal species, or imperiled ecological community where the species or community occurrence is considered to be one of the most viable, highest quality, or in the best condition, as identified by an element occurrence ranking (EORANK) of A (excellent quality) or B (good quality)."

35(c). Define "Hydrologically Sensitive Areas."

ANSWER: Hydrological sensitive areas were defined by the South Dakota Public Utilities Commission Amended Final Order as "the High Plains Aquifer area in southern Tripp County," as well as "other similarly vulnerable and beneficially useful surficial aquifers that Keystone is aware of."

35(d). Explain how unusually sensitive areas and hydrologically sensitive areas are addressed differently compared to other areas.

ANSWER: Unusually sensitive areas are High Consequence Areas (HCAs), as defined by 49 CFR 195.6. Keystone has elected to treat "hydrologically sensitive areas," as defined in the South Dakota Public Utilities Commission Order Condition 35, as operator-defined HCAs. By designating these segments as operator-defined HCAs, these locations are treated by Keystone as if they were PHMSA-identified HCAs . Portions of the pipeline that could potentially affect HCAs are subject to high levels of inspection and repair criteria, as mandated by 49 CFR 195.

35(e). Confirm that you are not fully aware of all vulnerable and beneficially useful aquifers and your intent is to only become aware of them during construction and route evaluation not yet completed.

ANSWER: Keystone does not confirm these statements. Keystone has consulted with groundwater staff with South Dakota's Department of Natural Resources (SD

DENR) and rural water districts regarding Keystone's route relative to aquifers in South Dakota. Keystone also used data available on the SDDENR website http://denr.sd.gov/data.aspx and published literature regarding the geology and hydrology of the along and near the pipeline ROW to assist in identifying vulnerable aquifers in South Dakota. Geological references and hydrogeological references are listed in Chapters 3 and 4 in the Department of State Supplemental FEIS. Some pertinent additional references are:

- Gutentag (1984): USGS Prof. Paper 1400-B
- Downey (1986): USGS Prof. Paper 1402-E
- Thamke et al (2014): USGS Scientific Inv. Report SIR 2014-5047.
- In addition, lithologic logs available from the SD DENR at

http://denr.sd.gov/des/wr/dblog.search.aspx and http://denr.sd.gov/data.aspx provide aquifer thickness data.

35(f). Define "unconfined aquifers."

ANSWER: From Applied Hydrogeology (1994) *"Unconfined Aquifer: Aquifer close to the surface with materials of high permeability extending from the land surface to the base of the aquifer. Water table aquifer."*

Source: Fetter, C.W. (1994.) Applied Hydrogeology. Prentice Hall. 680 pp.

35(g). List known unconfined aquifers to be crossed by the project.

ANSWER: Department of State Table 3.3-2 (SFEIS) presents a list of unconfined aquifers in South Dakota crossed by the Keystone XL Pipeline Project. Along the route in South Dakota, the High Plains Aquifer (Ogallala Formation) in Tripp County is often unconfined. Other areas with unconfined aquifers include alluvial aquifers associated with streams, and occasional unconfined stretches in the Hell Creek, Fox Hills, and Pierre Shale aquifers. However, along the majority of the route, aquifers crossed by the Keystone XL pipeline are confined.

35(h). Explain the concern of routing through unconfined aquifers.

ANSWER: In South Dakota, unconfined aquifers are found mainly associated with streams (alluvial aquifers) and in portions of the High Plains Aquifer (Ogallala Formation) in Tripp County (FSEIS). Table 3.3-2 (FSEIS) presents the unconfined aquifers in South Dakota. The Keystone XL pipeline in South Dakota was routed to reduce impacts to a number of valuable resources, including but not limited to, unconfined aquifers.

35(i). Describe how it could be possible to route through an unknown, unconfined aquifer during construction.

ANSWER: Keystone has attempted to identify vulnerable aquifers through consultation with State agencies and rural water districts, as well as data provided South Dakota Department of Environment and Natural Resources (SD DENR)

(http://denr.sd.gov/data.aspx), and published literature. The location of unconfined aquifers is documented in the literature on the hydrogeology of South Dakota and the SD DENR website provides well logs for wells near the pipeline ROW, so that unconfined conditions can be identified.

It is possible that, during construction and through discussion with landowners crossed by the Project, Keystone may identify shallow wells located in unconfined aquifers. Many water-bearing units in South Dakota may be unmapped due to their small size and type of geological formation that has limited use due to low water productivity and generally lower water quality. If present, these wells are often associated with agricultural uses (e.g., livestock stock tanks).

35(j). Provide documentation of further route evaluation since 2010, including assessments for aquifers and hydrologically sensitive areas.

OBJECTION AND RESPONSE: This request is vague, overlybroad, and unduly burdensome. Without waiving the objection, since 2010, Keystone has continued to identify groundwater resources through agency consultation use of the South Dakota Department of Environment and Natural Resources (SD DENR) website (http://denr.sd.gov/data.aspx) and the following publications. Geological references and hydrogeological references are listed in chapters 3 and 4 in the FSEIS. Some pertinent additional references are:

- Gutentag (1984): USGS Prof. Paper 1400-B
- Downey (1986): USGS Prof. Paper 1402-E
- Thamke et al (2014): USGS Scientific Inv. Report SIR 2014-5047.

In addition, lithologic logs available from the SD DENR at http://denr.sd.gov/des/wr/dblog.search.aspx and http://denr.sd.gov/data.aspx provide aquifer thickness data. Since 2010, the Keystone XL pipeline route was evaluated using these data sources to identify hydrologically sensitive areas.

35(k). Explain how you will deem an aquifer vulnerable and beneficially useful?

ANSWER: Keystone relies on two primary sources to identify vulnerable and beneficially useful aquifers: Pipeline and Hazardous Materials Safety Administration (PHMSA)-identified unusually sensitive areas for drinking water, as defined in 49 CFR 195.6, and Source Water Protection Areas for groundwater as identified by the South Dakota Department of Environment and Natural Resources (SD DENR). Both PHMSA and the SD DENR have provided these data confidentially to Keystone.

35(l). This condition states: "…in some reaches of the Project in southern Tripp County, the High Plains Aquifer is present at or very near ground surface and is overlain by highly permeable sands permitting the uninhibited infiltration of contaminants." Sandy soil and ground water at or above the surface means a pipe with expected pinhole leaks will be immersed in ground water. This is the exact type of situation of soil/ground

water which caused the route change in Nebraska. If this was reason to change the route in Nebraska, explain why it is still acceptable in South Dakota.

OBJECTION AND RESPONSE: This request is argumentative and assumes facts not in evidence. Without waiving the objection, "*Pipeline routing is optimized to reduce impacts and risks to the environment, population, and to reduce integrity concerns.*" Routing decisions in each state were made in consultation with the various local state and federal agencies. Reroutes in Nebraska were determined based on public and agency input during the NEPA process. Routes approved in South Dakota were based on consultation with South Dakota local agencies. All routing decisions took into account the screening options outlined in the FSEIS Section 2.2.2.2 Major Pipeline Route Alternatives and Section 2.2.5.1 Screening of Major Route Alternatives. The first round of screening included the following criteria:

- "Meeting the proposed Project's purpose and need, including the extent to which additional infrastructure (pipeline) is necessary to access Bakken crude oil;
- Consistency with the proposed border crossing and therefore the approved routing in Canada;
- Availability;
- Reliability;

- Length within the United States;
- Total length of the pipeline, including both the United States and Canada;
- Estimated number of aboveground facilities;
- Length co-located within an existing corridor;
- Acres of land directly affected during construction; and
- Acres of land directly affected permanently." (FSEIS Section 2.2.2.2 pg 2-2-2).

The second round of screening included the following criteria:

- "Total length of the pipeline, including both the United States and Canada;
- Use of the Canadian-approved Keystone XL pipeline ROW outside of the United States;
- Approximate acres affected by construction of the proposed Project (based on a typical 110-foot construction ROW)
- Federal lands crossed (miles);
- Principal aquifers crossed (miles);
- American Indian lands crossed (miles);
- Total wetlands crossed (miles);
- USFWS critical habitat for threatened and endangered species crossed (miles);

- Known cultural resource sites (listed on National Register of Historic Places) within 500 feet of proposed pipeline;
- Number of waterbodies crossed; and
- Soils designated as highly erodible by wind crossed (miles)." FSEIS Section 2.2.5.1 pg 2.2-59)

Rerouting away from the environmentally sensitive Nebraska Department of Environmental Quality (NDEQ)-identified Sand Hills Region was based on input from the NDEQ and the public.

South Dakota Public Utilities Commission's (SD PUC) Amended Order identified the southern portion of Tripp County as having a "hydrologically sensitive area" for groundwater resources due to the sandy soils and presence of unconfined portions of the High Plains Aquifer. As discussed previously, Keystone will treat "hydrologically sensitive areas", as defined in the SD PUC Order Condition 35, as operator-defined high consequence areas (HCAs). By designating these segments as operator-defined HCAs, these locations are treated by Keystone as if they were Pipeline and Hazardous Materials Safety Administration (PHMSA)-identified HCAs. Portions of the Keystone XL pipeline that could potentially affect HCAs are subject to high levels of inspection and repair criteria, as mandated by 49 CFR 195.

Where soils are fragile (i.e., sandy soils that exhibit conditions similar to the Nebraska Department of Environmental Quality-identified Sand Hills Region that are highly susceptible to erosion by wind), special considerations and measures also would be undertaken in proposed Project areas to protect environmentally sensitive resources.

"Approximately 76 percent (11,664 acres) of the overall proposed Project would affect soils characterized as highly erodible by either wind or water (see Figure 4.2.1-1). Erosion control measures would be implemented wherever soil is exposed, steep slopes are present, or erosion potential is high. To enforce use of these methods, an environmental inspector (EI) would be assigned to each construction spread. In addition, specific procedures have been developed to address concerns related to potential erosion to the fragile soils in the southern South Dakota and northern Nebraska region; the proposed Project right-of-way (ROW) through these fragile soils would be monitored for several years to ensure that reclamation and revegetation efforts are successful (see Section 4.2.3.2, Operation Impacts)." (FSEIS Section 4.2 Soils, pg 4.2-2)

"**Fragile Soils in Southern South Dakota and Northern Nebraska**

In southern South Dakota and northern Nebraska, the proposed Project

route would enter an area with fragile soils (i.e., landscapes where the soil exhibits conditions similar to the NDEQ-identified Sand Hills Region and the soils are very susceptible to wind erosion; see Soils Environmental Setting Sections 3.2.2.2, South Dakota, 3.2.2.3, Nebraska, and Figure 3.2.2-2, Highly Wind Erodible Soils). To address concerns related to potential erosion in the region, specific construction, reclamation, and post-construction procedures have been developed, as described in Section 4.15 of the CMRP, Fragile Soil Clean Up and Reclamation/Revegetation, (see Appendix G). This document provides site-specific reclamation plans that itemize construction, erosion control, and revegetation procedures for these fragile areas. Additionally, Keystone would implement micro-routing adjustments where practicable and appropriate to minimize steep topography with fragile soils.

To reduce potential impacts related to severe wind and water erosion, the following provides a summary of proposed Project best management practices (BMPs) that would be implemented during construction, reclamation, and post-construction. These BMPs are included in the CMRP for fragile soil areas. Additional procedures are also described in Sandy Prairie Construction/Reclamation Unit Plan (see Appendix R,

Construction/Reclamation Plans):

- Keystone would educate construction personnel regarding the necessity to strictly adhere to the proposed Project BMPs designed to minimize impacts to fragile soil landscape areas.
- Minor route re-alignments would be incorporated through these fragile areas to avoid particularly erosion-prone locations, such as ridgetops and existing blowouts as much as practicable.
- Keystone would avoid highly saturated areas, such as wetlands, to the maximum extent possible.
- Construction soil handling procedures would strive to reduce the width of disturbance to the native prairie landscape by adopting Trench-line or Blade-width stripping procedures where practicable.
- Topsoil conservation would be conducted on all areas where excavation occurs.
- Topsoil piles would be protected from erosion through matting, mulching, watering, or tackifying as deemed practicable.
- Traffic management limitations would be employed on specific areas possessing high erosion potential or sensitive habitat.
- Native seed mixes would be developed with input from the local

NRCS offices and through collaboration with regional experts. All seed would be certified noxious weed-free and would be calculated on a pure live seed basis.

- Straw or native prairie hay may be used as mulch, applied to the ROW, and crimped into the soil to prevent wind erosion. All mulch would be documented as noxious weed-free.
- Land imprinting may be employed to create impressions in the soil, thereby reducing erosion, improving moisture retention, and creating micro-sites for seed germination. (Land imprinting adds a waffle-like texture to the soil, forming indentations that capture and absorb rainwater that otherwise runs off untreated land.)
- Sediment logs (barriers in the form of logs used to control soil erosion) or straw wattles would be used in place of slope breakers (short terraces) that are constructed of soil. Using sediment logs would result in less soil disturbance to the ROW.
- Photodegradable matting would be applied on steep slopes or areas prone to extreme wind exposure such as north- or west-facing slopes and ridge tops. Biodegradable pins would be used in place of metal staples to hold the matting in place.

- Keystone would work with landowners to evaluate fencing the ROW from livestock, or alternatively, provide compensation to rest a pasture until vegetation can become established.
- Management concerns such as livestock access to water or movement within a pasture would be addressed as necessary by Keystone working with the landowner.
- As part of post-construction monitoring and repair, Keystone would monitor reclamation on the ROW for several years and would repair erosion and reseed poorly revegetated areas as deemed necessary by Keystone. During monitoring, landowners would be informed of these efforts and intended actions going forward.
- A noxious weed management plan would be established based on consultation with state and county experts.

Fragile Soils in Southern South Dakota and in Northern Nebraska

To address concerns related to potential erosion in the fragile soil areas in southern South Dakota and northern Nebraska, specific construction, reclamation, and post-construction procedures have been developed as described in the Fragile Soils section within the CMRP (see Appendix G). This document provides a site-specific reclamation plan that itemizes

construction, erosion control, and revegetation procedures for these fragile areas. Additional procedures are also described in Sandy Prairie Construction/Reclamation Unit Plan (see Appendix R, Construction/Reclamation Plans and Documentation). The proposed Project ROW through this region would be monitored for several years to ensure that reclamation and revegetation efforts are successful. Any proposed Project areas where reclamation and revegetation efforts are initially unsuccessful would be re-evaluated and restored.

Proposed Project areas that have been revegetated would be attractive as cattle forage. Due to potentially warmer soils in the immediate vicinity of the proposed pipeline, early forage may be concentrated along the ROW over time (Dave Wedin, personal communication, June 29, 2011). Additionally, animal trackways (i.e., a route of frequent travel by animals) can serve as incipient blowout areas. Keystone has agreed to inform landowners of this concern. Fencing of the ROW may be completed if required; however, fencing could be a serious impediment to landowner access. As described previously, Keystone would work with landowners to evaluate fencing the ROW from livestock, or alternatively, provide compensation to rest a pasture until vegetation can become established.

Also as previously indicated, Keystone would monitor reclamation on the ROW for several years and repair erosion and reseed poorly revegetated areas as necessary. Additionally, based on input received from the NRCS, Keystone would be required to employ a method of assessment of soil productivity such as yield comparison between ROW and non-ROW areas in areas where susceptible soils have been identified with the NRCS." (FSEIS, Section 4.2 Soils).

35(m). Explain TransCanada's follow-up with suggestion by DENR staff, given in testimony, to reroute the KXL pipeline around the city of Colome's source water area.

ANSWER: Routing is an iterative process where refinements to the route are continuously made as new, substantive data are obtained. In this case, Keystone had obtained HCA data from the Pipeline and Hazardous Materials Safety Administration (PHMSA) and consulted with the South Dakota Department of Environment and Natural Resources' (SD DENR) ground water Staff. During the consultation process, Keystone received Source Water Protection Area (SWPA) data. These data sets were integrated into the routing process and, upon identification of the route through the Colome SWPA, Keystone rerouted out of the area. Keystone consulted with the SD DENR's groundwater Staff and informed them of the issue with the initially proposed route and a proposed route refinement to avoid the SWPA. SD DENR staff confirmed that the reroute was acceptable.

36(a). Identify all emergency medical response planning contained within the emergency response plan.

OBJECTION: This request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the exclusive province of PHMSA. The PUC's jurisdiction over the emergency response plan is preempted by federal law, which has exclusive jurisdiction over issues of pipeline safety. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. See Amended Final Order, HP 09-001, Condition ¶ 36. Public disclosure of the emergency response plan would commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

36(b). What actions have been taken by TransCanada to ensure the medical communities in South Dakota are prepared and educated to treat people exposed to spills and water contamination from spills?

OBJECTION AND RESPONSE: To the extent that this request seeks production of the Emergency Response Plan, this request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the exclusive province of PHMSA. The PUC's jurisdiction over the emergency response plan is preempted by federal law, which has exclusive jurisdiction over issues of pipeline safety. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. See Amended Final Order, HP 09-001, Condition ¶ 36. Public disclosure of the emergency response plan would commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf. Without waiving the objection, TransCanada has provided educational information to possible affected public elected officials, excavators, and first responders. This educational material comes in the form of a pamphlet and is titled Oil Pipeline for Emergency Responders. It is marked as Keystone 1523-1538.

36(c). How will inhabitants and communities near the project area be notified of spills?

ANSWER: Keystone's response teams will use the National Incident Management System (NIMS) Incident Command System (ICS) to manage emergency response activities. First response to an incident will be provided by a Keystone local response team. Keystone's Regional Emergency Operations Center (EOC) will respond, to the degree necessary, to incidents exceeding local capability. Duties of the local responders are described in the TransCanada-Keystone Emergency Response Plan (see FSEIS, Appendix I) which will be adapted for use on Keystone XL.

Response teams will be led by an Incident Commander, and will include persons accountable for external notifications including a Public Information Officer (including media communications), and a Liaison Officer (including agency communications). External notifications are those made to entities outside of the Company including Federal, State and local regulatory agencies, as well as railroad and utility companies. These notifications include both verbal and written requirements. Landowners and appropriate public agencies will be notified in the case of potential groundwater contamination.

40(a). Provide documentation supporting your assertion that polyethylene water piping is permeable to BTEX.

ANSWER: Permeation of polyvinyl chlorine (PVC) and polyethylene (PE) pipes by any hydrocarbon is extremely rare (Gaunt et al. 2006). Permeation incidents were

reported at a frequency of one per 14,000 miles of mains and one per 1,000,000 miles of PE/PVC service connections (Gaunt et al. 2006).

A number of studies have been conducted on the topic of hydrocarbon permeation through PVC and PE water piping, including:

Gaunt, James A. et. al. 2006. "Performance of Plastic Pipes and Pipe Gaskets In Hydrocarbon Contamination: Field Experience and Laboratory Studies". Department of Civil, Construction, and Environmental Engineering Iowa State University, Ames, IA. American Waterworks Association.

Berens, A.R. 1985. "Prediction of organic chemical permeation through PVC pipe". JAWWA 77 (11), 57-64 (1985).

40(b). Explain health concerns related to BTEX.

ANSWER: BTEX consists of benzene, toluene, ethylbenzene, and xylenes. Benzene can result in health impacts from short term (i.e., acute) exposure or long-term (i.e., chronic) exposure. Acute effects can include drowsiness, dizziness, rapid heart rate, headaches, and unconsciousness. At extremely high concentrations, acute toxicity can result in mortality. Benzene levels at these concentrations would not be anticipated from a release from the Keystone XL Pipeline Project. Potential chronic health effects of benzene exposure include anemia and excessive bleeding. Long-term exposure to high concentrations of benzene in the air can lead to cancer (ATSDR 2007a, EPA 2015). Due

to emergency response cleanup, sampling, and monitoring, remedial actions, and the high volatility of benzene, benzene concentrations would largely dissipate within the first 24 hours, minimizing the potential for chronic effects in humans.

Toluene exposure may cause fatigue, confusion, and weakness (ATSDR 2001, EPA 2015). At extremely high levels, toluene may cause mortality. Toluene levels at this concentration would not be expected to occur due to a release along the Keystone XL Pipeline Project.

Ethylbenzene exposure may cause eye and throat irritation or dizziness (ATSDR 2010, EPA 2015). Chronic exposure to low levels of ethylbenzene (weeks to years) may cause damage to the inner ear or kidneys. Ethylbenzene has been identified as a possible human carcinogen.

High levels of xylene exposure, either acute or chronic, can cause headaches, lack of muscle coordination, confusion, and eye, skin, throat, and nose irritation. Extremely high levels can cause unconsciousness and mortality (ATSDR 2007b, EPA 2015). Xylene levels at this concentration would not be expected to occur due to a release along the Project. Studies by the International Agency for Research on Cancer and the EPA have not been able to rule xylene out as a carcinogen.

More detailed information is available through the Agency for Toxic Substances & Disease Registry (ATSDR; http://www.atsdr.cdc.gov/) and the US Environmental

Protection Agency (USEPA; http://water.epa.gov/drink/contaminants/).

Agency for Toxic Substances and Disease Registry. 2014. ATSDR Toxic Substances Portal. Available from: http://www.atsdr.cdc.gov/

Agency for Toxic Substances & Disease Registry (ATSDR). 2010. ToxFAQs for Ethylbenzene. Accessed January 20, 2015. http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=382&tid=66.

Agency for Toxic Substances & Disease Registry (ATSDR). 2001. ToxFAQs for Toluene. Accessed January 20, 2015. http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=160&tid=29.

Agency for Toxic Substances & Disease Registry (ATSDR). 2007a. ToxFAQs for Benzene. Accessed January 20, 2015. http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=38&tid=14.

Agency for Toxic Substances & Disease Registry (ATSDR). 2007b. ToxFAQs for Xylene. Accessed January 20, 2015. http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=295&tid=53.

US Environmental Protection Agency (EPA). 2015. Drinking Water Contaminants. Accessed January 20, 2015. http://water.epa.gov/drink/contaminants/.

Environmental Protection Agency. 2014. National Primary Drinking Water Regulations. Available from: http://water.epa.gov/drink/contaminants/

40(c). Provide an MSDS of all products to be transported in KXL, including the diluents.

ANSWER: Representative Material Safety Data Sheets are provided in Appendix Q of the FSEIS.

40(d). Provide list of ground water quality standards, specifically listing chemicals involved in tar sands oil product and diluents.

OBJECTION: Keystone does not determine ground water quality standards. They are established by the South Dakota Department of Environment and Natural Resources.

40(e). Describe how the decision was made to designate concern of BTEX only within 500 feet of the Project.

ANSWER: This decision was made by the PUC as part of Amended Permit Condition 40.

40(f). Confirm this safety measure will only be implemented at the request of a landowner or public water supply system.

ANSWER: Yes.

40(g). Explain why this measure is optional instead of mandatory.

ANSWER: This decision was made by the PUC as part of Amended Permit Condition 40.

40(h). TransCanada has agreed to do this: "At least forty-five days prior to commencing construction, Keystone shall publish a notice in each newspaper of general circulation in each county through which the Project will be constructed advising landowners and public water supply systems of this condition." What percent of inhabitants do you expect to reach by issuing a warning in this manner?

OBJECTION AND RESPONSE: This request is speculative and argumentative. A notice is not a "warning." Without waiving the objection, Keystone expects that notice in newspapers of general circulation would reach a substantial portion of the inhabitants.

46(a). Provide written plan as to how you will find and provide a permanent water supply for various locations along route if a well should become contaminated, including specific alternate sources.

ANSWER: In the unlikely event of a leak, petroleum hydrocarbons generally do not move more than 300 feet through the subsurface and substantive movement takes months to years offering ample time for emergency response and containment. Therefore, impacts to private and public wells are not anticipated. Further, Keystone will comply with the South Dakota Public Utilities Commission order (Condition of Permit #46): "In the event that a person's well is contaminated as a result of construction or pipeline operation, Keystone shall pay all costs associated with finding and providing a permanent

water supply that is at least of similar quality and quantity; and any other related damages, including but not limited to any consequences, medical or otherwise, related to water contamination."

46(b). Define "quantity" as it is used in this condition.

ANSWER: Keystone interprets "quantity" to have its ordinary meaning.

46(c). Provide cost estimates for providing water to the city of Colome, domestic wells or an entire ranching operation should water supplies become contaminated.

ANSWER: Please refer to DOS SFEIS Appendiz Z Mitigation Measures page 108 item 7. Keystone has committed, in the event that a spill contaminates potable water supplies, be responsible for cleanup and restoration. Keystone would be responsible for providing an appropriate alternative potable water supply of comparable volume and quality to those impacted or provide compensation, if this option is agreed upon by the affected parties and Keystone. For groundwater used for industrial or irrigation purposes, Keystone may provide either an alternate supply of water or appropriate compensation for those facilities impacted, as may be agreed upon among the affected parties and Keystone. If the permit were approved, Keystone would memorialize that agreement through an appropriate written agreement with the Environmental Protection Agency.

46(d). Explain how providing a permanent water supply will be ensured into perpetuity.

ANSWER: *See* answer to interrogatory no. 46(a).

46(e). Explain how people and cattle using private wells and public wells can be assured their water is free of contamination from undetected leakage, particularly in Tripp County.

ANSWER: Given the leak detection methodologies that are part of the project, undetected well contamination is unlikely.

46(f). Describe what experience South Dakota has had cleaning up tar sands oil product spills into rivers and ground water.

OBJECTION: This request seeks information that is not within Keystone's custody or control.

46(g). Describe any experience the State of South Dakota or any other state has had in "sparging" ground water in order to cleanse tar sands oil product from aquifers.

OBJECTION: This request seeks information that is not within Keystone's custody or control.

46(h). Describe types of spills which may be difficult or impossible to remediate.

ANSWER: Crude oil spills can be remediated. Initial contaminant and cleanup is important to limit the area affected and to remove as much product as quickly as possible. Any residual oil can be remediated through a variety of remediation technologies as well as through natural attenuation.

As discussed in Section 2.1 of the FSEIS, Keystone has reviewed the National Transportation Safety Board 2012 Marshall, Michigan Accident Report, including the conditions that led to operational failures on the pipeline that resulted in the spill. Keystone has stated they would include lessons learned from this spill, including the following:

- "Get big quick: timeliness of a tactical response to an oil spill into water is imperative. While Keystone has stated that it already uses this philosophy, the Kalamazoo spill reinforced this need to respond with as many resources as possible as quickly as possible. To that end, Keystone would strategically store equipment and employ personnel and contractors along the length of the pipeline to ensure a maximum 6-hour response time.
- Pre-qualify a large contractor network: Contractors would be used to supplement any response Keystone would make to an oil spill. By ensuring a large pool of trained/skilled contractors along the length of the pipeline have been pre-qualified and contracted with Keystone, the response time would be minimized and resources (equipment and personnel) available are maximized.
- Emergency response planning details need to include source

containment: source containment plans including strategies and tactics would be included in the overarching ERP.

- Equipment resources required for sunken and submerged oil: Keystone would further identify equipment resources required to respond to sunken and submerged oil and ensure personnel are appropriately trained on the equipment. A primary strategy for oil spill response would still be to contain and recover as much oil as possible as quickly as possible to prevent oil from weathering and therefore potentially becoming submerged and sinking. In addition, Keystone already owns and practices the use of containment devices that would prevent downstream migration of submerged and sunken oil such as dams. This type of equipment would be further identified and procured for the proposed Project."

Section 2.1 of the FSEIS also covers remediation of potential crude oil spills and construction related spills.

"Corrective remedial actions would be dictated by federal, state, and local regulations and enforced by the PHMSA Office of Pipeline Safety as well as appropriate state and/or local agencies. Required remedial actions may be large or small, dependent upon a number of factors including state

mandated remedial cleanup levels, potential effects to sensitive receptors, the volume and extent of the contamination, whether or not there is a violation of water quality standards, and the magnitude of adverse impacts caused by remedial activities. A large remediation action could include one or more of a number of approaches (such as excavation of soil, pumping and treating ground water, or natural attenuation). However, the selection of a remedial measure would be in coordination and agreement with the appropriate regulatory agency.

If, during construction, tanks or contamination are found, they would be managed according to federal, state, and/or local regulations. Further, Keystone would make individuals available who are trained in identifying and disposing of hazardous materials during construction.

If there is an accidental release from the proposed Project, Keystone would implement the remedial measures necessary to meet the federal, state, and local standards that are designed to help ensure protection of human health and environmental quality. Additional information on remediation is presented in Section 4.13 of the FSEIS, Potential Releases."

46(i). Identify responsible parties who will conduct water analysis to assure toxins from

undetected leaks have not migrated into water resources, including frequency of testing and who will assume cost of testing.

ANSWER: If a release were to occur, Keystone would implement its Emergency Response Plan (ERP). This ERP is responsive to the size of spill and resources potentially affected. In the event surface waters were impacted, Keystone would implement its ERP and notify appropriate federal and state agencies. If the release is significant, an Incident Command Team will develop a sampling plan, determined in consultation with the appropriate state and federal agencies that identifies the appropriate sampling, frequency, and responsible payee.

46(j). Describe potential scenarios in which medical costs related to contamination will be reimbursed.

ANSWER: If it is determined that medical costs are incurred and result of contamination caused by Keystone, Keystone will reimburse such costs.

46(k). Provide a detailed listing of potential toxins which could contaminate wells.

ANSWER: The South Dakota Department of Environment and Natural Resources (SD DENR) identifies a number of compounds that can potentially contaminate wells (refer to the following list [SD DENR 2009]). Many of these chemicals are not constituents of petroleum hydrocarbons but are associated with farming, industrial activities, and urban runoff.

- 1,1,1-Trichlorethane
- 1,1,2-Trichlorethane
- 1,1-Dichloroethylene
- 1,2 Dibromo-3-chloropropane (DBCP)
- 1,2,4-Trichlorobenzene
- 1,2-Dichloroethane
- 1,2-Dichloropropane
- 2,4,5-TP (Silvex)
- 2,4-d, 3-Hydroxycarbofuran
- Alachlor (Lasso)
- Aldicarb
- Aldicarb sulfone
- Aldicarb sulfoxide
- Aldrin
- Antimony (total)
- Arsenic (total)
- Atrazine
- Barium (total)
- Benzene
- Benzo[a]pyrene
- Beryllium (total)
- Butachlor
- Cadmium (total)
- Carbaryl
- Carbofuran
- Carbon tetrachloride
- Chlordane
- Chromium (total)
- cis-1,2-Dichloroethylene
- Dalapon
- Di(2-Ethylhexyl) adipate
- Di(2-ethylhexyl) phthalate
- Dicamba
- Dichloromethane (methylene chloride)
- Dieldrin
- Dinoseb
- Diquat
- Endothall
- Endrin
- Ethylbenzene
- Ethylene dibromide (EDB)
- Glyphosate
- Heptachlor
- Heptachlor epoxide
- Hexachlorobenzene (HCB)
- Hexachlorocyclopenta-diene
- Lindane
- m-Xylene
- Mercury (total inorganic)
- Methomyl
- cis-1,2-Dichloroethylene
- Dalapon
- Di(2-Ethylhexyl) adipate
- Di(2-ethylhexyl) phthalate
- Dicamba
- Dichloromethane (methylene chloride)
- Methoxychlor
- Metolachlor
- Metribuzin
- Monochlorobenzene (Chlorobenzene)
- Nitrate
- Nitrite
- o-Dichlorobenzene
- o-Xylene
- Oxamyl (Vydate)
- p-Dichlorobenzene
- p-Xylene
- Pentachlorophenol
- Picloram
- Propachlor
- Selenium (total)
- Simazine
- Styrene
- Tetrachloroethylene
- Thallium (total)
- Toluene
- Total polychlorinated biphenyls (PCBs)
- Toxaphene
- trans-1,2-Dichloroethylene
- Trichloroethylene
- Vinyl chloride

South Dakota Department of Environment and Natural Resources (SD DENR). 2009.

Tripp County Water User District Drinking Water Quality Report. Available from:

http://www.ewg.org/tap-water/whatsinyourwater2/SD/tripp-county-water-user-district/4600520.

46(l). Provide documentation detailing adverse health effects caused from exposure to these toxins, including the various routes of entry into the human body.

ANSWER: As stated in the previous response (#54), many of these compounds identified in the previous response are not constituents of crude oil.

The U.S. Environmental Protection Agency has a detailed listing of potential drinking water contaminants. This includes the toxins addressed above and their potential health effects on humans due to ingestion of contaminated drinking water. This information is available at http://water.epa.gov/drink/contaminants/.

Additionally, the Agency for Toxic Substances and Disease Registry (ATSDR) website includes detailed reports on potential health effects of these toxins as well as potential routes of entry into the human body. This information is available at http://www.atsdr.cdc.gov/.

Agency for Toxic Substances and Disease Registry. 2014. ATSDR Toxic Substances Portal. Available from: http://www.atsdr.cdc.gov/

Environmental Protection Agency. 2014. National Primary Drinking Water Regulations. Available from: http://water.epa.gov/drink/contaminants/.

18(a). Regarding an advisory warning issued in September, 2014 by the federal Pipeline

and Hazardous Materials Safety Administration, what are TransCanada's plans to ensure pipeline safety due to the fact different types of product will be transported in KXL?

OBJECTION AND RESPONSE: This request seeks information related to pipeline safety, which is within the exclusive jurisdiction of PHMSA. Without waiving the objection, PHMSA Advisory 2014-0040 is not applicable to Keystone. This advisory is related to flow reversal, product change (e.g., crude oil to refined product) and/or conversion to service (e.g., convert from natural gas to crude oil) and throughput capacity change.

18(b). PHMSA cautioned pipeline operators across the country about "the potential significant impact flow reversals, product changes and conversion to service may have on the integrity (safety) of a pipeline." The advisory adds: "Flow reversals, product changes, and conversions to service may impact various aspects of a pipeline's operation, maintenance, monitoring, integrity management, and emergency response. Pressure gradients, velocity, and the location, magnitude, and frequency of pressure surges and cycles may change. Operators may also consider increasing the throughput capacity of the pipeline. Increasing throughput may also impact the pressure profile and pressure transients. … Leak detection and monitoring systems may be affected."

OBJECTION AND ANSWER: This request is not a question and cannot be answered. It also relates to an issue that is within the exclusive jurisdiction of PHMSA

and is therefore not relevant or likely to lead to the discovery of admissible evidence. Without waiving the objection, PHMSA Advisory 2014-0040 is not applicable to Keystone. This advisory is related to flow reversal, product change (e.g., crude oil to refined product) and/or conversion to service (e.g., convert from natural gas to crude oil) and throughput capacity change.

18(c). Current regulations state: "Operators must review their integrity (safety) management program. … Operators must notify PHMSA if these changes will substantially affect their integrity management program, its implementation, or modifies the schedule for carrying out the program elements."

OBJECTION: This request is not a question and cannot be answered. It also relates to an issue that is within the exclusive jurisdiction of PHMSA and is therefore not relevant or likely to lead to the discovery of admissible evidence.

18(d). KXL is intended to transport two very different products, the much less dense and highly volatile Bakken oil product and the heavy diluted bitumen from Alberta. How will the two very different products affect KXL's operation, maintenance, monitoring, integrity management, and emergency response? How will the two very different products affect pressure gradients, velocity, and the location, magnitude, and frequency of pressure surges and cycles?

ANSWER: Please refer to Department of State FSEIS Chapter 3 Section 3.13.3. The Keystone pipeline is designed to transport a range of crude oils. The hydraulic analysis considers various inputs such velocity, surge and cyclic loading. The operation, maintenance, monitoring, integrity management, and emergency response plans consider the range of products transported.

33(a). Provide updated maps.

OBJECTION AND ANSWER: This request is vague, overlybroad, unduly burdensome, and seeks information that is not relevant or likely to lead to the discovery of admissible evidence. Without waiving the objection, please refer to the attached route variation maps marked as Keystone 0470-0583.

41(a). Provide map detailing all water bodies to be crossed in S.D., to include locations KXL would cross the Missouri and Yellowstone Rivers upstream from S.D.

OBJECTION: Keystone has previously filed with the PUC maps showing the route through South Dakota, which also show where the pipeline crosses rivers and other water bodies. Waterbody crossing permitting is within the control of the United States Army Corps of Engineers, and is beyond Keystone's control.

41(b). Provide map clearly depicting all waterways crossed by route which are tributaries into the Missouri River.

OBJECTION: Keystone has previously filed with the PUC maps showing the route through South Dakota, which also show where the pipeline crosses rivers and other water bodies.

41(c). Identify distances from KXL waterway crossings to point of confluence with the Missouri River.

OBJECTION: Keystone withdraws its previous objection. For the perennial stream crossings where the downstream portions of the stream are located with the boundaries of South Dakota and have a point of confluence with the Missouri River, the distance from the KXL pipeline crossing of each waterway to the Missouri River are in Table 1 below.

Table 1. Downstream Distance to the Missouri River

Stream Name	Periodicity	Miles downstream to Missouri River
Cottonwood Creek	Perennial	87.2
Bad River	Perennial	93.4
South Fork Grand River	Perennial	290.4
Clarks Fork Creek	Perennial	285.7
South Fork Moreau River	Perennial	290.4
Pine Creek	Perennial	222.7
Dry Creek	Perennial	86.5

41(d). Provide map(s) demonstrating all public water utility intakes on the Missouri River system.

OBJECTION: This request is overlybroad, unduly burdensome, and seeks information that is not within Keystone's custody or control. In addition, the location of the information is related to HCA's and deemed confidential by PHMSA.

41(e). By what date will permitting of water body crossings be completed?

OBJECTION: Permitting of water body crossings is within the control of the United States Army Corps of Engineers, and is beyond Keystone's control.

41(f). Provide a copy of the CMR Plan. Ex TC-1, 5.4.1, pp. 45-46.

ANSWER: A current copy of the CMR Plan is attached to Keystone's certification petition and is on file with the PUC.

41(g). Provide research which describes migration of spillage in these waterways.

OBJECTION: This request is vague, overlybroad, and unduly burdensome.

41(h). Please explain and describe water protection areas located downstream of major river crossings on the proposed route.

OBJECTION: This request is overlybroad, unduly burdensome, and seeks information that is not within Keystone's custody or control. In addition, the location of the information is related to HCA's and deemed confidential by PHMSA.

41(i). Explain risks of HDD, including possibility of contaminants being released into waterways during this process.

ANSWER: This issue is addressed in the FSEIS at pages 4.3-21, 4.8-20, and 4.7-11, 12.

50(a). Provide a map depicting the High Consequence Areas.

OBJECTION: This request seeks the identity and location of High Consequence Areas, which is confidential by statute, and Keystone is required by PHMSA to keep this information confidential.

50(b). Explain why the total length of pipe affecting HCA decreased from 34.3 miles to 19.9 miles.

OBJECTION AND ANSWER: To the extent that this request seeks the identity and location of High Consequence Areas, that information is confidential by statute and Keystone is required by PHMSA to keep this information confidential. Without waiving the objection, during the detailed engineering design phase of the Project, the route was adjusted. In doing so, the route deviated away from DOT designated HCA areas there by reducing total HCA miles crossed by the Project. Please refer to the attached route variation list and maps.

50(c). Explain how the statistic which states a spill could affect a HCA no more than once in 250 years.

OBJECTION AND ANSWER: To the extent that this request seeks the identity and location of High Consequence Areas, that information is confidential by statute and

Keystone is required by PHMSA to keep this information confidential. Without waiving the objection, page 4-21 of the 2009 KXL Risk Assessment shows that a spill affecting HCA in any state crossed by the Project has an occurrence interval of 53 years. This is calculated based on historical incident data from Pipeline and Hazardous Materials Safety Administration, as discussed in Section 3.0. This is calculated by taking the inverse of the incident frequency (measured as incidents per mile per year) multiplied by the miles of high consequence areas crossed (141.2 miles). The result is an estimate, in years, of the time between spills. This is similar to the concept of flood recurrence intervals (e.g., 100-year floods).

107(a). Provide the analysis by Dr. Michael Madden which professes the Project would not (ii) substantially impair the health, safety, or welfare of the inhabitants in the project area.

OBJECTION: Dr. Madden was PUC Staff's witness in Docket 09-001, and his direct testimony is a matter of public record.

107(b). Explain how the 2010 permit, which relies on the federal environmental impact statement prepared by the Department of State, addresses specific concerns of South Dakota, including the health, safety and welfare of South Dakota citizens.

OBJECTION: This request is vague, unclear, argumentative, and seeks information that is not relevant or likely to lead to the discovery of admissible evidence.

The PUC addressed the health, safety, and welfare of South Dakota residents in the Amended Final Decision and Order in Docket 09-001. In addition, South Dakota residents had notice and opportunity to participate in the lengthy NEPA process conducted by the Department of State.

107(c). Explain your interpretation of "substantially" as it is used in state law SDCL 49-41 B-22 which states the applicant for a facility construction permit has the burden of proof to establish that:

(3) "The facility will not substantially impair the health, safety or welfare of the inhabitants."

OBJECTION: This request seeks a legal opinion or conclusion and is therefore beyond the scope of discovery and not likely to lead to the discovery of admissible evidence under SDCL § 15-6-26(b). It was an issue for the PUC to determine in Docket HP 09-001.

107(d). State with 100% certainty that this project will have no impact on the health, safety or welfare of the people of South Dakota.

OBJECTION: This request is argumentative and seeks information that is not relevant or likely to lead to the discovery of admissible evidence. The PUC addressed the health, safety, and welfare of South Dakota residents in the Amended Final Decision and Order in Docket 09-001. Keystone has not asserted that the project would

have "no impact" on the health, safety, or welfare of the people of South Dakota.

107(e). Describe how areas of dense populations versus areas of sparse populations affect project decision.

OBJECTION AND RESPONSE: This request is vague and unclear. Without waiving the objection, to the extent feasible and consistent with other routing criteria, areas of dense population are avoided during project routing.

Dated this 5th day of February, 2015.

TRANSCANADA KEYSTONE PIPELINE, LP
by its agent, TC Oil Pipeline Operations, Inc.

By _____

Its Director, Authorized Signatory

Subscribed and sworn to before me

this 5th day of February, 2015.

_____

John W. Love, Lawyer
Notary Public - Canada

OBJECTIONS

The objections stated to Cindy Myers' Interrogatories and Request for Production of Documents were made by James E. Moore, one of the attorneys for Applicant TransCanada herein, for the reasons and upon the grounds stated therein.

Dated this 6th day of February, 2015.

WOODS, FULLER, SHULTZ & SMITH P.C.

By _____
William Taylor
James E. Moore
Post Office Box 5027
300 South Phillips Avenue, Suite 300
Sioux Falls, SD 57117-5027
Phone: (605) 336-3890
Fax: (605) 339-3357
Email: Bill.Taylor@woodsfuller.com
James.Moore@woodsfuller.com
Attorneys for Applicant TransCanada

CERTIFICATE OF SERVICE

I hereby certify that on the 6th day of February, 2015, I sent by e-mail transmission, a true and correct copy of Keystone's Responses to Cindy Myers' First Interrogatories and Request for Production of Documents, to the following:

Cindy Myers, R.N.
PO Box 104
Stuart, NE 68780
csmyers77@hotmail.com

One of the attorneys for TransCanada

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT	:	HP 14-001 TRANSCANADA KEYSTONE PIPELINE, LP'S OBJECTIONS TO CINDY MYERS' FIRST INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

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TransCanada Keystone Pipeline, LP ("Keystone") makes the following objections to interrogatories pursuant to SDCL § 15-6-33 and objections to request for production of documents pursuant to SDCL § 15-6-34(a). Keystone will further respond, as indicated throughout the objections, on or before February 6, 2015. These objections are made within the scope of SDCL § 15-6-26(e) and shall not be deemed continuing nor be supplemented except as required by that rule.

GENERAL OBJECTION

Keystone objects to the instructions and definitions contained in Cindy Myers' First Set of Interrogatories and Requests for Production of Documents to the extent that they are inconsistent with the provisions of SDCL Ch. 15-6. *See* ARSD 20:10:01:01.02.

Keystone's answers are based on the requirements of SDCL §§ 15-6-26, 15-6-33, 15-6-34, and 15-6-36.

INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

1. Please identify the person or persons providing each answer to an Interrogatory or portion thereof, giving the full name, address of present residence, date of birth, business address and occupation.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

2. Prior to answering these interrogatories, have you made due and diligent search of all books, records, and papers of the Applicant with the view of eliciting all information available in this action?

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

2(a). Describe how TransCanada will comply with these Acts as they apply to the project in relation to rivers, ground water and water system crossings in South Dakota.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

2(b). Provide research entailing migration of benzene in watersheds, rivers and ground water.

ANSWER: Any responsive, non-privileged documents will be provided on or before February 6, 2015.

8(a). Explain what changes have been made in the Emergency Response Plan and Integrity Management Plan since 2010.

OBJECTION: To the extent that this request seeks production of the Emergency Response Plan, the request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan and the integrity management plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

8(b). Provide the Emergency Response Plan.

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

8(c). Provide the Integrity Management Plan.

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the integrity management plan could commercially disadvantage Keystone. In addition, Keystone is

not required to submit its Integrity Management Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation.

18(a). Where will fuel storage facilities be located within 200 feet of private wells and 400 feet of municipal wells?

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

18(b). How will minimizing and exercising vigilance be enforced?

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

21(a). Define "frac-out."

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

21(b). What are concerns and safety issues related to a "frac-out."

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

21(c). Provide "frac-out plan."

ANSWER: Any responsive, non-privileged documents will be provided on or before February 6, 2015.

34(a). Describe what progress has been made in the evaluation and performance assessment activities regarding high consequence areas since 2010.

OBJECTION: To the extent that this request seeks a list of High Consequence Areas, the identity and location of High Consequence Areas is confidential by statute and Keystone is required by PHMSA to keep this information confidential. To the extent that this request seeks production of the Emergency Response Plan, the request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http:///keystonepipeline-xl.state.gov/documents/organization/221189.pdf. Without waiving the objection, Keystone will provide a response to the rest of the request on or before February 6, 2015.

34(b). Define "high consequence area."

OBJECTION: To the extent that this request seeks a list of High Consequence Areas, the identity and location of High Consequence Areas is confidential by statute and Keystone is required by PHMSA to keep this information confidential. Without waiving the objection, Keystone will provide a response to the rest of the request on or before February 6, 2015.

34(c). Provide a completed list of high consequence areas.

OBJECTION: The identity and location of High Consequence Areas is confidential by statute and Keystone is required by PHMSA to keep this information confidential.

34(d). Explain how project inhabitants and local communities will be informed and educated about high consequence areas.

OBJECTION: To the extent that this request seeks a list of High Consequence Areas, the identity and location of High Consequence Areas is confidential by statute and Keystone is required by PHMSA to keep this information confidential. Without waiving the objection, Keystone will provide a response to the rest of the request on or before February 6, 2015.

34(c). Provide a copy of the Emergency Response Plan. (Requested above with #8.)

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

34(f). Provide Integrity Management Plan. (Requested above with #8.)

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the integrity management plan could commercially disadvantage Keystone. In addition, Keystone is

not required to submit its Integrity Management Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation.

35(a). Provide the Integrity Management and Emergency Response Plans. (Requested above.)

OBJECTION: The request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the province of PHMSA. The PUC's jurisdiction over pipeline safety is preempted by federal law. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. Public disclosure of the emergency response plan and the integrity management plan could commercially disadvantage Keystone. In addition, Keystone is not required to submit these documents to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

35(b). Define "Unusually Sensitive Areas."

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(c). Define "Hydrologically Sensitive Areas."

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(d). Explain how unusually sensitive areas and hydrologically sensitive areas are addressed differently compared to other areas.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(e). Confirm that you are not fully aware of all vulnerable and beneficially useful aquifers and your intent is to only become aware of them during construction and route evaluation not yet completed.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(f). Define "unconfined aquifers."

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(g). List known unconfined aquifers to be crossed by the project.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(h). Explain the concern of routing through unconfined aquifers.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(i). Describe how it could be possible to route through an unknown, unconfined aquifer during construction.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(j). Provide documentation of further route evaluation since 2010, including assessments for aquifers and hydrologically sensitive areas.

OBJECTION AND RESPONSE: This request is vague, overlybroad, and unduly burdensome. Without waiving the objection, any responsive, non-privileged documents showing changes in the route or addressing aquifers and hydrologically sensitive areas will be provided on or before February 6, 2015.

35(k). Explain how you will deem an aquifer vulnerable and beneficially useful?

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

35(l). This condition states: "…in some reaches of the Project in southern Tripp County, the High Plains Aquifer is present at or very near ground surface and is overlain by highly permeable sands permitting the uninhibited infiltration of contaminants." Sandy soil and ground water at or above the surface means a pipe with expected pinhole

leaks will be immersed in ground water. This is the exact type of situation of soil/ground water which caused the route change in Nebraska. If this was reason to change the route in Nebraska, explain why it is still acceptable in South Dakota.

OBJECTION AND RESPONSE: This request is argumentative and assumes facts not in evidence. Without waiving the objection, Keystone will answer this interrogatory on or before February 6, 2015.

35(m). Explain TransCanada's follow-up with suggestion by DENR staff, given in testimony, to reroute the KXL pipeline around the city of Colome's source water area.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

36(a). Identify all emergency medical response planning contained within the emergency response plan.

OBJECTION: This request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the exclusive province of PHMSA. The PUC's jurisdiction over the emergency response plan is preempted by federal law, which has exclusive jurisdiction over issues of pipeline safety. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. See Amended Final Order, HP 09-001,

Condition ¶ 36. Public disclosure of the emergency response plan would commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency Response Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf.

36(b). What actions have been taken by TransCanada to ensure the medical communities in South Dakota are prepared and educated to treat people exposed to spills and water contamination from spills?

OBJECTION AND RESPONSE: To the extent that this request seeks production of the Emergency Response Plan, this request seeks information that is beyond the scope of the PUC's jurisdiction and Keystone's burden under SDCL § 49-41B-27. This request also seeks information addressing an issue that is governed by federal law and is within the exclusive province of PHMSA. The PUC's jurisdiction over the emergency response plan is preempted by federal law, which has exclusive jurisdiction over issues of pipeline safety. *See* 49 C.F.R. Part 194; 49 U.S.C. § 60104(c). This request further seeks information that is confidential and proprietary. See Amended Final Order, HP 09-001, Condition ¶ 36. Public disclosure of the emergency response plan would commercially disadvantage Keystone. In addition, Keystone is not required to submit its Emergency

Response Plan to PHMSA until sometime close to when the Keystone Pipeline is placed into operation. Keystone's Emergency Response Plan is addressed in The Final Supplemental Environmental Impact Statement at http://keystonepipeline-xl.state.gov/documents/organization/221189.pdf. Without waiving the objection, Keystone will provide a response on or before February 6, 2015.

36(c). How will inhabitants and communities near the project area be notified of spills?

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

40(a). Provide documentation supporting your assertion that polyethylene water piping is permeable to BTEX.

ANSWER: Any responsive, non-privileged documents will be provided on or before February 6, 2015.

40(b). Explain health concerns related to BTEX.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

40(c). Provide an MSDS of all products to be transported in KXL, including the diluents.

ANSWER: Any responsive, non-privileged documents will be provided on or before February 6, 2015.

40(d). Provide list of ground water quality standards, specifically listing chemicals involved in tar sands oil product and diluents.

OBJECTION: Keystone does not determine ground water quality standards. They are established by the South Dakota Department of Environment and Natural Resources.

40(e). Describe how the decision was made to designate concern of BTEX only within 500 feet of the Project.

OBJECTION: This request seeks information that is not within Keystone's custody or control. This decision was made by the PUC as part of Amended Permit Condition 40.

40(f). Confirm this safety measure will only be implemented at the request of a landowner or public water supply system.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

40(g). Explain why this measure is optional instead of mandatory.

OBJECTION: This request seeks information that is not within Keystone's custody or control. This decision was made by the PUC as part of Amended Permit Condition 40.

40(h). TransCanada has agreed to do this: "At least forty-five days prior to commencing construction, Keystone shall publish a notice in each newspaper of general circulation in each county through which the Project will be constructed advising landowners and public water supply systems of this condition." What percent of inhabitants do you expect to reach by issuing a warning in this manner?

OBJECTION AND RESPONSE: This request is speculative and argumentative. A notice is not a "warning." Without waiving the objection, Keystone expects that notice in newspapers of general circulation would reach a substantial portion of the inhabitants.

46(a). Provide written plan as to how you will find and provide a permanent water supply for various locations along route if a well should become contaminated, including specific alternate sources.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

46(b). Define "quantity" as it is used in this condition.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

46(c). Provide cost estimates for providing water to the city of Colome, domestic wells or an entire ranching operation should water supplies become contaminated.

ANSWER: Any responsive, non-privileged documents will be provided on or before February 6, 2015.

46(d). Explain how providing a permanent water supply will be ensured into perpetuity.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

46(e). Explain how people and cattle using private wells and public wells can be assured their water is free of contamination from undetected leakage, particularly in Tripp County.

OBJECTION: This request seeks information that is not within Keystone's custody or control.

46(f). Describe what experience South Dakota has had cleaning up tar sands oil product spills into rivers and ground water.

OBJECTION: This request seeks information that is not within Keystone's custody or control.

46(g). Describe any experience the State of South Dakota or any other state has had in "sparging" ground water in order to cleanse tar sands oil product from aquifers.

OBJECTION: This request seeks information that is not within Keystone's custody or control.

46(h). Describe types of spills which may be difficult or impossible to remediate.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

46(i). Identify responsible parties who will conduct water analysis to assure toxins from undetected leaks have not migrated into water resources, including frequency of testing and who will assume cost of testing.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

46(j). Describe potential scenarios in which medical costs related to contamination will be reimbursed.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

46(k). Provide a detailed listing of potential toxins which could contaminate wells.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

46(l). Provide documentation detailing adverse health effects caused from exposure to these toxins, including the various routes of entry into the human body.

ANSWER: Any responsive, non-privileged documents will be provided on or before February 6, 2015.

18(a). Regarding an advisory warning issued in September, 2014 by the federal Pipeline

and Hazardous Materials Safety Administration, what are TransCanada's plans to ensure pipeline safety due to the fact different types of product will be transported in KXL?

OBJECTION AND RESPONSE: This request seeks information related to pipeline safety, which is within the exclusive jurisdiction of PHMSA. Without waiving the objection, Keystone will answer this interrogatory on or before February 6, 2015.

18(b). PHMSA cautioned pipeline operators across the country about "the potential significant impact flow reversals, product changes and conversion to service may have on the integrity (safety) of a pipeline." The advisory adds: "Flow reversals, product changes, and conversions to service may impact various aspects of a pipeline's operation, maintenance, monitoring, integrity management, and emergency response. Pressure gradients, velocity, and the location, magnitude, and frequency of pressure surges and cycles may change. Operators may also consider increasing the throughput capacity of the pipeline. Increasing throughput may also impact the pressure profile and pressure transients. … Leak detection and monitoring systems may be affected."

OBJECTION: This request is not a question and cannot be answered. It also relates to an issue that is within the exclusive jurisdiction of PHMSA and is therefore not relevant or likely to lead to the discovery of admissible evidence.

18(c). Current regulations state: "Operators must review their integrity (safety) management program. … Operators must notify PHMSA if these changes will

substantially affect their integrity management program, its implementation, or modifies the schedule for carrying out the program elements."

OBJECTION: This request is not a question and cannot be answered. It also relates to an issue that is within the exclusive jurisdiction of PHMSA and is therefore not relevant or likely to lead to the discovery of admissible evidence.

18(d). KXL is intended to transport two very different products, the much less dense and highly volatile Bakken oil product and the heavy diluted bitumen from Alberta. How will the two very different products affect KXL's operation, maintenance, monitoring, integrity management, and emergency response? How will the two very different products affect pressure gradients, velocity, and the location, magnitude, and frequency of pressure surges and cycles?

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

33(a). Provide updated maps.

OBJECTION: This request is vague, overlybroad, unduly burdensome, and seeks information that is not relevant or likely to lead to the discovery of admissible evidence. Without waiving the objection, Keystone will provide maps showing changes to the route on or before February 6, 2015.

41(a). Provide map detailing all water bodies to be crossed in S.D., to include locations KXL would cross the Missouri and Yellowstone Rivers upstream from S.D.

OBJECTION: Keystone has previously filed with the PUC maps showing the route through South Dakota, which also show where the pipeline crosses rivers and other water bodies. Waterbody crossing permitting is within the control of the United States Army Corps of Engineers, and is beyond Keystone's control.

41(b). Provide map clearly depicting all waterways crossed by route which are tributaries into the Missouri River.

OBJECTION: Keystone has previously filed with the PUC maps showing the route through South Dakota, which also show where the pipeline crosses rivers and other water bodies.

41(c). Identify distances from KXL waterway crossings to point of confluence with the Missouri River.

OBJECTION: This request seeks information that is beyond Keystone's custody and control and not maintained within the ordinary course of business.

41(d). Provide map(s) demonstrating all public water utility intakes on the Missouri River system.

OBJECTION AND RESPONSE: This request is overlybroad, unduly burdensome, and seeks information that is not within Keystone's custody or control.

Without waiving the objection, Keystone will provide information related to defined well head protection areas and source water intakes within the area of its risk assessment to the extent that they are not confidential.

41(e). By what date will permitting of water body crossings be completed?

OBJECTION: Permitting of water body crossings is within the control of the United States Army Corps of Engineers, and is beyond Keystone's control.

41(f). Provide a copy of the CMR Plan. Ex TC-1, 5.4.1, pp. 45-46.

OBJECTION: A current copy of the CMR Plan is attached to Keystone's certification petition and is on file with the PUC.

41(g). Provide research which describes migration of spillage in these waterways.

OBJECTION: This request is vague, overlybroad, and unduly burdensome.

41(h). Please explain and describe water protection areas located downstream of major river crossings on the proposed route.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

41(i). Explain risks of HDD, including possibility of contaminants being released into waterways during this process.

ANSWER: Keystone will answer this interrogatory on or before February 6, 2015.

50(a). Provide a map depicting the High Consequence Areas.

OBJECTION: This request seeks the identity and location of High Consequence Areas, which is confidential by statute, and Keystone is required by PHMSA to keep this information confidential.

50(b). Explain why the total length of pipe affecting HCA decreased from 34.3 miles to 19.9 miles.

OBJECTION: To the extent that this request seeks the identity and location of High Consequence Areas, that information is confidential by statute and Keystone is required by PHMSA to keep this information confidential. Keystone will provide a response to the rest of the request on or before February 6, 2015.

50(c). Explain how the statistic which states a spill could affect a HCA no more than once in 250 years.

OBJECTION: To the extent that this request seeks the identity and location of High Consequence Areas, that information is confidential by statute and Keystone is required by PHMSA to keep this information confidential. Keystone will provide a response to the rest of the request on or before February 6, 2015.

107(a). Provide the analysis by Dr. Michael Madden which professes the Project would not (ii) substantially impair the health, safety, or welfare of the inhabitants in the project area.

OBJECTION: Dr. Madden was PUC Staff's witness in Docket 09-001, and his direct testimony is a matter of public record.

107(b). Explain how the 2010 permit, which relies on the federal environmental impact statement prepared by the Department of State, addresses specific concerns of South Dakota, including the health, safety and welfare of South Dakota citizens.

OBJECTION: This request is vague, unclear, argumentative, and seeks information that is not relevant or likely to lead to the discovery of admissible evidence. The PUC addressed the health, safety, and welfare of South Dakota residents in the Amended Final Decision and Order in Docket 09-001. In addition, South Dakota residents had notice and opportunity to participate in the lengthy NEPA process conducted by the Department of State.

107(c). Explain your interpretation of "substantially" as it is used in state law SDCL 49-41 B-22 which states the applicant for a facility construction permit has the burden of proof to establish that:

(3) "The facility will not substantially impair the health, safety or welfare of the inhabitants."

OBJECTION: This request seeks a legal opinion or conclusion and is therefore beyond the scope of discovery and not likely to lead to the discovery of

admissible evidence under SDCL § 15-6-26(b). It was an issue for the PUC to determine in Docket HP 09-001.

107(d). State with 100% certainty that this project will have no impact on the health, safety or welfare of the people of South Dakota.

OBJECTION: This request is argumentative and seeks information that is not relevant or likely to lead to the discovery of admissible evidence. The PUC addressed the health, safety, and welfare of South Dakota residents in the Amended Final Decision and Order in Docket 09-001. Keystone has not asserted that the project would have "no impact" on the health, safety, or welfare of the people of South Dakota.

107(e). Describe how areas of dense populations versus areas of sparse populations affect project decision.

OBJECTION AND RESPONSE: This request is vague and unclear. Without waiving the objection, to the extent feasible and consistent with other routing criteria, areas of dense population are avoided during project routing.

Dated this 23rd day of January, 2015.

WOODS, FULLER, SHULTZ & SMITH P.C.

By /s/ James E. Moore

William Taylor
James E. Moore
Post Office Box 5027
300 South Phillips Avenue, Suite 300
Sioux Falls, SD 57117-5027
Phone: (605) 336-3890
Fax: (605) 339-3357
Email: Bill.Taylor@woodsfuller.com
James.Moore@woodsfuller.com
Attorneys for Applicant TransCanada

CERTIFICATE OF SERVICE

I hereby certify that on the 23rd day of January, 2015, I sent by e-mail transmission, a true and correct copy of Keystone's Objections to Cindy Myers' First Interrogatories and Request for Production of Documents, to the following:

Cindy Myers, R.N.
PO Box 104
Stuart, NE 68780
csmyers77@hotmail.com

/s/ James E. Moore
One of the attorneys for TransCanada

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT	:	HP 14-001 TRANSCANADA KEYSTONE PIPELINE, LP'S RESPONSES TO CINDY MYERS' SECOND INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

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Applicant TransCanada makes the following responses to interrogatories pursuant to SDCL § 15-6-33, and responses to requests for production of documents pursuant to SDCL § 15-6-34(a). These responses are made within the scope of SDCL 15-6-26(e) and shall not be deemed continuing nor be supplemented except as required by that rule. Applicant objects to definitions and directions in answering the discovery requests to the extent that such definitions and directions deviate from the South Dakota Rules of Civil Procedure.

INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

1. State the name, current address, and telephone number of the person answering these interrogatories.

ANSWER: A number of different people assisted in providing answers to these interrogatories. Keystone previously disclosed the identity of the persons whose prefiled testimony will be provided before the hearing.

2. Re. Condition #36---Does TransCanada have a documented emergency medical response plan for this project?

ANSWER: Not at this time. The current Keysotne Pipeline Emergency Response Plan (ERP) will be amended to include Keystone XL Project.

3. Re. Condition #36---Do your drills for cleaning up spills include scouring beds of water bodies for submerged oil?

ANSWER: No, scouring beds of water bodies for submerged oil is a specialized technique performed by an experienced contractor. Based on the assessment of an actual incident this could be one of many techniques implemented. Training and exercises include ICS, table top, deployment and full scale exercises. Our exercise planners are required to invite first responders to full scale exercises which include the development of an incident management team and the simultaneous deployment of equipment resources to proximate a real event. These exercises are conducted in various locations along the pipeline system.

4. Re. Condition #36---What communication has there been from TransCanada to Indian Health Services and South Dakota health care facilities regarding

tar sands oil information, KXL spill scenarios, and staff training for treating victims exposed to tar sands spills?

ANSWER: TransCanada has provided educational information to possible affected public, elected officials, excavators and first responders. This educational material comes in the form of a pamphlet and is titled Oil Pipeline for Emergency Responders. A copy is marked as Keystone 1523-1538.

5. Re. Condition #36---How has TransCanada prepared the South Dakota medical community for spills from this project?

ANSWER: TransCanada has provided educational information to possible affected public, elected officials, excavators and first responders. This educational material comes in the form of a pamphlet and is titled Oil Pipeline for Emergency Responders. A copy is marked as Keystone 1523-1538.

6. Re. Fact #107d---Please further explain and clarify your reply in my first set of interrogatories: "Keystone has not asserted that the project would have 'no impact' on the health, safety and welfare of South Dakota." Does this mean there are potential impacts on the health, safety and welfare of South Dakota residents? What are these potential impacts on the health, safety and welfare of South Dakota residents?

ANSWER: The potential impacts of the Keystone XL project on the health, safety, and welfare of South Dakota residents are addressed in Keystone's permit

application filed in Docket HP09-001, and were addressed by the Commission in the Amended Final Decision and Order dated June 29, 2010.

7. Re. Condition #35---Please explain how the reroute across the High Plains Aquifer in Tripp Co. improved the safety for those depending on that water? Does the reroute still cross the aquifer? Specifically, describe the reroute.

ANSWER: Yes, the route crosses the High Plains Aquifer. Route variations in Tripp County were not due to the aquifer but pertained to landowner and constructability issues. Route variation maps were previously provided.

8. Re. Fact #107e---You try to avoid areas of dense population. Is the reason for this because less number of people at risk? What specifically is your reason for avoiding areas of dense population?

ANSWER: Pipeline routing is an iterative process and takes into consideration numerous aspects: pipeline route length and overall project footprint, public safety, environmental constraints, population density, land-use compatibility, optimization with other industrial infrastructure, constructability limitations and regulatory constraints. Areas of urbanization are avoided to the extent practicable as these locations pose a challenge during construction and operational activities due to work space constraints, congestion and disruption to the public. Avoidance of urbanized and densely populated

areas is also a primary mitigation to the risk of damage to the pipeline due to excavation activities by others.

9. Re. Condition #36---Has TransCanada considered that benzene plumes in flowing water could cause contamination of public water plants?

ANSWER: TransCanada has considered downstream receptors in its analysis per Special Condition 14. Please refer to Department of State SFEIS Appendix P Risk Assessment Section 4.0 Consequences of a Spill.

10. Re. Condition #34---What information has TransCanada provided to residents who live in a high consequence area about the increased risks associated with that designation?

ANSWER: TransCanada's Public Awareness Program is designed to increase awareness of pipeline safety to protect the public, environment and TransCanada facilities. The PA Program reaches out to affected public, excavators/contractors, emergency officials and local and the local public to ensure they are engaged and educated about living and working safely near TransCanada facilities. This includes awareness of areas that have been defined as high consequence areas.

11. Re. Condition #36b---Is the pamphlet titled "Oil Pipeline for Emergency Responders", marked as Keystone the only medical information provided by TransCanada?

ANSWER: TransCanada is not a medical provider and does not provide medical information. The local medical authority has jurisdiction during an incident or emergency.

12. Re. Condition #35---Will TransCanada provide routine analyses of the aquifer water in Tripp County to assure the residents will not be poisoned from those expected/undetected leaks?

ANSWER: In the event of a release, TransCanada will work with the appropriate agencies to complete any required analysis.

13. Re. Condition #36---What education, training, information and/or preparation has TransCanada provided for water treatment plants using water from the Missouri River? What communication has taken place between TransCanada and water treatment systems which use water from the Missouri River?

ANSWER: TransCanada's Public Awareness Program is designed to increase awareness of pipeline safety to protect the public, environment and TransCanada facilities. The PA Program reaches out to affected public, excavators/contractors, emergency officials and local and the local public to ensure they are engaged and educated about living and working safely near TransCanada facilities.

14. Re. Finding of Fact #41---I had previously requested distances between tributaries and their confluence with the Missouri River. You provided a list, but failed

to include the Little Missouri River, Cheyenne River and the White River. I request this information again.

ANSWER: Listed in the table below are the distances from the KXL pipeline crossing of the three waterways requested to the Missouri River.

Stream Name	Miles downstream to Missouri River
Little Missouri River	384.2
Cheyenne River	89.5
White River	82.4

Dated this 10 day of March, 2015.

TRANSCANADA KEYSTONE PIPELINE, LP
by its agent, TC Oil Pipeline Operations, Inc.

By _____
Joseph Brown
Its Director, Authorized Signatory

Subscribed and sworn to before me

this 10 day of March, 2015.

_____
John W. Love, Lawyer
Notary Public - Canada

OBJECTIONS

The objections stated to Cindy Myers' Interrogatories and Request for Production of Documents were made by James E. Moore, one of the attorneys for Applicant TransCanada herein, for the reasons and upon the grounds stated therein.

Dated this 10th day of March, 2015.

WOODS, FULLER, SHULTZ & SMITH P.C.

By 

William Taylor
James E. Moore
Post Office Box 5027
300 South Phillips Avenue, Suite 300
Sioux Falls, SD 57117-5027
Phone: (605) 336-3890
Fax: (605) 339-3357
Email: Bill.Taylor@woodsfuller.com
James.Moore@woodsfuller.com
Attorneys for Applicant TransCanada

CERTIFICATE OF SERVICE

I hereby certify that on the 10th day of March, 2015, I sent by e-mail transmission, a true and correct copy of Keystone's Responses to Cindy Myers' Second Interrogatories and Request for Production of Documents, to the following:

Cindy Myers, R.N.
PO Box 104
Stuart, NE 68780
csmyers77@hotmail.com

One of the attorneys for TransCanada

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE PETITION OF TRANSCANADA KEYSTONE PIPELINE, LP FOR ORDER ACCEPTING CERTIFICATION OF PERMIT ISSUED IN DOCKET HP09-001 TO CONSTRUCT THE KEYSTONE XL PIPELINE	* * * * * * * * * *	**STAFF'S RESPONSE TO INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS FROM CINDY MYERS, R.N.** **HP14-001**

COMES NOW, Commission Staff by and through its attorney of record, Kristen N. Edwards, and hereby provides the following response to Cindy Myers, R.N.'s Interrogatories and Requests for Production of Documents.

Dated this 10th day of March, 2015.

Kristen N. Edwards
Staff Attorney
South Dakota Public Utilities Commission
500 East Capitol Avenue
Pierre, SD 57501

1-1) As a health professional, I'm concerned about the health community being educated and prepared to treat people adversely affected from tar sands spills. I've requested a copy of TransCanada's Emergency Response Plan to identify specific components of medical emergency response planning. This information was not divulged. How may I obtain a copy of the emergency health plan? If this hasn't been completed for KXL, would it be possible to obtain a copy of the ERP for Keystone I?

Who is responsible for emergency medical response planning in the situation of spillage from TransCanada's KXL project?

Response: OBJECTION. Staff objects to this question on the grounds that it attempts to shift the burden from the company to staff, as well as on the grounds that it attempts to shift the regulatory burden from the federal government to commission staff for the purpose of inspecting Emergency Response Plans of an interstate pipeline.

Subject to and without waiving its objection, staff provides the following answer. It is staff's understanding that the Emergency Response Plan is not completed until close to the time a pipeline is ready to begin operations. All information submitted to the PUC regarding Keystone I's ERP is available in 7.0 of the company's Quarterly Report. For the last Quarterly Report filed by TransCanada for Keystone I, view the report at http://www.puc.sd.gov/commission/dockets/HydrocarbonPipeline/2007/HP07-001/4thquarterly2010.pdf.

Additionally, the final version of the Keystone Pipeline Emergency Response Plan will be amended to include Keystone XL. A redacted version of the ERP is available in Appendix I of the Finial Supplemental Environmental Impact Study, which is publicly available. The company may choose to redact information for public viewing due to the sensitive nature of the information contained in the ERP.

1-2) Re. Amended Permit Condition #40: According to TransCanada, the SD PUC made the decision to designate the concern of BTEX being hazardous if polyethylene and PVC water pipe is being used near this compound of chemicals. Is this correct? How was it decided that residents could request for their water piping to be changed if they lived within 500 feet of the project? How come this idea was not mandatory, and instead only at the request of the landowner?

Response: OBJECTION. This question calls for a legal opinion from the commission, which Staff is unable to provide. Staff is unable to answer for the commission, as Staff is separate from the commissioners, who are the decision-makers in the process.

1-3) I understand that that TransCanada must obtain permits from the US Army Corps of Engineers before crossing water bodies with their project. Does the US Army Corps of Engineers document studies of benzene migration in water before granting these permits? Does the Army Corps of Engineers rely on the FSEIS for this information? Who will be enforcing the Clean Water Act regulations re. this project?

Response: OBJECTION. This question attempts to shift the regulatory burden from the US Army Corps of Engineers to PUC staff. Furthermore, this information is more appropriately sought from the company or from the US Army Corps of Engineers. Subject to and without waiving its objection, staff provides the following answer.

It is staff's understanding that TransCanada has not submitted any permit applications to the US Army Corps of Engineers. As such, staff does not have any information as to what information would be analyzed should the company apply for a permit.

Enforcement of the Clean Water Act does not fall under the PUC's purview, and therefore, will not be responsible for enforcing the Clean Water Act. It is Staff's understanding that enforcement of the Clean Water Act would be done by the SD DENR and the EPA.

1-4) How did the PUC determine "the facility will not substantially impair the health, safety or welfare of the inhabitants."?

Response: The Commission made that determination after carefully reviewing all of the evidence in HP09-001. See Amended Final Decision and Order and transcript of formal hearing available online in Docket No. HP09-001. However, in HP09-001, as in this and any proceeding before the Commission, staff is a party to the docket and dos not take part in in Commission decisions. Therefore, staff has no more information than any other party or member of the public.

1-5) Has the PUC considered that toxins from KXL spillage could migrate via flowing water into public water intakes along the Missouri River? Where can I discover information as to locations of public water intakes along the Missouri River?

Response: Staff would rely on DENR's expert testimony on this matter. Staff has not received this information from DENR as of the due date of these responses. However, Staff will supplement this answer if and when this information is received from Staff's DENR witness.

1-6) Who is responsible for testing water for those expected/undetected leaks? Particularly in Tripp County where the pipeline will be immersed in groundwater?

Response: Staff would rely on DENR's expert testimony on this matter. Staff has not received this information from DENR as of the due date of these responses. However, Staff will supplement this answer if and when this information is received from Staff's DENR witness.

1-7) If high consequence areas are kept confidential by TransCanada, how can residents be assured of their safety? I feel residents are entitled to know this information.

Response: Similar to the ERP, the Integrity Management Plan could also contain sensitive information that the company may choose to keep confidential. The HCAs per se are not confidential, but TransCanada could be choosing to keep confidential the locations of the sections of pipe that have the ability to impact an HCA due to the sensitive nature of the information. Per code, an HCA is defined as:

(1) A commercially navigable waterway, which means a waterway where a substantial likelihood of commercial navigation exists;

(2) A high population area, which means an urbanized area, as defined and delineated by the Census Bureau, that contains 50,000 or more people and has a population density of at least 1,000 people per square mile;

(3) An other populated area, which means a place, as defined and delineated by the Census Bureau, that contains a concentrated population, such as an incorporated or unincorporated city, town, village, or other designated residential or commercial area;

(4) An unusually sensitive area, as defined in §195.6.

This information is readily available on census bureau websites and other sources.

1-8) What actions has the PUC taken to assure the South Dakota Health Care Community has been educated and trained to treat patients adversely affected from KXL spillage? Has there been communication with IHS and other health centers in SD?

Response: OBJECTION. This question attempts to shift the regulatory burden from DENR and the federal government, specifically the EPA or PHMSA, to Staff. This information is covered by the Emergency Response Plan, which is under the jurisdiction of the aforementioned agencies.

1-9) What education and training has been completed for SD public water treatment utilities to prepare them for tar sands spillage into SD waterways?

Response: OBJECTION. This question attempts to shift the burden from the company to Staff. It is the burden of the company to produce this information. Subject to and without waiving its objection, should Staff acquire any information from our experts to answer this question, we may supplement this answer at that time.

1-10) Please explain the reroute in Tripp County. How did the reroute improve safety?

Response: OBJECTION. This question attempts to shift the burden from the company to staff. Subject to and without waiving its objection, staff provides the following answer.

It is staff's understanding that the each route revision in Tripp County was made for the follow reason or reasons:

1. To minimize landowner impacts and reduce crossing of varying terrain features;
2. To minimize constructability and safety concerns with current Interstate 90, Hwy 16, and State Railroad crossings;
3. Per landowner requests to avoid a row of trees and minimize landowner impacts;
4. To minimize multiple creek crossings;
5. To avoid a well and impacts to a fence;
6. To avoid road crossing within a wetland area;
7. To minimize side slope construction;
8. To avoid a well and construction footprint impacts to a fence surrounding a historical site;
9. To avoid a drainage crossing and accommodate a road crossing;
10. To avoid side slop construction and sudden terrain changes;
11. To accommodate pump station design;
12. To accommodate pump station design;
13. To avoid any well impacts;
14. To avoid any well impacts; and
15. To avoid swampy low lying area near a pond.

1-11) What information have you shared with water treatment plants which access the Missouri River about oil spills into the Missouri River or tributaries of the Missouri River?

Response: OBJECTION. This question is outside of the scope of discovery as established by the commission's order, dated, December 17, 2014. Furthermore, water system operators had the opportunity to intervene in this proceeding, as well as HP09-001 if they had concern that their potable water intakes could be adversely impacted by the pipeline. Subject to and without waiving its objection, Staff will provide more information from its DENR witness when such information is received.

1-12) What information about tar sands spills into waterways has TransCanada provided the Department of Environment and Natural Resources?

Response: OBJECTION. This question is outside of the scope of discovery as established by the commission's order, dated, December 17, 2014. This question does not draw from a condition change, as required by the commission Order. Subject to and without waiving its objection, Staff will provide more information from its DENR witness when such information is received.

1-13) What plan do you have in place to respond to tar sands oil spills into the Missouri River or tributaries of the Missouri River?

Response: OBJECTION. This question attempts to shift the regulatory burden from DENR, PHMSA, and the EPA to Staff. The PUC does not have jurisdiction over interstate pipelines and would, therefore, not be involved with spill cleanup. Subject to and without waiving its objection, Staff will provide more information from its DENR witness when such information is received.

1-14) What education and training has been provided to water treatment facilities accessing Missouri River water regarding how to adequately respond to tar sands oil spills into the Missouri River or tributaries of the Missouri River?

Response: OBJECTION. This question attempts to shift the burden from the company to Staff. It is the burden of the company to produce this information. Subject to and without waiving its objection, Staff has asked this question of its DENR witness and will supplement its response if and when that information is received.

1-15) How do you plan to clean up a tar sands spill into the High Plains Aquifer in Tripp County?

Response: The PUC is not involved in cleanup. This would be the responsibility of the company, with the oversight of DENR and the EPA. The company must have a plan, subject to the approval or agreement of DENR and the EPA.

1-16) Describe the experience the State of South Dakota has had using "sparging" to clean up an aquifer. Has "sparging" ever been used to clean tar sands oil product from an aquifer?

Response: This is outside the technical expertise of Staff. Staff does not have knowledge of sparging. Should we acquire such information from one of our experts, Staff may supplement this answer at that time.

Questions from Cindy Myers to PUC Staff

5) Has the PUC considered that toxins from KXL spillage could migrate via flowing water into public water intakes along the Missouri River? Where can I discover information as to locations of public water intakes along the Missouri River?

Information about public water intakes in South Dakota is available on DENR's website at http://denr.sd.gov/des/dw/sysinfomap.aspx.

6) Who is responsible for testing water for those expected/undetected leaks? Particularly in Tripp County where the pipeline will be immersed in groundwater?

TransCanada, with regulatory oversight by the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA), will be responsible for the monitoring and operation of the proposed Keystone XL pipeline throughout South Dakota. PHMSA's construction, operation and monitoring requirements are outlined in the Code of Federal Regulations Title 49, Part 195 – Transportation of Hazardous Liquids by Pipeline.

If the pipeline leaked, South Dakota Codified Law (SDCL) 34A-18 requires crude oil pipeline operators to implement their response plan regardless of who caused the release. DENR has regulatory authority over the assessment and cleanup of pipeline spills and will ensure cleanup continues until all state requirements and standards are met. This would include sampling water supplies to ensure no water supply sources are impacted. If a water supply is impacted, TransCanada would be responsible for mitigating those impacts.

In addition, the federal Safe Drinking Water Act requires public water systems to periodically sample for volatile organic chemicals. Samples are collected by water systems operation specialists and analyzed in a laboratory certified to analyze drinking water samples for volatile organic chemicals. Samples are collected from the entry point to the distribution system at a frequency based on prior detections with all data reported to DENR's Drinking Water Program. If contamination is detected in a water supply above regulatory limits, operators work with DENR to correct the problem and identify the contaminant source.

9) What education and training has been completed for SD public water treatment utilities to prepare them for tar sands spillage into SD waterways?

DENR contracts for water system operation specialist certification training through the South Dakota Association of Rural Water Systems. The certification training includes information and education on emergency response activities resulting from a variety of scenarios including petroleum releases and other contamination events.

In addition, a research project was conducted through South Dakota's Regional Water System Research Consortium titled *Improving Safety of Crude Oil and Regional Water System Pipeline Crossings*. The report findings were presented at several conferences attended by water system

personnel. The study dealt specifically with crude oil pipelines and makes design recommendation for pipeline designs when crossing regional water systems distribution lines. The report is available on the internet at:
http://www.sdarws.com/PDF/SDRWRC/PipelineCrossingSafetyFinalReport.pdf

11) What information have you shared with water treatment plants which access the Missouri River about oil spills into the Missouri River or tributaries of the Missouri River?

DENR along with representatives from Iowa, Nebraska, local emergency managers, wildlife experts, EPA Region VII, and industry representatives including TransCanada are all participants in the Siouxland Sub-area Spill Contingency Committee who worked to develop a Siouxland Sub-area Spill Contingency Plan. As part of the implementation of this plan the group holds exercises, training sessions and meetings to discuss response and recovery efforts needed to respond to large oil or chemical releases. The plan addresses potential impacts to water supply intakes and notification procedures in the event of a release.

In addition, if there is a release into the Missouri River DENR's spill program works with the Drinking Water Program to ensure potentially impacted downstream facilities are notified and assisted as needed.

12) What information about tar sands spills into waterways has TransCanada provided the Department of Environment and Natural Resources?

TransCanada has not provided DENR with any specific information about tar sands spills into waterways from the proposed Keystone XL pipeline. However, SDCL 34A-18 requires crude oil pipeline operators to submit an oil spill response plan to DENR prior to operating the pipeline. The plan will address crude oil spills into waterways. DENR expects TransCanada to comply with SDCL 34A-18 prior to placing the Keystone XL pipeline into operation.

In compliance with SDCL 34A-18, TransCanada has provided DENR with an oil spill response plan for the existing Keystone pipeline and has conducted two full-scale spill response exercises in Yankton, SD where the pipeline crosses the Missouri River.

13) What plan do you have in place to respond to tar sands oil spills into the Missouri River or tributaries of the Missouri River?

SDCL 34A-18 requires crude oil pipeline operators to submit their oil spill response plan to DENR for approval and requires crude oil pipeline operators to implement their response plan in the event of a spill regardless of where the spill is or who caused the release.

In the event of a pipeline leak, DENR has regulatory authority over the assessment and cleanup of the spill and will ensure the cleanup continues until all state requirements and standards are met.

If the pipeline company did not responds to a spill, DENR has the authority to take legal action against the company to force their response, and while legal action is pending, has access to state and federal safety net clean up funds that could be used to initiate a response to protect against immediate threats to human health and the environment.

In addition DENR has been involved in the development of the following response plans and procedures which may be implemented in the event of a major crude oil spill: EPA Region VIII Emergency Response Plan, South Dakota Emergency Response Plan, South Dakota Disaster Recovery Plan, DENR Emergency Operations Plan, and DENR's Handbook for Reporting, Investigating, and Remediating Petroleum Releases in South Dakota.

14) What education and training has been provided to water treatment facilities accessing Missouri River water regarding how to adequately respond to tar sands oil spills into the Missouri River or tributaries of the Missouri River?

Education and training associated with spill response and other source water contamination events is included in DENR's contracted system operations specialist training as noted in question #9 above.

15) How do you plan to clean up a tar sands spill into the High Plains Aquifer in Tripp County?

SDCL 34A-18 requires crude oil pipeline operators to submit their oil spill response plan to DENR for approval and requires crude oil pipeline operators to implement their response plan in the event of a spill regardless of where the spill is or who caused the release. If the proposed Keystone XL pipeline leaked into the High Plains aquifer, TransCanada would be responsible for the cleanup.

However, DENR has regulatory authority over the assessment and cleanup of the spill and will ensure the cleanup continues until all state requirements and standards are met. In general, required cleanup actions would include: stopping the release, removal of free product, sampling of soil, surface water and groundwater to define the nature and extent of the contamination, design and implementation of cleanup actions to remediate remaining contamination to levels below state standards.

If the pipeline company did not responds to a spill, DENR has the authority to take legal action against the company to force their response, and while legal action is pending, has access to state and federal safety net clean up funds that could be used to initiate a response to protect against immediate threats to human health and the environment.

16) Describe the experience the State of South Dakota has had using "sparging" to clean up an aquifer. Has "sparging" ever been used to clean tar sands oil product from an aquifer?

DENR has not used sparging to cleanup a tar sands oil spill in an aquifer because there has not been a tar sands oil spill that has impacted an aquifer in South Dakota. However, DENR staff do

have experience with the installation and operation of soil vapor extraction and sparging systems used to remediate aquifers contaminated with refined petroleum products such as gasoline and diesel fuel.

Paul Seamans' Statement
07-16-15

The sleeves are a big plastic pipe that a contractor came in and installed underneath where the Keystone XL route will go. So essentially this pipe, which is probably 10 to 12 inch diameter is already over 7 feet in the ground so that the KXL pipe would be able to cross over it without disturbing the water line. The theory is if any work needs to be done near the KXL line in the future on the water lines the the water district would be able to slip a new water line through the sleeve without digging to close to the oil pipeline.

A contractor came in and installed these sleeves at all spots where the KXL would cross a West River/Lyman Jones water line a couple of years ago. I am fairly sure that all the WR/LJ water lines are PVC. Permit condition #40 says that existing pipe will be replaced with BTEX resistant pipe (as you well know) within 500 feet of the oil line or a total length of 1000 feet for a line that crosses under the KXL. This has not been done as the area near my pasture where the sleeve was installed was only dug up for a length of 40 feet. There is no way that TC could have replaced 1000 feet of PVC pipe with BTEX resistant pipe in these spots.

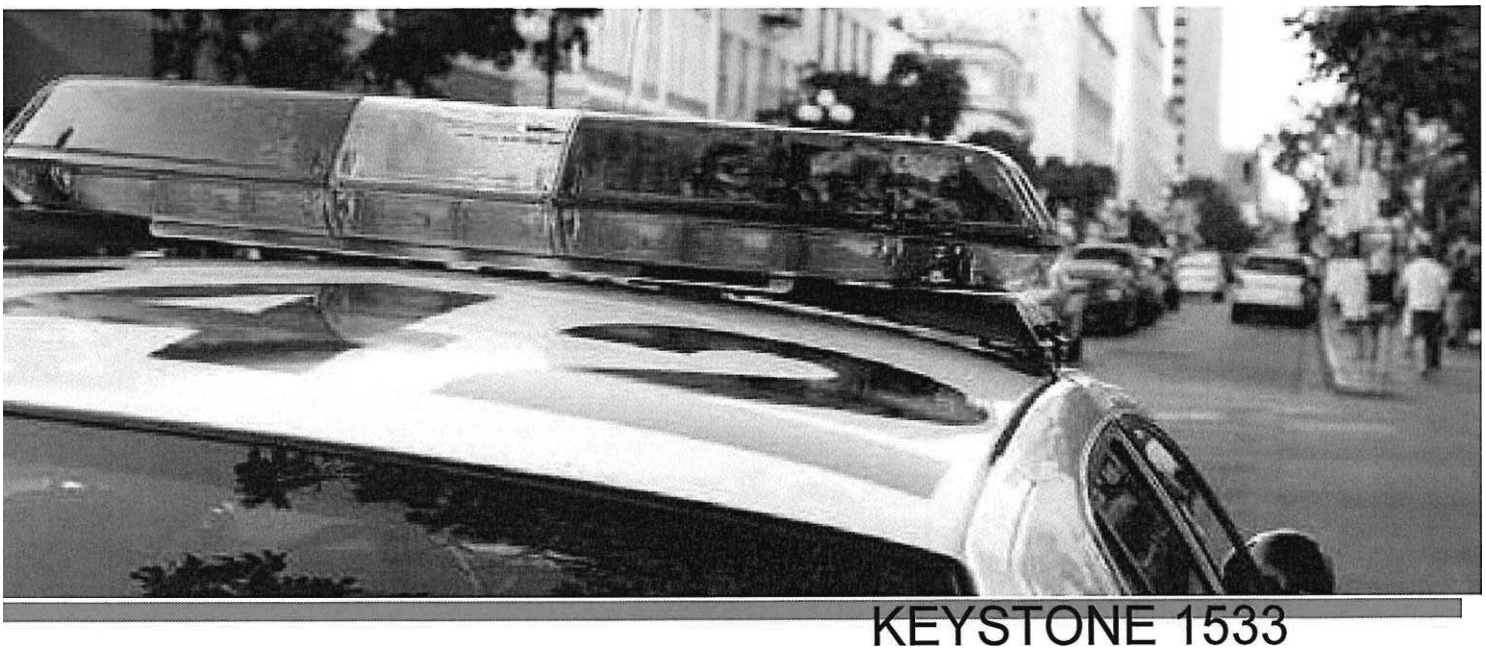
Safety in the Community

Safety is a core value at TransCanada. We make safety — for ourselves, each other, our contractors and for members of our communities — an integral part of the way we work.

TransCanada's operations extend across North America with established offices in various communities. Each region is fully staffed with qualified employees trained in pipeline safety and emergency response to ensure the safe and efficient operation of the facilities in the area.

We view the communities we operate in as emergency response partners. We will work collaboratively with emergency responders, extending invitations to participate in exercises and training.

In the event of an emergency, we work with emergency response officials in a Unified Command to ensure everyone is familiar with local operations and is ready to respond in the event of an incident. TransCanada does not expect volunteer or dedicated local emergency services to have the equipment or specific experience needed to respond to a leak or rupture with the exception of protecting the public by conducting evacuations if necessary and keeping them out of the impacted area.



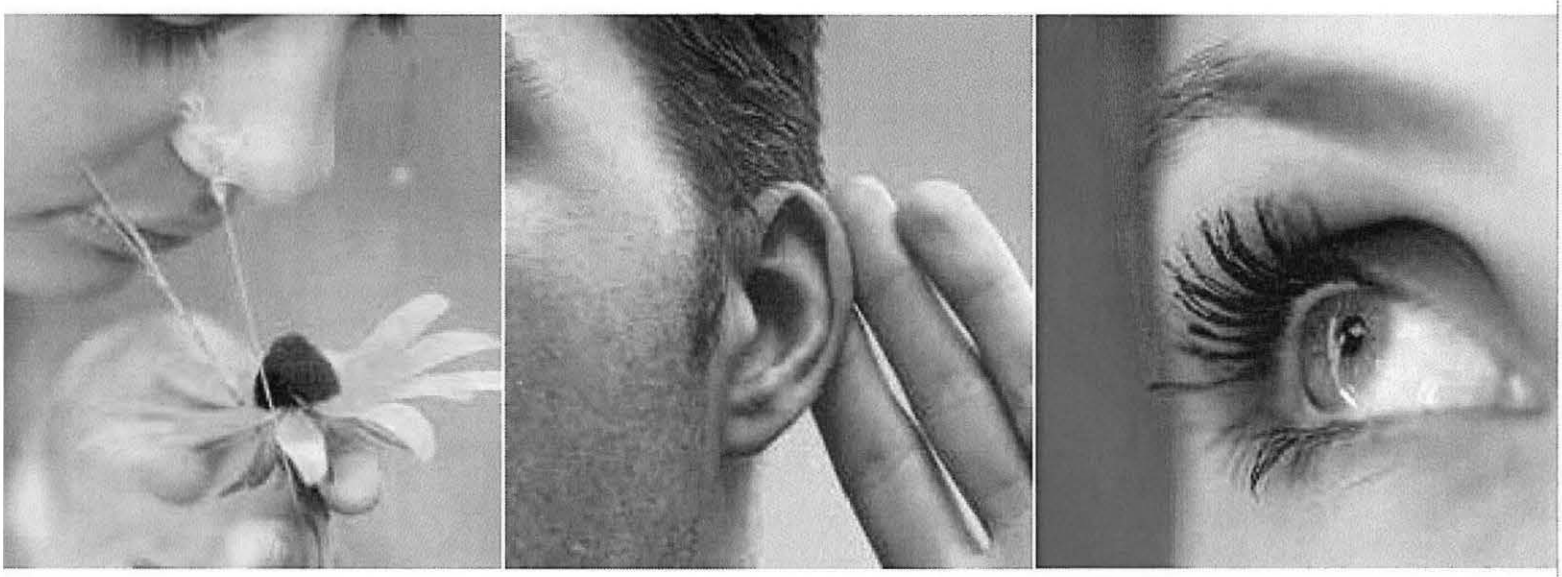
Actions for Emergency Services

Do

- Protect yourselves and the public.
- Contain and extinguish any secondary fires if safe to do so.
- Refer to 128 in the 2012 ERG for guidance on initial response including potential evacuation distances.
- Provide traffic and crowd control.
- Secure the site and establish a safe zone to ensure public safety. Keep a safe distance away.
- Evacuate unnecessary personnel.
- Monitor for I-EL, H S and benzene if possible.
- Eliminate all ignition sources if safe to do so.
- Provide first aid as needed.
- Allow TransCanada employees clear and quick access to the emergency site.

Do Not

- Attempt to operate any valves.
- Go near the spill until a hazard assessment has been conducted by TransCanada.
- Attempt to contain the oil or try to identify the oil.



Leak Detection

Although a pipeline leak is rare, it is important to know how to recognize the signs. Use your senses of smelling, seeing and hearing to detect a potential pipeline leak.

What you may smell

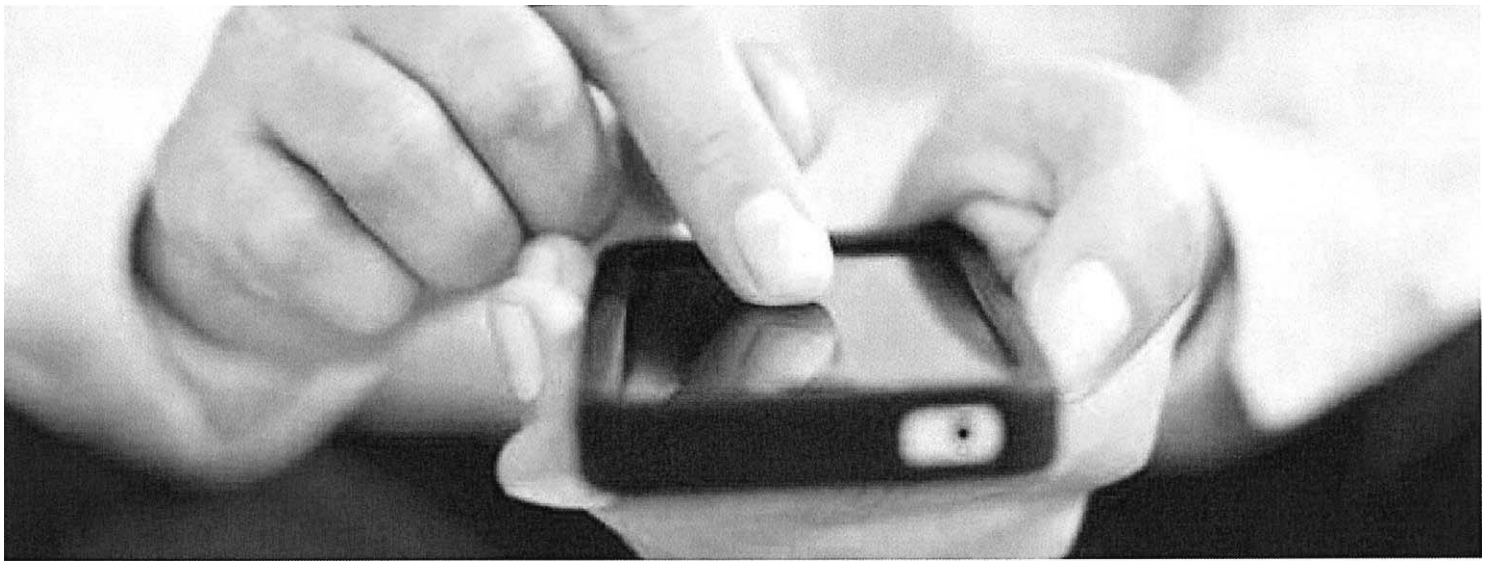
- Many petroleum products have a distinct smell. Crude oil can possess a rotten egg, gasoline, tar or "skunk-like" odor.

What you may hear

- A hissing or roaring sound.

What you may see

- Amber to black liquid.
- Rainbow sheen or black liquid on top of water.
- Discolored vegetation on or near a pipeline in an area that is usually green.
- Stained or melted snow/ice over pipeline areas.

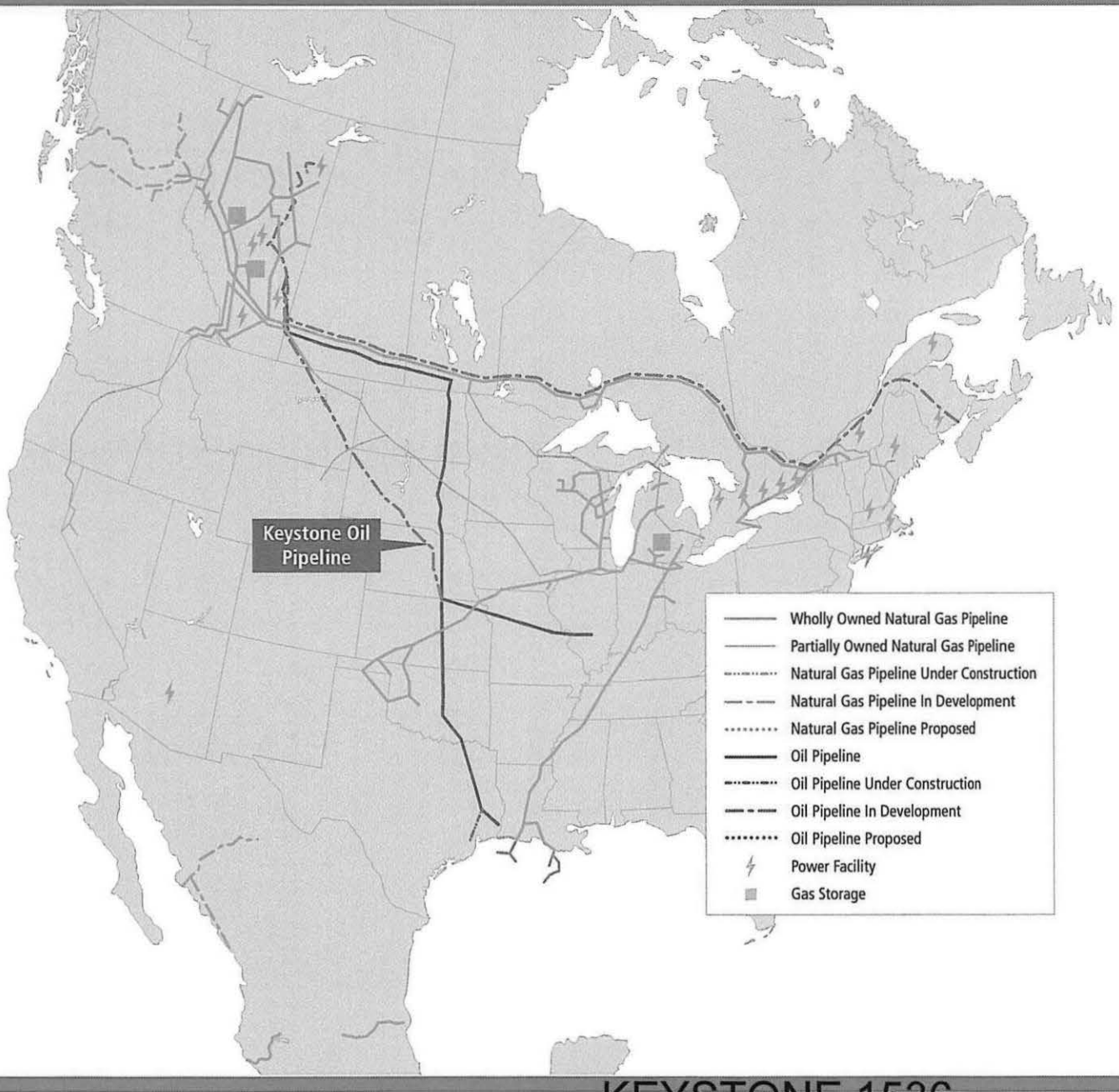


If You Suspect a Leak

If you witness any of the typical signs listed, or any other unusual sights, sounds or smells near a pipeline location, it is important that you follow these steps:

1. Leave the area immediately.
2. Move to a safe location, call '911'.
3. Call TransCanada's emergency number: 1.800.447.8066. This number can be found on all pipeline marker signs and facility gates.
4. Warn others to stay away.

North American Assets



KEYSTONE 1536

Important Contact Information

Call Before You Dig - It's Free

United States.....811

Emergencies1.800.447.8066

General Inquiries.....1 .866.717.7473

For Crossing or Encroachment Agreements.....us_crossings@transcanada.com

Actions for Emergency Services

Do

Protect yourselves and the public.

Contain and extinguish any secondary fires if safe to do so.

Refer to 128 in the 2012 ERG for guidance on initial response including potential evacuation distances.

Provide traffic and crowd control.

- Secure the site and establish a safe zone to ensure public safety. Keep a safe distance away.

Evacuate unnecessary personnel.

Monitor for I-EL, H2S and benzene if possible.

Eliminate all ignition sources if safe to do so.

Provide first aid as needed.

Allow TransCanada employees clear and quick access to the emergency site.

Do Not

Attempt to operate any valves.

- Go near the spill until a hazard assessment has been conducted by TransCanada.

Attempt to contain the oil or try to identify the oil.

TransCanada Emergency Number:

1-8001447-8066

10towwhat'sbelow.
Call beforeyoudig.

TransCanada
In business to deliver

KEYSTONE 1538

Subject: Re: Review quotes for accuracy please
> To: csmyers77@hotmail.com
> From: Vann.Bradley@epamail.epa.gov
> Date: Fri, 10 Jun 2011 15:51:45 -0500
>
> •Brad Vann, Environmental Scientist, EPA, Region 7
> “Its a lot easier to put chemicals in the ground than to take them out
> of the ground or groundwater”
> •“I would also be concerned if I had a drinking water well down-gradient
> from any petroleum or chemical source, and would want to know
> specifically what safety protocols are being employed to ensure that a
> release has not occurred, or if it did, it would not impact my water
> supply (i.e., leak preventers, inspection frequency, routine testing,
> installation of sentinel wells, leak response protocols, etc.).”
> "Petroleum is a mixture of many of organic compounds"
> •Benzene:
> Is a known human carcinogenic.
> •Benzene is a degradation chemical from crude oil. In pure form it is
> not soluble with water but solubility can occur with mixtures of other
> chemicals and at dilute concentrations. These dilute concentrations do
> mix with the water sufficiently to exceed safe drinking water limits.
> •“The safe drinking water limit (Maximum Contaminant Level or MCL) for
> Benzene in drinking water is 5 parts per billion”
> •Because this is such a minute amount, “you can’t smell, taste or see it
> (below odor and taste threshold). It requires laboratory analysis to
> detect at these concentrations. Therefore, it would be possible to
> drink dilute Benzene above the MCL and not know.
>
> Bradley Vann - RPM
> US EPA Region VII (SUPR/IANE)
> 901 N. 5th Street
> Kansas City, KS 66101
> phone: (913) 551-7611
> fax: (913) 551- 9611
> vann.bradley@epa.gov
>
>
>
>
> From: Cindy Myers <csmyers77@hotmail.com>
>
> To: Bradley Vann/R7/USEPA/US@EPA
>
> Date: 06/10/2011 02:56 PM
>
> Subject: Review quotes for accuracy please
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>
> •Brian Vann, EPA, Region 7
> “Lot easier to put in the ground than to take out of the ground”
> •“I would be concerned also if I had a well down-gradient from a
> chemical source”
> •Benzene:
> Known carcinogenic
> •A degree of benzene from crude oil is soluble in water, mix with the
> water.
> •“Allowable limit in drinking water is 5 parts per billion”
> •Because this is such a minute amount, “you can’t smell, taste or see
> it.” Analysis required to detect. Would be possible that you would
> drink and not know.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF TRANSCANADA KEYSTONE PIPELINE, LP FOR ORDER ACCEPTING CERTIFICATION OF PERMIT ISSUED IN DOCKET HP-09-001 TO CONSTRUCT THE KEYSTONE XL PIPELINE	Surrebuttal to Darren Kearney's rebuttal to Cindy Myers' testimony regarding Dr. Madden's socio-economic analysis HP14-001

I am responding to Darren Kearney's rebuttal to my direct testimony. My testimony stated:

> "testimonial analysis by Dr. Madden is woefully inadequate to meet SDCL 49-416-22, which requires the project must protect the health, safety and welfare of SD residents. He is not a medical doctor, but an economist."

Mr. Kearney states I misunderstood the purpose of Dr. Madden's testimony.

I understand that Dr. Madden is an economist and his testimony reflects a very brief socio-economic analysis of the project.

However, as written, the HP09-001 document, specifically Finding of Fact #107, implies that Dr. Madden's analysis from a socioeconomic standpoint was also meant to support the subpart of SDCL 49-41 B-22 which states:

"The facility will not substantially impair the health, safety or welfare of the inhabitants."

Finding of Fact #107 is included in Appendix C, South Dakota Final Decision and Order Tracking Table of Changes which was ordered by the PUC as part of the scope of discovery.

Finding of Fact #107 is listed under the heading "Socio-Economic Factors".

HP09-001, Finding of Fact #107, as directly copied from that document:

Socio-Economic Factors
107. Socio-economic evidence offered by both Keystone and Staff demonstrates that the welfare of the citizens of South Dakota will not be impaired by the Project. Staff expert Dr. Michael Madden conducted a socio-economic analysis of the Keystone Pipeline, and concluded that the positive economic benefits of the project were unambiguous, while most if not all of the social impacts were positive or neutral. S-2, Madden Assessment at 21. The Project, subject to compliance with the Special Permit and the Conditions herein, would not, from a socioeconomic standpoint: (i) pose a threat of serious injury to the socioeconomic conditions in the project area; (ii) substantially impair the health, safety, or welfare of the inhabitants in the project area; or(iii) unduly interfere with the orderly development of the region.

I agree with Mr. Kearney that Dr. Madden's testimony does not include information concerning how the project would impact the health, safety, or welfare of the inhabitants, but finding of fact #107, as written, concludes that Dr. Madden's testimony supports SDCL 49-41 B-22, including the subpart "The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area" and also the subpart "the facility will not substantially impair the health, safety or welfare of the inhabitants"

Respectfully submitted this 29th day of April, 2015

Cindy Myers
Individual Intervener HP14-001
PO Box 104
87925 468th Ave.
Stuart, NE 68780
csmyers77@hotmail.com
402-709-2920

A copy of this letter has been electronically sent to the following:

Ms. Patricia Van Gerpen
Executive Director
South Dakota Public Utilities Commission
500 E. Capitol Ave.
Pierre, SD 57501
patty.vangerpen@state.sd.us
(605) 773-3201 (605) 773-3201 - voice

Ms. Kristen Edwards
Staff Attorney
South Dakota Public Utilities Commission
500 E. Capitol Ave.
Pierre, SD 57501
Kristen.edwards@state.sd.us
(605) 773-3201 (605) 773-3201 - voice

Mr. Brian Rounds
Staff Analyst
South Dakota Public Utilities Commission
500 E. Capitol Ave.
Pierre, SD 57501
brian.rounds@state.sd.us
(605) 773-3201 (605) 773-3201- voice

Mr. Darren Kearney
Staff Analyst
South Dakota Public Utilities Commission
500 E. Capitol Ave.
Pierre, SD 57501
darren.kearney@state.sd.us
(605) 773-3201 (605) 773-3201 - voice

Mr. James E. Moore - Representing: TransCanada Keystone Pipeline, LP
Attorney
Woods, Fuller, Shultz and Smith P.C.
PO Box 5027
Sioux Falls, SD 57117
james.moore@woodsfuller.com

(605) 336-3890(605) 336-3890 - voice
(605) 339-3357 - fax

Mr. Bill G. Taylor - Representing: TransCanada Keystone Pipeline, LP
Attorney
Woods, Fuller, Shultz and Smith P.C.
PO Box 5027
Sioux Falls, SD 57117
bill.taylor@woodsfuller.com
(605) 336-3890(605) 336-3890 - voice
(605) 339-3357 - fax

Mr. Paul F. Seamans
27893 249th St.
Draper, SD 57531
jacknife@goldenwest.net
(605) 669-2777(605) 669-2777 - voice

Mr. John H. Harter
28125 307th Ave.
Winner, SD 57580
johnharter11@yahoo.com
(605) 842-0934(605) 842-0934 - voice

Ms. Elizabeth Lone Eagle
PO Box 160
Howes, SD 57748
bethcbest@gmail.com
(605) 538-4224(605) 538-4224 - voice

Mr. Tony Rogers
Rosebud Sioux Tribe - Tribal Utility Commission
153 S. Main St.
Mission, SD 57555
tuc@rosebudsiouxtribe-nsn.gov
(605) 856-2727(605) 856-2727 - voice

Ms. Viola Waln
PO Box 937
Rosebud, SD 57570
walnranch@goldenwest.net
(605) 747-2440(605) 747-2440 - voice

Ms. Jane Kleeb
Bold Nebraska
1010 N. Denver Ave.
Hastings, NE 68901
jane@boldnebraska.org
(402) 705-3622(402) 705-3622 - voice

Mr. Benjamin D. Gotschall
Bold Nebraska
6505 W. Davey Rd.
Raymond, NE 68428
ben@boldnebraska.org
(402) 783-0377(402) 783-0377 - voice

Mr. Byron T. Steskal & Ms. Diana L. Steskal
707 E. 2nd St.
Stuart NE 68780
prairierose@nntc.net
(402) 924-3186(402) 924-3186 - voice

Ms. Cindy Myers, R.N.
PO Box 104
Stuart, NE 68780
csmyers77@hotmail.com
(402) 709-2920(402) 709-2920 - voice

Mr. Arthur R. Tanderup
52343 857th Rd.
Neligh, NE 68756
atanderu@gmail.com
(402) 278-0942(402) 278-0942 - voice

Mr. Lewis GrassRope
PO Box 61
Lower Brule, SD 57548
wisestar8@msn.com
(605) 208-0606(605) 208-0606 - voice

Ms. Carolyn P. Smith
305 N. 3rd St.
Plainview, NE 68769
peachie_1234@yahoo.com
(402) 582-4708(402) 582-4708 - voice

Mr. Robert G. Allpress
46165 Badger Rd.
Naper, NE 68755
bobandnan2008@hotmail.com
(402) 832-5298 (402) 832-5298 - voice

Mr. Louis T. Genung
902 E. 7th St.
Hastings, NE 68901
tg64152@windstream.net
(402) 984-7548 (402) 984-7548 - voice

Mr. Peter Capossela, P.C. - Representing: Standing Rock Sioux Tribe
Attorney at Law
PO Box 10643
Eugene, OR 97440
pcapossela@nu-world.com
(541) 505-4883 (541) 505-4883 - voice

Ms. Nancy Hilding
6300 W. Elm
Black Hawk, SD 57718
nhilshat@rapidnet.com
(605) 787-6779 (605) 787-6779 - voice

Mr. Gary F. Dorr
27853 292nd
Winner, SD 57580
gfdorr@gmail.com
(605) 828-8391 (605) 828-8391 - voice

Mr. Bruce & Ms. RoxAnn Boettcher
Boettcher Organics
86061 Edgewater Ave.
Bassett, NE 68714
boettcherann@abbnebraska.com
(402) 244-5348 (402) 244-5348 - voice

Ms. Wrexie Lainson Bardaglio
9748 Arden Rd.
Trumansburg, NY 14886
wrexie.bardaglio@gmail.com
(607) 229-8819 (607) 229-8819 - voice

Mr. Cyril Scott
President
Rosebud Sioux Tribe
PO Box 430
Rosebud, SD 57570
cscott@gwtc.net
ejantoine@hotmail.com
(605) 747-2381(605) 747-2381 - voice

Mr. Eric Antoine
Attorney
Rosebud Sioux Tribe
PO Box 430
Rosebud, SD 57570
ejantoine@hotmail.com
(605)747-2381(605)747-2381 - voice

Ms. Paula Antoine
Sicangu Oyate Land Office Coordinator
Rosebud Sioux Tribe
PO Box 658
Rosebud, SD 57570
wopila@gwtc.net
paula.antoine@rosebudsiouxtribe-nsn.gov
(605) 747-4225(605) 747-4225 - voice

Mr. Harold C. Frazier
Chairman
Cheyenne River Sioux Tribe
PO Box 590
Eagle Butte, SD 57625
haroldcfrazier@yahoo.com
(605) 964-4155(605) 964-4155 - voice

Mr. Cody Jones
21648 US HWY 14/63
Midland, SD 57552
(605) 843-2827(605) 843-2827 - voice

Ms. Amy Schaffer
PO Box 114
Louisville, NE 68037
amyannschaffer@gmail.com

(402) 234-2590(402) 234-2590

Mr. Jerry Jones
22584 US HWY 14
Midland SD 57552
(605) 843-2264(605) 843-2264

Ms. Debbie J. Trapp
24952 US HWY 14
Midland, SD 57552
mtdt@goldenwest.net

Ms. Gena M. Parkhurst
2825 Minnewasta Place
Rapid City, SD 57702
gmp66@hotmail.com
(605) 716-5147(605) 716-5147 - voice

Ms. Joye Braun
PO Box 484
Eagle Butte, SD 57625
jmbraun57625@gmail.com
(605) 964-3813(605) 964-3813

Mr. Robert Flying Hawk
Chairman
Yankton Sioux Tribe
PO Box 1153
Wagner, SD 57380
Robertflyinghawk@gmail.com
(605) 384-3804(605) 384-3804 - voice

Ms. Thomasina Real Bird - Representing - Yankton Sioux Tribe
Attorney
Fredericks Peebles & Morgan LLP
1900 Plaza Dr.
Louisville, CO 80027
trealbird@ndnlaw.com
(303) 673-9600(303) 673-9600 - voice
(303) 673-9155 - fax

Ms. Chastity Jewett
1321 Woodridge Dr.
Rapid City, SD 57701
chasjewett@gmail.com
(605) 431-3594(605) 431-3594 - voice

Mr. Duncan Meisel
350.org
20 Jay St. #1010
Brooklyn, NY 11201
duncan@350.org
(518) 635-0350(518) 635-0350 - voice

Ms. Sabrina King
Dakota Rural Action
518 Sixth Street, #6
Rapid City, SD 57701
sabrina@dakotarural.org
(605) 716-2200(605) 716-2200 - voice

Mr. Frank James
Dakota Rural Action
PO Box 549
Brookings, SD 57006
fejames@dakotarural.org
(605) 697-5204(605) 697-5204 - voice
(605) 697-6230 - fax

Mr. Bruce Ellison
Attorney
Dakota Rural Action
518 Sixth St. #6
Rapid City, SD 57701
belli4law@aol.com
(605) 716-2200(605) 716-2200 - voice
(605) 348-1117(605) 348-1117 - voice

Mr. Tom BK Goldtooth
Indigenous Environmental Network (IEN)
PO Box 485
Bemidji, MN 56619
ien@igc.org
(218) 760-0442(218) 760-0442 - voice

Mr. Dallas Goldtooth
38371 Res. HWY 1
Morton, MN 56270
goldtoothdallas@gmail.com
(507) 412-7609(507) 412-7609

Mr. Ronald Fees
17401 Fox Ridge Rd.
Opal, SD 57758
(605) 748-2422(605) 748-2422 - voice

Ms. Bonny Kilmurry
47798 888 Rd.
Atkinson, NE 68713
bjkilmurry@gmail.com
(402) 925-5538(402) 925-5538 - voice

Mr. Robert P. Gough
Secretary
Intertribal Council on Utility Policy
PO Box 25
Rosebud, SD 57570
bobgough@intertribalCOUP.org
(605) 441-8316(605) 441-8316 - voice

Mr. Terry & Cheryl Frisch
47591 875th Rd.
Atkinson, NE 68713
tcfrisch@q.com
(402) 925-2656(402) 925-2656 - voice

Ms. Tracey Zephier - Representing: Cheyenne River Sioux Tribe
Fredericks Peebles & Morgan LLP
Ste. 104
910 5th St.
Rapid City, SD 57701
tzephier@ndnlaw.com
(605) 791-1515(605) 791-1515 - voice

Mr. Robin S. Martinez - Representing: Dakota Rural Action
Martinez Madrigal & Machicao, LLC
616 W. 26th St.

Kansas City, MO 64108
robin.martinez@martinezlaw.net

Ms. Mary Turgeon Wynne, Esq.
Rosebud Sioux Tribe - Tribal Utility Commission
153 S. Main St
Mission, SD 57555
tuc@rosebudsiouxtribe-nsn.gov
(605) 856-2727(605) 856-2727 - voice

Mr. Matthew L. Rappold - Representing: Rosebud Sioux Tribe
Rappold Law Office
816 Sixth St.
PO Box 873
Rapid City, SD 57709
Matt.rappold01@gmail.com
(605) 828-1680(605) 828-1680 - voice

Ms. April D. McCart - Representing: Dakota Rural Action
Certified Paralegal
Martinez Madrigal & Machicao, LLC
616 W. 26th St.
Kansas City, MO 64108
april.mccart@martinezlaw.net
(816) 415-9503(816) 415-9503 - voice

Mr. Paul C. Blackburn - Representing: Bold Nebraska
Attorney
4145 20th Ave. South
Minneapolis, MN 55407
paul@paulblackburn.net
(612) 599-5568(612) 599-5568 - voice

Ms. Kimberly E. Craven - Representing: Indigenous Environmental Network (IEN)
Attorney
3560 Catalpa Way
Boulder, CO 80304
kimecraven@gmail.com
(303) 494-1974(303) 494-1974 - voice

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT	:	HP 14-001 TRANSCANADA KEYSTONE PIPELINE, LP'S SUPPLEMENTAL RESPONSES TO CINDY MYERS' FIRST INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o

Applicant TransCanada makes the following supplemental responses to interrogatories pursuant to SDCL § 15-6-33, and responses to requests for production of documents pursuant to SDCL § 15-6-34(a). These supplemental responses are made within the scope of SDCL 15-6-26(e) and shall not be deemed continuing nor be supplemented except as required by that rule. Applicant objects to definitions and directions in answering the discovery requests to the extent that such definitions and directions deviate from the South Dakota Rules of Civil Procedure.

GENERAL OBJECTION

Keystone objects to the instructions and definitions contained in Cindy Myers' First Set of Interrogatories and Requests for Production of Documents to the extent that they are inconsistent with the provisions of SDCL Ch. 15-6. *See* ARSD 20:10:01:01.02.

Keystone's answers are based on the requirements of SDCL §§ 15-6-26, 15-6-33, 15-6-34, and 15-6-36.

INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

1. Please identify the person or persons providing each answer to an Interrogatory or portion thereof, giving the full name, address of present residence, date of birth, business address and occupation.

ANSWER: Given the extremely broad scope volume of more than 800 discovery requests received by Keystone in this docket, a range of personnel were involved in answering the interrogatories. Keystone will designate the following witnesses with overall responsibility for the responsive information as related to the Conditions and proposed changes to the Findings of Fact, which are identified in Appendix C to Keystone's Certification Petition: Corey Goulet, President, Keystone Projects, 450 1st Street S.W., Calgary, AB Canada T2P 5H1; Steve Marr, Manager, Keystone Pipelines & KXL, TransCanada Corporation, Bank of America Center, 700 Louisiana, Suite 700, Houston, TX 77002; Meera Kothari, P. Eng., 450 1st Street, S.W., Calgary, AB Canada T2P 5H1; David Diakow, Vice President, Commercial, Liquids Pipeline, 450 1st Street S.W., Calgary, AB Canada T2P 5H1; Jon Schmidt, Vice President, Environmental & Regulatory, exp Energy Services, Inc., 1300 Metropolitan Boulevard, Suite 200,

Tallahassee, FL 32308; Heidi Tillquist, Senior Associate, Stantec Consulting Ltd., 2950 E. Harmony Rd., Suite 290, Fort Collins, CO 80528.

In addition to the witnesses previously identified, Keystone may offer rebuttal testimony from Danielle Dracy regarding emergency response; Lou Thompson regarding tribal engagement; Steve Klekar regarding tax issues; and Doug Robertson regarding SCADA and leak detection. Resumes for these possible rebuttal witnesses are marked as Keystone 1930-1934.

Dated this 10 day of March, 2015.

TRANSCANADA KEYSTONE PIPELINE, LP
by its agent, TC Oil Pipeline Operations, Inc.

By _____
Joseph Brown
Director, Authorized Signatory

Subscribed and sworn to before me

this 10 day of March, 2015.

_____
John W. Love, Lawyer
Notary Public - Canada

CERTIFICATE OF SERVICE

I hereby certify that on the 10th day of March, 2015, I sent by e-mail transmission, a true and correct copy of Keystone's Supplemental Responses to Cindy Myers' First Interrogatories and Request for Production of Documents, to the following:

Cindy Myers, R.N.
PO Box 104
Stuart, NE 68780
csmyers77@hotmail.com

One of the attorneys for TransCanada

Carol Moyer, Public Water Contact for Colome, SD
Colome City Finance Officer

Information and quotes from phone and email conversations with Carol on 05-13-15
Permission granted by Carol to use this information in my testimony.

- The first route crossed through the 10 acres where Colome's two wells are located.
- The route was moved approximately 200 yards from the well acreage.
- "I do have concerns"
- "I don't think safety was a concern at all"
- "Moved it just far enough to get an easement"

Kevin Schlosser, Emergency Management Coordinator, Avera McKennan (Assists Avera St. Mary's in Pierre, SD)

Quotes/thoughts from Kevin per phone visit and email on 04-01-15 and 04-02-15
Permission granted by Kevin to use this information in my testimony.

- **"What are we dealing with? Give me an SDS, to know the chemicals involved."**
- **"Time-frame, how fast is it moving, when will it reach water intakes"**
- **"Would want to know how to slow it down, contain it. I would like to ask industry experts how soon will it reach us. I have not seen any of that."**
- **"If they would provide SDS, it would be kept in the Emergency Department to have readily available.**
- **"Have not been given any information specific to tar sands oil product."**
- **"I would rely on the County Emergency Manager, the Sheriff's Dept., and also would rely on a SDS for treatments."**
- **Not aware of training to instruct health facilities how to respond to tar sands emergencies/disasters.**
- **For decontamination, would rely on the Safety Data Sheet for review and instructions.**
- **"I've checked w/ the person that does Emergency Preparedness for Avera St. Mary's and they have not seen SDS to this point" (email message on 04-02-15)**

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY TRANSCANADA KEYSTONE PIPELINE, LP FOR A PERMIT UNDER THE SOUTH DAKOTA ENERGY CONVERSION AND TRANSMISSION FACILITIES ACT TO CONSTRUCT THE KEYSTONE XL PROJECT	))))))	**AMENDED FINAL DECISION AND ORDER; NOTICE OF ENTRY** **HP09-001**

PROCEDURAL HISTORY

On March 12, 2009, TransCanada Keystone Pipeline, LP ("Applicant" or "Keystone") filed an application with the South Dakota Public Utilities Commission ("Commission") for a permit as required by SDCL Chapter 49-41B to construct the South Dakota portion of the Keystone XL Pipeline ("Project")[1]. The originally filed application described the Project as proposed to be an approximately 1,702 mile pipeline for transporting crude oil from Alberta, Canada, to the greater Houston area in Texas, with approximately 1,375 miles to be located in the United States and 313 miles located in South Dakota.

On April 6, 2009, the Commission issued its Notice of Application; Order for and Notice of Public Input Hearings; and Notice of Opportunity to Apply for Party Status. The notice provided that pursuant to SDCL 49-41 B-17 and ARSD 20:10:22:40, each municipality, county, and governmental agency in the area where the facility is proposed to be sited; any nonprofit organization, formed in whole or in part to promote conservation or natural beauty, to protect the environment, personal health or other biological values, to preserve historical sites, to promote consumer interests, to represent commercial and industrial groups, or to promote the orderly development of the area in which the facility is to be sited; or any interested person, may be granted party status in this proceeding by making written application to the Commission on or before May 11, 2009.

Pursuant to SDCL 49-41B-15 and 49-41B-16, and its Notice of Application; Order for and Notice of Public Hearings and Notice of Opportunity to Apply for Party Status, the Commission held public hearings on Keystone's application as follows: Monday, April 27, 2009, 12:00 noon CDT at Winner Community Playhouse, 7th and Leahy Boulevard, Winner, SD, at which 26 persons presented comments or questions; Monday, April 27, 2009, 7:00 p.m. MDT at Fine Arts School, 330 Scottie Avenue, Philip, SD, at which 17 persons presented comments or questions; and Tuesday, April 28, 2009, 6:00 p.m. MDT at Harding County Recreation Center, 204 Hodge Street, Buffalo, SD, at which 16 persons presented comments or questions. The purpose of the public input hearings was to hear public comment regarding Keystone's application. At the public input hearings, Keystone presented a brief description of the project, following which interested persons appeared and presented their views, comments and questions regarding the application.

On April 29, 2009, Mary Jasper (Jasper) filed an Application for Party Status. On May 4, 2009, Paul F. Seamans (Seamans) filed an Application for Party Status. On May 5, 2009, Darrell Iversen (D. Iversen) filed an Application for Party Status. On May 8, 2009, the City of Colome (Colome) and Glen Iversen (G. Iversen) filed Applications for Party Status. On May 11, 2009, Jacqueline Limpert (Limpert), John H. Harter (Harter), Zona Vig (Vig), Tripp County Water User District (TCWUD), Dakota Rural Action (DRA) and David Niemi (David Niemi) filed Applications for

[1]The Commission's Orders in the case and all other filings and documents in the record are available on the Commission's web page for Docket HP09-001 at: http://puc.sd.gov/dockets/hydrocarbonpipeline/2009/hp09-001.aspx

Party Status. On May 11, 2009, the Commission received a Motion for Extension of Time to File Application for Party Status from DRA requesting that the intervention deadline be extended to June 10, 2009. On May 12, 2009, Debra Niemi (Debra Niemi) and Lon Lyman (Lyman) filed Applications for Party Status. On May 15, 2009, the Commission received a Response to Motion to Extend Time from DRA and a Motion to Establish a Procedural Schedule from the Commission's Staff ("Staff").

At its regularly scheduled meeting of May 19, 2009, the Commission voted unanimously to grant party status to Jasper, Seamans, D. Iversen, Colome, G. Iversen, Limpert, Harter, Vig, TCWUD, DRA, David Niemi, Debra Niemi and Lyman. The Commission also voted to deny the Motion for Extension of Time to File Application for Party Status, and in the alternative, the Commission extended the intervention deadline to May 31, 2009. On May 29, 2009, Ruth M. Iversen (R. Iversen) and Martin R. Lueck (Lueck) filed Applications for Party Status. At its regularly scheduled meeting of June 9, 2009, the Commission voted unanimously to grant the Motion to Establish a Procedural Schedule and granted intervention to R. Iversen and Lueck.

On August 26, 2009, the Commission received a revised application from Keystone. On September 3, 2009, the Commission received a Motion for Extension of Time to Submit Testimony from DRA. At its regularly scheduled meeting of September 8, 2009, the Commission voted unanimously to grant the Motion for Extension of Time to Submit Testimony to extend DRA's time for filing and serving testimony until September 22, 2009.

On September 18, 2009, Keystone filed Applicant's Response to Dakota Rural Action's Request for Further Discovery. On September 21, 2009, DRA filed a Motion to Compel Responses and Production of Documents Addressed to TransCanada Keystone Pipeline, LP Propounded by Dakota Rural Action. At an ad hoc meeting on September 23, 2009, the Commission considered DRA's Motion to Compel and on October 2, 2009, issued its Order Granting in Part and Denying in Part Motion to Compel Discovery. By letter filed on September 29, 2009, Chairman Johnson requested reconsideration of the Commission's action with respect to DRA's Request 6 regarding Keystone documents pertaining to development of its Emergency Response Plan for the Project. At its regularly scheduled meeting on October 6, 2009, the Commission voted two to one, with Commissioner Hanson dissenting, to require Keystone to produce to DRA via email the References for the Preparation of Emergency Response Manuals before the close of business on October 6, 2009, that DRA communicate which documents on the list it wished Keystone to produce on or before the close of business on October 8, 2009, and that Keystone produce such documents to DRA on or before October 15, 2009.

On October 2, 2009, Staff filed a letter requesting the Commission to render a decision as to whether the hearing would proceed as scheduled commencing on November 2, 2009. Staff's letter stated that rescheduling the hearing would result in significant scheduling complications for Staff's expert witnesses whose scheduling and travel arrangements had been made months earlier based on the Commission's Order Setting Procedural Schedule issued on June 30, 2009. At its regular meeting on October 6, 2009, the Commission considered Staff's request. At the meeting, all parties agreed that the hearing could proceed on the scheduled dates. DRA requested that its date for submission of pre-filed testimony be extended from October 14, 2009, until October 22, if possible, or at least until October 20, 2009. After discussion, the parties agreed on an extension for DRA's pre-filed testimony until October 20, 2009, with Applicant's rebuttal to be filed by October 27, 2009. The Commission voted unanimously to approve such dates and issued its Order Setting Amended Procedural Schedule on October 8, 2009.

On October 15, 2009, the Commission issued its Order for and Notice of Hearing setting the matter for hearing on November 2-6, 2009, and its Order for and Notice of Public Hearing for an

additional informal public input hearing to be held in Pierre on November 3, 2009, commencing at 7:00 p.m. CST. On October 19, 2009, DRA requested that the time for commencement of the public hearing be changed from 7:00 p.m. CST to 6:00 p.m. CST to better accommodate the schedules of interested persons. On October 21, 2009, the Commission issued an Amended Order for and Notice of Public Hearing amending the start time for the public hearing to 6:00 p.m. CST.

On October 19, 2009, Keystone filed a second revised application ("Application") containing minor additions and amendments reflecting refinements to the route and facility locations and the most recent environmental and other planning evaluations.

In accordance with the scheduling and procedural orders in this case, Applicant, Staff and Intervenors David and Debra Niemi filed pre-filed testimony. The hearing was held as scheduled on November 2-4, 2009, at which Applicant, DRA and Staff appeared and participated. The informal hearing was held as scheduled on the evening of November 3, 2009, at which 23 persons presented comments and/or questions. A combined total of 326 persons attended the public input hearings in Winner, Phillip, Buffalo and Pierre. As of February 26, 2009, the Commission had received 252 written comments regarding this matter from the public.

On December 31, 2009, the Commission issued its Amended Order Establishing Briefing Schedule setting the following briefing schedule: (i) initial briefs and proposed findings of fact and conclusions of law from all parties wishing to submit them due by January 20, 2010; and (ii) reply briefs and objections and revisions to proposed findings of fact and conclusions of law due from all parties wishing to submit them on or before February 2, 2010.

On January 13, 2009, Intervenor David Niemi filed a letter with the Commission requesting and recommending a series of conditions to be included in the order approving the permit, if granted. On January 20, 2010, initial briefs were filed by the Applicant and Staff. On January 20, 2010, Applicant also filed and served proposed findings of fact and conclusions of law. On January 21, 2010, DRA filed an initial brief and Motion to Accept Late-Filed Brief. On January 21 and 26, 2010, respectively, Keystone and Staff filed letters of no objection to acceptance of DRA's late-filed initial brief. On February 2, 2010, reply briefs were filed and served by Applicant, DRA and Staff, and Keystone filed Applicant's Response to David Niemi's Letter filed on January 13, 2010.

At an ad hoc meeting on February, 18, 2010, after separately considering each of a set of draft conditions prepared by Commission Counsel from inputs from the individual Commissioners and a number of Commissioner motions to amend the draft conditions, the Commission voted unanimously to approve conditions to which a permit to construct the Project would be subject, if granted, and to grant a permit to Keystone to construct the Project, subject to the approved conditions.

On April 14, 2010, Keystone filed Applicant's Motion for Limited Reconsideration of Certain Permit Conditions ("Motion"). On April 19, 2010, intervenors David Niemi and Seamans filed responses to the Motion. On April 19, 2010, Peter Larson ("Larson") filed two comments responsive to the Motion. On April 27, 2010, Keystone filed Applicant's Reply Brief In Support of Motion for Limited Reconsideration responding to the responses and comments filed by Niemi, Seamans and Larson. On April 28, 2010, Staff filed a response to the Motion. On April 29, 2010, DRA filed the Answer of Dakota Rural Action in Opposition to Applicant's Motion for Limited Reconsideration of Certain Permit Conditions.

At its regularly scheduled meeting on May 4, 2010, the Commission considered the Motion and the responses and comments filed by the parties and Larson. Applicant, Staff, intervenor John

H. Harter, DRA and Larson appeared and participated in the hearing on the Motion. After an extensive discussion among the Commission and participants, the Commission made rulings on the specific requests in the Motion and voted to grant the Motion in part and deny in part and amend certain of the Conditions as set forth in the Commission's Order Granting in Part Motion to Reconsider and Amending Certain Conditions In Final Decision And Order, which was issued by the Commission on June 29, 2010.

Having considered the evidence of record, applicable law and the arguments of the parties, the Commission makes the following Findings of Fact, Conclusions of Law and Decision:

FINDINGS OF FACT

Parties

1. The permit applicant is TransCanada Keystone Pipeline, LP, a limited partnership, organized under the laws of the State of Delaware, and owned by affiliates of TransCanada Corporation ("TransCanada"), a Canadian public company organized under the laws of Canada. Ex TC-1, 1.5, p. 4.

2. On May 19, 2009, the Commission unanimously voted to grant party status to all persons that had requested party status prior to the commencement of the meeting. On June 9, 2009, the Commission unanimously voted to grant party status to all persons that had requested party status after the commencement of the meeting on May 19, 2009, through the intervention deadline of May 31, 2009. Fifteen persons intervened, including: Mary Jasper, Paul F. Seamans, Darrell Iversen, the City of Colome, Glen Iversen, Jacqueline Limpert, John H. Harter, Zona Vig, Tripp County Water User District ("TCWUD"), Dakota Rural Action, David Niemi, Debra Niemi, Ruth M. Iversen, Martin R. Lueck, and Lon Lyman. Minutes of May 19, 2009, and June 9, 2009, Commission Meetings; Applications for Party Status.

3. The Staff also participated in the case as a full party.

Procedural Findings

4. The application was signed on behalf of the Applicant on February 26, 2009, in Calgary, Alberta, Canada, and was filed with the Commission on March 12, 2009. Ex TC -1, 9.0, p. 116.

5. The Commission issued the following notices and orders in the case as described in greater detail in the Procedural History above, which is hereby incorporated by reference in these Findings of Fact and Conclusions of Law:

- Order of Assessment of Filing Fee
- Notice of Application; Order for and Notice of Public Input Hearings; and Notice of Opportunity to Apply for Party Status
- Order Granting Party Status; Order Denying Motion for Extension of Time to File Application for Party Status; Order Extending Intervention Deadline
- Order Granting Motion to Establish Procedural Schedule and Order Granting Party Status
- Order Setting Procedural Schedule
- Order Granting Motion for Extension of Time to Submit Testimony

- Order Granting in Part and Denying in Part Motion to Compel Discovery
- Order Amending Order Granting in Part and Denying in Part Motion to Compel Discovery
- Order Setting Amended Procedural Schedule
- Order for and Notice of Hearing
- Order for and Notice of Public Hearing
- Amended Order for and Notice of Public Hearing
- Order Establishing Briefing Schedule
- Amended Order Establishing Briefing Schedule
- Order Granting in Part Motion to Reconsider and Amending Certain Conditions In Final Decision And Order

6. Pursuant to SDCL 49-41B-15 and 49-41B-16 and its Notice of Application; Order for and Notice of Public Hearings; and Notice of Opportunity to Apply for Party Status, the Commission held public hearings on Keystone's application at the following times and places (see Public Hearing Transcripts):

- Monday, April 27, 2009, 12:00 noon CDT at Winner Community Playhouse, 7th and Leahy Boulevard, Winner, SD
- Monday, April 27, 2009, 7:00 p.m. MDT at Fine Arts School, 330 Scottie Avenue, Philip, SD
- Tuesday, April 28, 2009, 6:00 p.m. MDT at Harding County Recreation Center, 204 Hodge Street, Buffalo, SD.

7. The purpose of the public hearings was to afford an opportunity for interested persons to present their views and comments to the Commission concerning the Application. At the hearings, Keystone presented a brief description of the project after which interested persons presented their views, comments and questions regarding the application. Public Hearing Transcripts.

8. The following testimony was prefiled in advance of the formal evidentiary hearing held November 2, 3 and 4, 2009, in Room 414, State Capitol, Pierre, South Dakota:

A. Applicant's March 12, 2009, Direct Testimony.
- Robert Jones
- John Phillips
- Richard Gale
- Jon Schmidt
- Meera Kothari
- John Hayes
- Donald Scott
- Heidi Tillquist
- Tom Oster

B. Supplemental Direct Testimony of August 31, 2009.
- John Phillips

C. Intervenors' Direct Testimony of September 11, 2009.
- David Niemi
- Debra Niemi

D. Staff's September 25, 2009, Direct Testimony.

- Kim McIntosh
- Brian Walsh
- Derric Iles
- Tom Kirschenmann
- Paige Hoskinson Olson
- Michael Kenyon
- Ross Hargove
- Patrick Robblee
- James Arndt
- William Walsh
- Jenny Hudson
- David Schramm
- William Mampre
- Michael K. Madden
- Tim Binder

E. Applicant's Updated Direct and Rebuttal Testimony.

- Robert Jones Updated Direct (10/23/09)
- Jon Schmidt Updated Direct and Rebuttal (10/19/09)
- Meera Kothari Updated Direct and Rebuttal (10/19/09)
- Donald M. Scott Updated Direct (10/19/09)
- John W. Hayes Updated Direct (10/19/09)
- Heidi Tillquist Updated Direct (10/20/09)
- Steve Hicks Direct and Rebuttal (10/19/09)

F. Staff's Supplemental Testimony of October 29, 2009.

- William Walsh
- William Mampre
- Ross Hargrove

9. As provided for in the Commission's October 21, 2009, Amended Order for and Notice of Public Hearing, the Commission held a public input hearing in Room 414 of the State Capitol beginning at 6:00 p.m. on November 3, 2009, at which 23 members of the public presented comments and/or questions. Transcript of November 3, 2009 Public Input Hearing.

Applicable Statutes and Regulations

10. The following South Dakota statutes are applicable: SDCL 49-41B-1 through 49-41B-2.1, 49-41B-4, 49-41B-11 through 49-41B-19, 49-41B-21, 49-41B-22, 49-41B-24, 49-41B-26 through 49-41B-38 and applicable provisions of SDCL Chs. 1-26 and 15-6.

11. The following South Dakota administrative rules are applicable: ARSD Chapter 20:10:01, ARSD 20:10:22:01 through ARSD 20:10:22:25 and ARSD 20:10:22:36 through ARSD 20:10:22:40.

12. Pursuant to SDCL 49-41B-22, the Applicant for a facility construction permit has the burden of proof to establish that:

(1) The proposed facility will comply with all applicable laws and rules;

(2) The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area;
(3) The facility will not substantially impair the health, safety or welfare of the inhabitants; and
(4) The facility will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government.

The Project

13. The Project will be owned, managed and operated by the Applicant, TransCanada Keystone Pipeline, LP. Ex TC-1, 1.5 and 1.7, p. 4.

14. The purpose of the Project is to transport incremental crude oil production from the Western Canadian Sedimentary Basin ("WCSB") to meet growing demand by refineries and markets in the United States ("U.S."). This supply will serve to replace U.S. reliance on less stable and less reliable sources of offshore crude oil. Ex TC-1, 1.1, p. 1; Ex TC-1, 3.0 p. 23; Ex TC-1, 3.4 p. 24.

15. The Project will consist of three segments: the Steele City Segment, the Gulf Coast Segment, and the Houston Lateral. From north to south, the Steele City Segment extends from Hardisty, Alberta, Canada, southeast to Steele City, Nebraska. The Gulf Coast Segment extends from Cushing, Oklahoma south to Nederland, in Jefferson County, Texas. The Houston Lateral extends from the Gulf Coast Segment in Liberty County, Texas southwest to Moore Junction, Harris County, Texas. It will interconnect with the northern and southern termini of the previously approved 298-mile-long, 36-inch-diameter Keystone Cushing Extension segment of the Keystone Pipeline Project. Ex TC-1, 1.2, p. 1. Initially, the pipeline would have a nominal capacity to transport 700,000 barrels per day ("bpd"). Keystone could add additional pumping capacity to expand the nominal capacity to 900,000 bpd. Ex TC-1, 2.1.2, p. 8.

16. The Project is an approximately 1,707 mile pipeline with about 1,380, miles in the United States. The South Dakota portion of the pipeline will be approximately 314 miles in length and will extend from the Montana border in Harding County to the Nebraska border in Tripp County. The Project is proposed to cross the South Dakota counties of Harding, Butte, Perkins, Meade, Pennington, Haakon, Jones, Lyman and Tripp. Ex TC-1, 1.2 and 2.1.1, pp. 1 and 8. Detailed route maps are presented in Ex TC-1, Exhibits A and C, as updated in Ex TC-14.

17. Construction of the Project is proposed to commence in May of 2011 and be completed in 2012. Construction in South Dakota will be conducted in five spreads, generally proceeding in a north to south direction. The Applicant expects to place the Project in service in 2012. This in-service date is consistent with the requirements of the Applicant's shippers who have made the contractual commitments that underpin the viability and need for the project. Ex TC-1, 1.4, pp. 1 and 4; TR 26.

18. The pipeline in South Dakota will extend from milepost 282.5 to milepost 597, approximately 314 miles. The pipeline will have a 36-inch nominal diameter and be constructed using API 5L X70 or X80 high-strength steel. An external fusion bonded epoxy ("FBE") coating will be applied to the pipeline and all buried facilities to protect against corrosion. Cathodic protection will be provided by impressed current. The pipeline will have batching capabilities and will be able to transport products ranging from light crude oil to heavy crude oil. Ex TC-1, 2.2, 2.2.1, 6.5.2, pp. 8-9, 97-98; Ex TC-8, ¶ 26.

19. The pipeline will operate at a maximum operating pressure of 1,440 psig. For location specific low elevation segments close to the discharge of pump stations, the maximum operating pressure will be 1,600 psig. Pipe associated with these segments of 1,600 psig MOP are excluded from the Special Permit application and will have a design factor of 0.72 and pipe wall thickness of 0.572 inch (X-70) or 0.500 inch (X-80). All other segments in South Dakota will have a MOP of 1,440 psig. Ex TC-1, 2.2.1, p. 9.

20. The Project will have seven pump stations in South Dakota, located in Harding (2), Meade, Haakon, Jones and Tripp (2) Counties. TC-1, 2.2.2, p. 10. The pump stations will be electrically driven. Power lines required for providing power to pump stations will be permitted and constructed by local power providers, not by Keystone. Initially, three pumps will be installed at each station to meet the nominal design flow rate of 700,000 bpd. If future demand warrants, pumps may be added to the proposed pump stations for a total of up to five pumps per station, increasing nominal throughput to 900,000 bpd. No additional pump stations will be required to be constructed for this additional throughput. No tank facilities will be constructed in South Dakota. Ex TC-1, 2.1.2, p.8. Sixteen mainline valves will be located in South Dakota. Seven of these valves will be remotely controlled, in order to have the capability to isolate sections of line rapidly in the event of an emergency to minimize impacts or for operational or maintenance reasons. Ex TC-1, 2.2.3, pp. 10-11.

21. The pipeline will be constructed within a 110-foot wide corridor, consisting of a temporary 60-foot wide construction right-of-way and a 50-foot permanent right-of-way. Additional workspace will be required for stream, road, and railroad crossings, as well as hilly terrain and other features. The Applicant committed to reducing the construction right-of-way to 85 feet in certain wetlands to minimize impacts. Ex TC-1, 2.2.4, pp. 11-12; Ex TC-7, ¶ 20. FERC guidelines provide that the wetland construction right-of-way should be limited to 75 feet except where conditions do not permit, and Staff witness Hargrove's Construction, Mitigation and Reclamation Plan Review states that industry practice is to reduce the typical construction right-of-way width to 75 feet in non-cultivated wetlands, although exceptions are sometimes made for larger-diameter pipelines or where warranted due to site-specific conditions. Ex S-5, p. 2 and Attachment 2, 6.2; TR 335, 353. The Commission finds that the construction right-of-way should be limited to 75 feet, except where site-specific conditions require use of Keystone's proposed 85-foot right-of-way or where special circumstances are present, and the Commission accordingly adopts Condition 22(a), subject to the special circumstance provisions of Condition 30.

22. The Project will be designed, constructed, tested, and operated in accordance with all applicable requirements, including the U.S. Department of Transportation, Pipeline Hazardous Materials and Safety Administration (PHMSA) regulations set forth at 49 CFR Part 195, as modified by the Special Permit requested for the Project from PHMSA (see Finding 71). These federal regulations are intended to ensure adequate protection for the public and the environment and to prevent crude oil pipeline accidents and failures. Ex TC-1, 2.2, p. 8.

23. The current estimated cost of the Keystone Project in South Dakota is $921.4 million. Ex TC-1, 1.3, p. 1.

Demand for the Facility

24. The transport of additional crude oil production from the WCSB is necessary to meet growing demand by refineries and markets in the U.S. The need for the project is dictated by a number of factors, including increasing WCSB crude oil supply combined with insufficient export pipeline capacity; increasing crude oil demand in the U.S. and decreasing domestic crude supply;

the opportunity to reduce U.S. dependence on foreign off-shore oil through increased access to stable, secure Canadian crude oil supplies; and binding shipper commitments to utilize the Keystone Pipeline Project. Ex TC-1, 3.0, p. 23.

25. According to the U.S. Energy Information Administration ("EIA"), U.S. demand for petroleum products has increased by over 11 percent or 2,000,000 bpd over the past 10 years and is expected to increase further. The EIA estimates that total U.S. petroleum consumption will increase by approximately 10 million bpd over the next 10 years, representing average demand growth of about 100,000 bpd per year (EIA Annual Energy Outlook 2008). Ex TC-1, 3.2, pp. 23-24.

26. At the same time, domestic U.S. crude oil supplies continue to decline. For example, over the past 10 years, domestic crude production in the United States has declined at an average rate of about 135,000 bpd per year, or 2% per year. Ex TC-1, 3.3, p. 24. Crude and refined petroleum product imports into the U.S. have increased by over 3.3 million bpd over the past 10 years. In 2007, the U.S. imported over 13.4 million bpd of crude oil and petroleum products or over 60 percent of total U.S. petroleum product consumption. Canada is currently the largest supplier of imported crude oil and refined products to the U.S., supplying over 2.4 million bpd in 2007, representing over 11 percent of total U.S. petroleum product consumption (EIA 2007). Ex TC-1, 3.4, p. 24.

27. The Project will provide an opportunity for U.S. refiners in Petroleum Administration for Defense District III, the Gulf Coast region, to further diversify supply away from traditional offshore foreign crude supply and to obtain direct access to secure and growing Canadian crude supplies. Access to additional Canadian crude supply will also provide an opportunity for the U.S. to offset annual declines in domestic crude production and, specifically, to decrease its dependence on other foreign crude oil suppliers, such as Mexico and Venezuela, the top two heavy crude oil exporters into the U.S. Gulf Coast. Ex TC-1, 3.4, p. 24.

28. Reliable and safe transportation of crude oil will help ensure that U.S. energy needs are not subject to unstable political events. Established crude oil reserves in the WCSB are estimated at 179 billion barrels (CAPP 2008). Over 97 percent of WCSB crude oil supply is sourced from Canada's vast oil sands reserves located in northern Alberta. The Alberta Energy and Utilities Board estimates there are 175 billion barrels of established reserves recoverable from Canada's oil sands. Alberta has the second largest crude oil reserves in the world, second only to Saudi Arabia. Ex TC-1, 3.1, p. 23.

29. Shippers have already committed to long-term binding contracts, enabling Keystone to proceed with regulatory applications and construction of the pipeline once all regulatory, environmental, and other approvals are received. These long-term binding shipper commitments demonstrate a material endorsement of support for the Project, its economics, proposed route, and target market, as well as the need for additional pipeline capacity and access to Canadian crude supplies. Ex TC-1, 3.5, p. 24.

Environmental

30. In order to construct the Project, Keystone is required to obtain a Presidential Permit from the U.S. Department of State ("DOS") authorizing the construction of facilities across the international border. Ex TC-1, 1.8, pp. 4-5; 5.1, p. 30.

31. Because Keystone is required to obtain a Presidential Permit from the DOS, the National Environmental Policy Act requires the DOS to prepare an Environmental Impact Statement

("EIS"). Ex TC-1, 1.8, pp. 4-5; Ex TC-4; Ex S-3. In support of its Presidential Permit application, Keystone has submitted studies and other environmental information to the DOS. Ex TC-1, 1.8, pp. 4-5; 5.1, p. 30.

32. Table 6 to the Application summarizes the environmental impacts that Keystone's analysis indicates could be expected to remain after its Construction Mitigation and Reclamation Plan is implemented. Ex TC-1, pp. 31-37.

33. The pipeline will cross the Unglaciated Missouri Plateau. This physiographic province is characterized by a dissected plateau where river channels have incised into the landscape. Elevations range from just over 3,000 feet above mean sea level in the northwestern part of the state to around 1,800 feet above mean sea level in the White River valley. The major river valleys traversed include the Little Missouri River, Cheyenne River, and White River. Ex TC-1, 5.3.1, p. 30; Ex TC-4, ¶15. Exhibit A to the Application includes soil type maps and aerial photograph maps of the Keystone pipeline route in South Dakota that indicate topography, land uses, project mileposts and Section, Township, Range location descriptors. Ex TC-1, Exhibit A. Updated versions of these maps were received in evidence as Exhibit TC-14.

34. The surficial geologic deposits along the proposed route are primarily composed of Quaternary alluvium, colluvium, alluvial terraces, and eolian deposits (sand dunes). The alluvium primarily occurs in modern stream channels and floodplains, but also is present in older river terraces. The bedrock geology consists of Upper Cretaceous and Tertiary rocks. The Upper Cretaceous units include the Pierre Shale, Fox Hills Formation, and the Hell Creek Formation. The Ogallala Group, present in the far southern portion of the Project in South Dakota, was deposited as a result of uplift and erosion of the Rocky Mountains. Material that was eroded from the mountains was transported to the east by streams and wind. Ex TC-1, 5.3.2, p. 37.

35. Sand, gravel, crushed stone, oil, natural gas, coal and metallic ore resources are mineral resources existing along the proposed route. The route passes through the Buffalo Field in Harding County. Construction will have very minor and short-term impact on current mineral extraction activities due to the temporary and localized nature of pipeline construction activities. Several oil and gas wells were identified within or close to the Project construction ROW. Prior to construction, Keystone will identify the exact locations of active, shut-in, and abandoned wells and any associated underground pipelines in the construction ROW and take appropriate precautions to protect the integrity of such facilities. Ex TC-1, 5.3.3, pp. 38-39.

36. Soil maps for the route are provided in Exhibit A to Ex TC-1. In the northwestern portions of South Dakota, the soils are shallow to very deep, generally well drained, and loamy or clayey. Soils such as the Assiniboine series formed in fluvial deposits that occur on fans, terraces, and till plains. Soils such as the Cabbart, Delridge, and Blackhall series formed in residuum on hills and plains. Fertile soils and smooth topography dominate Meade County. The soils generally are shallow to very deep, somewhat excessively drained to moderately well drained, and loamy or clayey. Cretaceous Pierre Shale underlies almost all of Haakon, Jones, and portions of Tripp counties. This shale weathers to smectitic clays. These clays shrink as they dry and swell as they get wet, causing significant problems for road and structural foundations. From central Tripp County to the Nebraska state line, soils typically are derived from shale and clays on the flatter to moderately sloping, eroded tablelands. In southern Tripp County, the route also crosses deep, sandy deposits on which the Doger, Dunday, and Valentine soils formed. These are dry, rapidly permeable soils. Topsoil layers are thin and droughty, and wind erosion and blowouts are a common hazard. Ex TC-1, 5.3.4, p. 40.

37. Grading and excavating for the proposed pipeline and ancillary facilities will disturb a variety of agricultural, rangeland, wetland and forestland soils. Prime farmland soils may be altered temporarily following construction due to short-term impact such as soil compaction from equipment traffic, excavation and handling. However, potential impacts to soils will be minimized or mitigated by the soil protection measures identified in the Construction Mitigation and Reclamation Plan (CMR Plan) to the extent such measures are fully implemented. The measures include procedures for segregating and replacing top soil, trench backfilling, relieving areas compacted by heavy equipment, removing surface rock fragments and implementing water and wind erosion control practices. Ex TC-1, 5.3.4, p. 41; TC-1 Ex. B.

38. To accommodate potential discoveries of contaminated soils, Keystone made a commitment in the Application to develop, in consultation with relevant agencies, procedures for the handling and disposal of unanticipated contaminated soil discovered during construction. These procedures will be added to the CMR Plan. If hydrocarbon contaminated soils are encountered during trench excavation, the appropriate federal and state agencies will be contacted immediately. A remediation plan of action will be developed in consultation with that agency. Depending on the level of contamination found, affected soil may be replaced in the trench or removed to an approved landfill for disposal. Ex TC-1, 5.3.4, p. 42.

39. The USGS ground motion hazard mapping indicates that potential ground motion hazard in the Project area is low. South Dakota historically has had little earthquake activity. No ground subsidence or karst hazards are present in the vicinity of the route. Ex TC-1, 5.3.6, p. 43.

40. Cretaceous and Tertiary rocks in the Missouri River Plateau have high clay content and upon weathering can be susceptible to instability in the form of slumps and earth flows. Landslide potential is enhanced on steeper slopes. Formations that are especially susceptible are the Cretaceous Hell Creek and Pierre Shale as well as shales in the Tertiary Fort Union Formation mainly on river banks and steep slopes. These units can contain appreciable amounts of bentonite, a rock made up of montmorillonite clay that has deleterious properties when exposed to moisture. The bentonite layers in the Pierre Shale may present hazards associated with swelling clays. These formations are considered to have "high swelling potential." Bentonite has the property whereby when wet, it expands significantly in volume. When bentonite layers are exposed to successive cycles of wetting and drying, they swell and shrink, and the soil fluctuates in volume and strength. Ex TC-1, 5.3.4, pp. 43.

41. Fifteen perennial streams and rivers, 129 intermittent streams, 206 ephemeral streams and seven man-made ponds will be crossed during construction of the Project in South Dakota. Keystone will utilize horizontal directional drilling ("HDD") to cross the Little Missouri, Cheyenne and White River crossings. Keystone intends to use open-cut trenching at the other perennial streams and intermittent water bodies. The open cut wet method can cause the following impacts: loss of in-stream habitat through direct disturbance, loss of bank cover, disruption of fish movement, direct disturbance to spawning, water quality effects and sedimentation effects. Alternative techniques include open cut dry flume, open cut dam-and-pump and horizontal directional drilling. Exhibit C to the Application contains a listing of all water body crossings and preliminary site-specific crossing plans for the HDD sites. Ex TC-14. Permitting of water body crossings, which is currently underway, will ultimately determine the construction method to be utilized. Keystone committed to mitigate water crossing impacts through implementation of procedures outlined in the CMR Plan. Ex TC-1, 5.4.1, pp. 45-46.

42. The pipeline will be buried at an adequate depth under channels, adjacent flood plains and flood protection levees to avoid pipe exposure caused by channel degradation and lateral scour. Determination of the pipeline burial depth will be based on site-specific channel and hydrologic investigations where deemed necessary. Ex TC-1, 5.4.1, p. 46.

43. Although improvements in pipeline safety have been made, the risk of a leak cannot be eliminated. Keystone's environmental consulting firm for the Project, AECOM, estimated the chances of and the environmental consequences of a leak or spill through a risk assessment. Ex TC-1, 6.5.2, pp. 96-102; Table 6; TC-12, 10, 24.

44. Keystone's expert estimated the chance of a leak from the Project to be not more than one spill in 7,400 years for any given mile of pipe. TR 128-132, 136-137; Ex TC-12, ¶10; TC-1, 5.5.1, p. 54; 6.1.2.1, p. 87. The frequency calculation found the chance to be no more than one release in 24 years in South Dakota. TR 137.

45. Keystone's spill frequency and volume estimates are conservative by design, overestimating the risk since the intent is to use the assessment for planning purposes. The risk assessment overestimates the probable size of a spill to ensure conservatism in emergency response and other planning objectives. If a spill were to occur on the Keystone pipeline, PHMSA data indicate that the spill is likely to be three barrels or less. Ex TC-12, ¶10; TR 128-132, 137; TC-1, 6.1.2.1, p. 87.

46. Except for a few miles in the far southern reach of the Project in southern Tripp County which will be located over the permeable Sand Hills and shallow High Plains Aquifer, the Project route in South Dakota does not cross geologic units that are traditionally considered as aquifers. TR 440. Where aquifers are present, at most locations they are more than 50 feet deep, which significantly reduces the chance of contamination reaching the aquifer. Additionally, the majority of the pipeline is underlain by low permeability confining materials (e.g., clays, shales) that inhibit the infiltration of released crude oil into aquifers. TR 158; Ex TC-12, ¶13, EX TC-1, 5.4.2, pp. 47-48. Keystone consulted with the DENR during the routing process to identify and subsequently avoid sensitive aquifers and recharge areas, e.g., Source Water Protection Areas (SWPAs) in order to minimize risk to important public groundwater resources, and no groundwater SWPAs are crossed by the Project in South Dakota. EX TC-1, 5.4.2, pp. 47-48. Except for the Sand Hills area, no evidence was offered of the existence of a shallow aquifer (i.e. less than 50 feet in depth) crossed by the Project.

47. Because of their high solubility and their very low Maximum Contaminant Levels ("MCLs"), the constituents of primary concern in petroleum, including crude oil, are benzene, toluene, ethyl benzene and xylene. These constituents are commonly referred to as BTEX. TR 142, 146. The crude oil to be shipped through the Project will be similar in composition to other crude oils produced throughout the world and currently shipped in the United States. TR 155-56. The BTEX concentration in the crude oil to be shipped through the Project is close to 1 % to 1.5%. TR 151.

48. The Project will pass through areas in Tripp County where shallow and surficial aquifers exist. Since the pipeline will be buried at a shallow depth, it is unlikely that the construction or operation of the pipeline will alter the yield from any aquifers that are used for drinking water purposes. Keystone will investigate shallow groundwater when it is encountered during construction to determine if there are any nearby livestock or domestic wells that might be affected by construction activities. Appropriate measures will be implemented to prevent groundwater contamination and steps will be taken to manage the flow of any ground water encountered. Ex TC-

1, 5.4.2, pp. 47-48. The Tripp County Water User District is up-gradient of the pipeline and therefore would not be affected by a spill. TR 441, 449-50.

49. The risk of a spill affecting public or private water wells is low because the components of crude oil are unlikely to travel more than 300 feet from the spill site. TR 142-43. There are no private or public wells within 200 or 400 feet, respectively, of the right of way. TC-16, Data Response 3-46.

50. The total length of Project pipe with the potential to affect a High Consequence Area ("HCA") is 34.3 miles. A spill that could affect an HCA would occur no more than once in 250 years. TC-12, ¶ 24.

51. In the event that soils and groundwater are contaminated by a petroleum release, Keystone will work with state agency personnel to determine what type of remediation process would be appropriate. TR 148. Effective emergency response can reduce the likelihood and severity of contamination. TC-12, ¶ 10, 14, 24. Soils and groundwater contaminated by a petroleum release can be remediated. TR 499-500. The experience of DENR is that pipeline facilities have responded immediately to the incident in every case. TR 502.

52. The Commission finds that the risk of a significant release occurring is low and finds that the risk that a release would irremediably impair a water supply is very low and that it is probable that Keystone, in conjunction with state and federal response agencies, will be able to and will be required to mitigate and successfully remediate the effects of a release.

53. The Commission nevertheless finds that the Sand Hills area and High Plains Aquifer in southeastern Tripp County is an area of vulnerability that warrants additional vigilance and attention in Keystone's integrity management and emergency response planning and implementation process. The evidence demonstrates that the shallow Sand Hills groundwater or High Plains Aquifer is used by landowners in the Project area, that many wells are developed into the aquifer, including TCWUD 's, that the very high permeability of both the sandy surficial soils and deeper soils render the formation particularly vulnerable to contamination and that rapid discovery and response can significantly lessen the impact of a release on this vulnerable groundwater resource. The Commission further finds that if additional surficial aquifers are discovered in the course of pipeline construction, such aquifers should have similar treatment. The Commission accordingly finds that Condition 35 shall be adopted.

54. Of the approximately 314-mile route in South Dakota, all but 21.5 miles is privately owned. 21.5 miles is state-owned and managed. The list is found in Table 14. No tribal or federal lands are crossed by the proposed route. Ex TC-1, 5.7.1, p. 75.

55. Table 15 of the Application identifies the land uses affected by the pipeline corridor. Among other things, it shows that the project will not cross or be co-located with any major industrial sites, the pipeline will not cross active farmsteads, but may cross near them and the pipeline will not cross suburban and urban residential areas. The project will not cross municipal water supplies or water sources for organized rural water districts. Ex TC-1, 5.7.1, pp. 76-78.

56. The pipeline will be compatible with the predominant land use, which is rural agriculture, because the pipeline will be buried to a depth of four feet in fields and will interfere only minimally with normal agricultural operations. In most locations, the pipeline will be placed below agricultural drain tiles, and drain tiles that are damaged will be repaired. The only above-ground

facilities will be pump stations and block valves located at intervals along the pipeline. Ex TC-1, 5.7.3, pp.78-79.

57. The Project's high strength X70 steel will have a puncture resistance of 51 tons of digging force. Ex TC-8, ¶ 28. Keystone will have a public awareness program in place and an informational number to call where landowners and others can obtain information concerning activities of concern. TC-1, 6.3.4, pp. 93-94. The Commission finds that the risk of damage by ordinary farming operations is very low and that problems can be avoided through exercise of ordinary common sense.

58. If previously undocumented sites are discovered within the construction corridor during construction activities, all work that might adversely affect the discovery will cease until Keystone, in consultation with the appropriate agencies such as the SHPO, can evaluate the site's eligibility and the probable effects. If a previously unidentified site is recommended as eligible to the National Registry of Historic Places, impacts will be mitigated pursuant to the Unanticipated Discovery Plan submitted to the SHPO. Treatment of any discovered human remains, funerary objects, or items of cultural patrimony found on federal land will be handled in accordance with the Native American Grave Protection and Repatriation Act. Construction will not resume in the area of the discovery until the authorized agency has issued a notice to proceed. If human remains and associated funerary objects are discovered on state or private land during construction activities, construction will cease within the vicinity of the discovery and the county coroner or sheriff will be notified of the find. Treatment of any discovered human remains and associated funerary objects found on state or private land will be handled in accordance with the provisions of applicable state laws. TR 40; Ex TC-1, 6.4, pp. 96; Ex TC-16, 3-54. In accordance with these commitments, the Commission finds that Condition 43 should be adopted.

59. Certain formations to be crossed by the Project, such as the Fox Hills, Ludlow and particularly the Hell Creek Formation are known to contain paleontological resources of high scientific and monetary value. TR 438-439, 442-444. In northwest South Dakota, the Hell Creek Formation has yielded valuable dinosaur bones including from a triceratops, the South Dakota State fossil. Ex TC-1, 5.3.2, p. 38. Protection of paleontological resources was among the most frequently expressed concerns at the public input hearings held by the Commission. There is no way for anyone to know with any degree of certainty whether fossils of significance will be encountered during construction activities. TR 439. Because of the potential significance to landowners of the encounter by construction activities with paleontological resources and the inability to thoroughly lessen the probability of such encounter through pre-construction survey and avoidance, the Commission adopts Condition 44 to require certain special procedures in high probability areas, including the Hell Creek formation, such as the presence of a monitor with training in identification of a paleontological strike of significance.

Design and Construction

60. Keystone has applied for a special permit ("Special Permit") from PHMSA authorizing Keystone to design, construct, and operate the Project at up to 80% of the steel pipe specified minimum yield strength at most locations. TC-1, 2.2, p. 8; TR 62. In Condition 2, the Commission requires Keystone to comply with all of the conditions of the Special Permit, if issued.

61. TransCanada operates approximately 11,000 miles of pipelines in Canada with a 0.8 design factor and requested the Special Permit to ensure consistency across its system and to reduce costs. PHMSA has previously granted similar waivers adopting this modified design factor for natural gas pipelines and for the Keystone Pipeline. Ex TC-8, ¶¶ 13, 17.

62. The Special Permit is expected to exclude pipeline segments operating in (i) PHMSA-defined HCAs described as high population areas and commercially navigable waterways in 49 CFR Section 195.450; (ii) pipeline segments operating at highway, railroad, and road crossings; (iii) piping located within pump stations, mainline valve assemblies, pigging facilities, and measurement facilities; and (iv) areas where the MOP is greater than 1,440 psig. Ex TC-8, ¶ 16.

63. Application of the 0.8 design factor and API 5L PSL2 X70 high-strength steel pipe results in use of pipe with a 0.463 inch wall thickness, as compared with the 0.512 inch wall thickness under the otherwise applicable 0.72 design factor, a reduction in thickness of .050 inches. TR 61. PHMSA previously found that the issuance of a waiver is not inconsistent with pipeline safety and that the waiver will provide a level of safety equal to or greater than that which would be provided if the pipeline were operated under the otherwise applicable regulations. Ex TC-8, ¶ 15.

64. In preparation for the Project, Keystone conducted a pipeline threat analysis, using the pipeline industry published list of threats under ASME B31.8S and PHMSA to determine threats to the pipeline. Identified threats were manufacturing defects, construction damage, corrosion, mechanical damage and hydraulic event. Safeguards were then developed to address these threats. Ex TC-8, ¶ 22.

65. Steel suppliers, mills and coating plants were pre-qualified using a formal qualification process consistent with ISO standards. The pipe is engineered with stringent chemistry to ensure weldability during construction. Each batch of pipe is mechanically tested to prove strength, fracture control and fracture propagation properties. The pipe is hydrostatically tested. The pipe seams are visually and manually inspected and also inspected using ultrasonic instruments. Each piece of pipe and joint is traceable to the steel supplier and pipe mill shift during production. The coating is inspected at the plant with stringent tolerances on roundness and nominal wall thickness. A formal quality surveillance program is in place at the steel mill and at the coating plant. Ex TC-8, ¶ 24; TR 59-60.

66. All pipe welds will be examined around 100 percent of their circumferences using ultrasonic or radiographic inspection. The coating is inspected and repaired if required prior to lowering into the trench. After construction the pipeline is hydrostatically tested in the field to 125 percent of its maximum operating pressure, followed by caliper tool testing to check for dents and ovality. Ex TC-8, ¶ 25.

67. A fusion-bonded epoxy ("FBE") coating will be applied to the external surface of the pipe to prevent corrosion. Ex TC- 8, ¶ 26.

68. TransCanada has thousands of miles of this particular grade of pipeline steel installed and in operation. TransCanada pioneered the use of FBE, which has been in use on its system for over 29 years. There have been no leaks on this type of pipe installed by TransCanada with the FBE coating and cathodic protection system during that time. When TransCanada has excavated pipe to validate FBE coating performance, there has been no evidence of external corrosion. Ex TC-8, ¶ 27.

69. A cathodic protection system will be installed comprised of engineered metal anodes, which are connected to the pipeline. A low voltage direct current is applied to the pipeline, resulting in corrosion of the anodes rather than the pipeline. Ex TC-8, ¶ 27. FBE coating and cathodic protection mitigate external corrosion. Ex TC-8, ¶ 26.

70. A tariff specification of 0.5 percent solids and water by volume will be utilized to minimize the potential for internal corrosion. This specification is half the industry standard of one percent. In Condition 32, the Commission requires Keystone to implement and enforce its crude oil specifications in order to minimize the potential for internal corrosion. Further, the pipeline is designed to operate in turbulent flow to minimize water drop out, another potential cause of internal corrosion. During operations, the pipeline will be cleaned using in-line inspection tools, which measure internal and external corrosion. Keystone will repair areas of pipeline corrosion as required by federal regulation. Ex TC-8, ¶ 26. Staff expert Schramm concluded that the cathodic protection and corrosion control measures that Keystone committed to utilize would meet or exceed applicable federal standards. TR 407-427; Ex S-12.

71. To minimize the risk of mechanical damage to the pipeline, it will be buried with a minimum of four feet of cover, one foot deeper than the industry standard, reducing the likelihood of mechanical damage. The steel specified for the pipeline is high-strength steel with engineered puncture resistance of approximately 51 tons of force. Ex TC-8, ¶ 28.

72. Hydraulic damage is caused by over-pressurization of the pipeline. The risk of hydraulic damage will be minimized through the SCADA system's continuous, real-time pressure monitoring systems and through operator training. Ex TC-8, ¶ 29.

73. The Applicant has prepared a detailed CMR Plan that describes procedures for crossing cultivated lands, grasslands, including native grasslands, wetlands, streams and the procedures for restoring or reclaiming and monitoring those features crossed by the Project. The CMR Plan is a summary of the commitments that Keystone has made for environmental mitigation, restoration and post-construction monitoring and compliance related to the construction phase of the Project. Among these, Keystone will utilize construction techniques that will retain the original characteristics of the lands crossed as detailed in the CMR Plan. Keystone's thorough implementation of these procedures will minimize the impacts associated with the Project. A copy of the CMR Plan was filed as Exhibit B to Keystone's permit application and introduced into evidence as TC-1, Exhibit B.

74. The CMR Plan establishes procedures to address a multitude of construction-related issues, including but not limited to the following:

- Training
- Advance Notice of Access
- Depth of Cover
- Noise Control
- Weed Control
- Dust Control
- Fire Prevention and Control
- Spill Prevention and Containment
- Irrigation Systems
- Clearing
- Grading
- Topsoil Removal and Storage
- Temporary Erosion and Sediment Control
- Clean-Up
- Reclamation and Revegetation
- Compaction Relief

- Rock Removal
- Soil Additives
- Seeding
- Construction in Residential and Commercial/Industrial Areas
- Drain Tile Damage Mitigation and Repair

Ex TC-1, Exhibit B.

75. The fire prevention and containment measures outlined in the CMR Plan will provide significant protection against uncontrolled fire in the arid region to be crossed by the Project. The Commission finds, however, that these provisions are largely centered on active construction areas and that certain additional fire prevention and containment precautions are appropriate as well for vehicles performing functions not in proximity to locations where fire suppression equipment will be based, such as route survey vehicles and vehicles involved in surveillance and inspection activities whether before, during and after construction. The Commission accordingly adopts Conditions 16(p) and the last sentence of Condition 30 to address these situations.

76. Keystone's CMR Plan includes many mitigation steps designed to return the land to its original production. These include topsoil removal and replacement, compaction of the trench line, decompaction of the working area, and tilling the topsoil after replacement. Ex TC-1, Exhibit B; Ex TC-6, ¶ 27; Ex TC-1, 6.1.2.2, pp. 87-88.

77. In areas where geologic conditions such as ground swelling, or slope instability, could pose a potential threat, Keystone will conduct appropriate pre-construction site assessments and subsequently will design facilities to account for various ground motion hazards as required by federal regulations. The main hazard of concern during construction of the pipeline will be from unintentional undercutting of slopes or construction on steep slopes resulting in instability that could lead to landslides. Other hazards may result from construction on Cretaceous shales that contain bentonite beds. The high swelling hazard may cause slope instability during periods of precipitation. Ex TC-1, 5.3.6, p. 44.

78. When selecting the proposed pipeline route, Keystone has attempted to minimize the amount of steep slopes crossed by the pipeline. Special pipeline construction practices described in the CMR Plan will minimize slope stability concerns during construction. Landslide hazards can be mitigated by:

- Returning disturbed areas to pre-existing conditions or, where necessary, reducing steep grades during construction;
- Preserving or improving surface drainage;
- Preserving or improving subsurface drainage during construction;
- Removing overburden where necessary to reduce weight of overlying soil mass; and
- Adding fill at toe of slope to resist movement.

Ex TC-1, 5.3.6, pp. 43-44.

79. Slope instability poses a threat of ground movement responsible for approximately 1 percent of liquid pipeline incidents (PHMSA 2008). Keystone will monitor slope stability during routine surveillance. Areas where slope stability poses a potential threat to the pipeline will be incorporated into Keystone's Integrity Management Plan. If ground movement is suspected of having caused abnormal movement of the pipeline, federal regulations (49 CFR Part 195) require

Keystone to conduct an internal inspection. Consequently, damage to the pipeline would be detected quickly and spills would be averted or minimized. Ex TC-1, 5.3.6, p. 44

80. Keystone is in the process of preparing, in consultation with the area National Resource Conservation Service, construction/reclamation unit ("Con/Rec Unit") mapping to address differing construction and reclamation techniques for different soils conditions, slopes, vegetation, and land use along the pipeline route. This analysis and mapping results in the identification of segments called Con/Rec Units. Ex. TC-5; TC-16, DR 3-25.

81. The Applicant will use special construction methods and measures to minimize and mitigate impacts where warranted by site specific conditions. These special techniques will be used when constructing across paved roads, primary gravel roads, highways, railroads, water bodies, wetlands, sand hills areas, and steep terrain. These special techniques are described in the Application. Ex TC-1, 2.2.6, p. 17; TC-6, ¶ 11.

82. Of the perennial streams that are crossed by the proposed route, the Cheyenne River is the largest water body and is classified as a warm water permanent fishery. Of the other streams that have been classified, habitat is considered more limited as indicated by a warm water semi-permanent or warm water marginal classification. Ex TC-1, 5.6.2, pp. 71-72, Table 13.

83. Keystone will utilize HDD for the Little Missouri, Cheyenne and White River crossings, which will aid in minimizing impacts to important game and commercial fish species and special status species. Open-cut trenching, which can affect fisheries, will be used at other perennial streams. Keystone will use best practices to reduce or eliminate the impact of crossings at the perennial streams other than the Cheyenne and White Rivers. Ex TC-1, 5.4.1, p. 46; 5.6.2, p. 72; TC-16, DR 3-39.

84. Water used for hydrostatic testing during construction and subsequently released will not result in contamination of aquatic ecosystems since the pipe is cleaned prior to testing and the discharge water is monitored and tested. Ex TC-1, 5.4.3.1, pp. 48-50. In Conditions 1 and 2, the Commission has required that Keystone comply with DENR's regulations governing temporary use and discharge of water and obtain and comply with the DENR General Permits for these activities.

85. During construction, Keystone will have a number of inspectors on a construction spread, including environmental inspectors, who will monitor erosion control, small spills, full tanks, and any environmental issues that arise. TR. 37-38. In Condition 14, the Commission requires that Keystone incorporate such inspectors into the CMR Plan.

86. The Pipeline corridor will pass through areas where shallow and surficial aquifers exist. Appropriate measures will be implemented to prevent groundwater contamination and steps will be taken to manage the flow of any ground water encountered. Ex TC-1, 5.4.2, p. 47-48.

87. In addition to those recommendations of Staff and its expert witnesses referenced specifically in these Findings, Staff expert witnesses made a number of recommendations which the Commission has determined will provide additional protections for affected landowners, the environment and the public, and has included Conditions in this Order requiring certain of these measures. These recommendations encompassed matters such as sediment control at water body crossings, soil profile analysis, topsoil, subsoil and rock segregation and replacement, special procedures in areas of bentenitic, sodic, or saline soils, noise, etc. Staff's final recommendations are set forth in its Brief. See also Staff Exhibits and testimony in Transcript Vols. II and III.

88. Keystone will be required to acquire permits authorizing the crossing of county roads and township roads. These permits will typically require Keystone to restore roads to their pre-construction condition. If its construction equipment causes damage to county or township roads, Keystone will be responsible for the repair of those roads to pre-construction condition. Pursuant to SDCL 49-41B-38, Keystone will be required to post a bond to ensure that any damage beyond normal wear to public roads, highways, bridges or other related facilities will be adequately compensated. Staff witness Binder recommended that the bond amount under SDCL 49-41B-38 for damage to highways, roads, bridges and other related facilities be set at $15,600,000 for 2011 and $15,600,000 for 2012. TR 224. Keystone did not object to this requirement.

89. The Commission finds that the procedures in the CMR Plan and the other construction plans and procedures that Keystone has committed to implement, together with the Conditions regarding construction practices adopted by the Commission herein, will minimize impacts from construction of the Project to the environment and social and economic condition of inhabitants and expected inhabitants in the Project area.

Operation and Maintenance

90. The Keystone pipeline will be designed constructed, tested and operated in accordance with all applicable requirements, including the PHMSA regulations set forth at 49 CFR Parts 194 and 195, as modified by the Special Permit. These federal regulations are intended to ensure adequate protection for the public and the environment and to prevent crude oil pipeline accidents and failures. Ex TC-8, ¶ 2.

91. The safety features of Keystone's operations are governed by 49 CFR Part 195 and include aerial inspection 26 times per year, with any interval not to exceed three weeks, right-of-way maintenance for accessibility, and continual monitoring of the pipeline to identify potential integrity concerns. A Supervisory Control and Data Acquisition ("SCADA") system will be used to monitor the pipeline at all times. Ex TC-8, ¶ 9.

92. The Project will have a SCADA system to remotely monitor and control the pipeline. The SCADA system will include: (i) a redundant, fully functional back-up Operational Control Center available for service at all times; (ii) automatic features within the system to ensure operation within prescribed limits; and (iii) additional automatic features at the pump stations to provide pipeline pressure protection in the event that communications with the SCADA host are interrupted. Ex TC-10, ¶ 8.

93. The pipeline will have a control center manned 24 hours per day. A backup control center will also be constructed and maintained. A backup communications system is included within the system design and installation. Keystone's SCADA system should have a very high degree of reliability. TR 82-83.

94. Keystone will use a series of complimentary and overlapping SCADA-based leak detection systems and methods at the Operational Control Center, including: (i) remote monitoring; (ii) software-based volume balance systems that monitor injection and delivery volumes; (iii) Computational Pipeline Monitoring or model-based leak detection systems that break the pipeline into smaller segments and monitor each segment on a mass balance basis; and (iv) computer-based, non-real-time, accumulated gain/(loss) volume trending to assist in identifying low rate or seepage releases below the 1.5 percent by volume detection threshold. The SCADA and other monitoring and control systems to be implemented by Keystone for the Project are state of the art

and consistent with the best commercially available technology. Ex TC-10, ¶ 8. Staff witness, William Mampre, testified that Keystone's SCADA system was one he probably would have selected himself. TR 431.

95. Additionally, Keystone will implement and utilize direct observation methodologies, which include aerial patrols, ground patrols and public and landowner awareness programs designed to encourage and facilitate the reporting of suspected leaks and events that may suggest a threat to the integrity of the pipeline. Ex TC10, ¶ 8. Remote sensing technologies that could be employed in pipeline surveillance such as aerial surveillance are in their infancy and practical systems are not currently available. Keystone would consider using such technology if it becomes commercially available. TR 89-90.

96. Keystone will implement abnormal operating procedures when necessary and as required by 49 CFR 195.402(d). Abnormal operating procedures will be part of the written manual for normal operations, maintenance activities, and handling abnormal operating and emergencies. Ex TC-1, 2.3.2, p. 20.

97. As required by US DOT regulations, Keystone will prepare an emergency response plan ("ERP") for the system. Ex TC-11, ¶ 13. The ERP will be submitted to PHMSA for review prior to commencement of pipeline operations. Ex TC-11, ¶ 13. The Commission finds that the ERP and manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies as required under 49 CFR195.402 should also be submitted to the Commission at the time it is submitted to PHMSA to apprise the Commission of its details. Keystone has agreed to do this. The Commission has so specified in Condition 36.

98. Keystone will utilize the ERP approved by PHMSA for the Keystone Pipeline as the basis for its ERP for the Project. Under the ERP, Keystone will strategically locate emergency response equipment along the pipeline route. The equipment will include trailers, oil spill containment and recovery equipment, boats, and a communication office. Keystone will also have a number of local contractors available to provide emergency response assistance. Ex TC-11, ¶ 15. Keystone's goal is to respond to any spill within six hours. TR 102-103. Additional details concerning the ERP and the ERP process are set forth in the Application at Section 6.5.2 and in the pre-filed and hearing testimony of John Hayes. Ex TC-11; EX TC-1, 6.5.2, pp. 96-101. Keystone has consulted with DENR in developing its ERP. TR 111-12.

99. If the Keystone pipeline should experience a release, Keystone would implement its ERP. TC-11, ¶ 10; S-18, p. 4. DENR would be involved in the assessment and abatement of the release, and require the leak to be cleaned up and remediated. S-18, p. 5. DENR has been successful in enforcing remediation laws to ensure the effects of any pipeline releases are mitigated. TR 488-89, 497, 502-03.

100. Local emergency responders may be required to initially secure the scene and ensure the safety of the public, and Keystone will provide training in that regard. Ex TC-11, ¶ 17; TR 105-107.

101. If ground movement is suspected of having caused abnormal movement of the pipeline, federal regulations (49 CFR Part 195) require Keystone to conduct an internal inspection. Consequently, damage to the pipeline would be detected quickly and spills would be averted or minimized. Ex TC-1, 5.3.6, p. 44.

102. In addition to the ERP, hazardous materials pipeline segments through High Consequence Areas ("HCAs") are subject to the Integrity Management Rule. 49 CFR 195.452. Pipeline operators are required to develop a written Integrity Management Plan ("IMP") that must include methods to measure the program's effectiveness in assessing and evaluating integrity and protecting HCAs. Keystone will develop and implement an IMP for the entire pipeline including the HCAs. The overall objective of the IMP is to establish and maintain acceptable levels of integrity and having regard to the environment, public and employee safety, regulatory requirements, delivery reliability, and life cycle cost. The IMP uses advanced in-line inspection and mitigation technologies applied with a comprehensive risk-based methodology. 49 CFR Part 195 also requires pipeline operators to develop and implement public awareness programs consistent with the API's Recommended Practice 1162, Public Awareness Programs for Pipeline Operators. Staff witness Jenny Hudson testified that Keystone's planning and preparation of the IMP were fully compliant with the PHMSA regulations and had no recommendations for conditions. Ex S-9, p.5.

103. The Commission finds that the threat of serious injury to the environment or inhabitants of the State of South Dakota from a crude oil release is substantially mitigated by the integrity management, leak detection and emergency response processes and procedures that Keystone is continuing to plan and will implement.

Rural Water Crossings

104. The route crosses through two rural water system districts, the West River/Lyman-Jones Rural Water District and the Tripp County Water User District. Keystone met with these rural water districts to discuss the Project and will continue to coordinate with these districts. During construction and maintenance, Keystone will coordinate with the One Call system to avoid impacts to underground utilities, including water lines. Ex TC-4.

Alternative Routes

105. The proposed Project route was developed through an, iterative process. TC-1, 4.1, p. 25. During the course of the route evaluation process, Keystone held public meetings, open houses, and one-on-one meetings with stakeholders to discuss and review the proposed routing through South Dakota. TC-1, 4.1.5, p. 27. The route was refined in Mellette County to avoid environmentally sensitive areas and reduce wetland crossings, and near Colome to avoid groundwater protection areas. Ex TC-3; TC-1, 4.2.1-4.2.2, p. 28.

106. SDCL 49-41B-36 explicitly states that Chapter 49-41B "shall not be construed as a delegation to the Public Utilities Commission of the authority to route a facility." The Commission accordingly finds and concludes that it lacks authority to compel the Applicant to select an alternative route or to base its decision on whether to grant or deny a permit for a proposed facility on whether the selected route is the route the Commission itself might select.

Socio-Economic Factors

107. Socio-economic evidence offered by both Keystone and Staff demonstrates that the welfare of the citizens of South Dakota will not be impaired by the Project. Staff expert Dr. Michael Madden conducted a socio-economic analysis of the Keystone Pipeline, and concluded that the positive economic benefits of the project were unambiguous, while most if not all of the social impacts were positive or neutral. S-2, Madden Assessment at 21. The Project, subject to compliance with the Special Permit and the Conditions herein, would not, from a socioeconomic standpoint: (i) pose a threat of serious injury to the socioeconomic conditions in the project area; (ii)

substantially impair the health, safety, or welfare of the inhabitants in the project area; or (iii) unduly interfere with the orderly development of the region.

108. The Project will pay property taxes to local governments on an annual basis estimated to be in the millions of dollars. Ex TC-2, ¶ 24, TC-13, S-13; TR 584. An increase in assessed, taxable valuation for school districts is a positive development. TR 175.

109. The Project will bring jobs, both temporary and permanent, to the state of South Dakota and specifically to the areas of construction and operation. Ex TC-1 at 6.1.1, pp. 85-86.

110. The Project will have minimal effect in the areas of agriculture, commercial and industrial sectors, land values, housing, sewer and water, solid waste management, transportation, cultural and historical resources, health services, schools, recreation, public safety, noise, and visual impacts. Ex TC-1. It follows that the project will not substantially impair the health, safety, or welfare of the inhabitants.

General

111. Applicant has provided all information required by ARSD Chapter 20:10:22 and SDCL Chapter 49-41B. S-1.

112. The Commission finds that the Conditions attached hereto as Exhibit A and incorporated herein by reference are supported by the record, are reasonable and will help ensure that the Project will meet the standards established for approval of a construction permit for the Project set forth in SDCL 49-41B-22 and should be adopted.

113. The Commission finds that subject to the conditions of the Special Permit and the Conditions set forth as Exhibit A hereto, the Project will (i) comply with all applicable laws and rules; (ii) not pose an unacceptable threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area; (iii) not substantially impair the health, safety or welfare of the inhabitants; and (iv) not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government.

114. The Commission finds that a permit to construct the Project should be granted subject to the Conditions set forth in Exhibit A.

115. To the extent that any Conclusion of Law set forth below is more appropriately a finding of fact, that Conclusion of Law is incorporated by reference as a Finding of Fact.

Based on the foregoing Findings of Fact, the Commission hereby makes the following:

CONCLUSIONS OF LAW

1. The Commission has jurisdiction over the subject matter and parties to this proceeding pursuant to SDCL Chapter 49-41B and ARSD Chapter 20:10:22. Subject to the findings made on the four elements of proof under SDCL 49-41B-22, the Commission has authority to grant,

deny or grant upon reasonable terms, conditions or modifications, a permit for the construction, operation and maintenance of the TransCanada Keystone Pipeline.

2. The TransCanada Keystone Pipeline Project is a transmission facility as defined in SDCL 49-41B-2.1(3).

3. Applicant's permit application, as amended and supplemented through the proceedings in this matter, complies with the applicable requirements of SDCL Chapter 49-41B and ARSD Chapter 20:10:22.

4. The Project, if constructed and operated in accordance with the terms and conditions of this decision, will comply with all applicable laws and rules, including all requirements of SDCL Chapter 49-41B and ARSD 20:10:22.

5. The Project, if constructed and operated in accordance with the terms and conditions of this decision, will not pose an unacceptable threat of serious injury to the environment nor to the social and economic conditions of inhabitants or expected inhabitants in the siting area.

6. The Project, if constructed and operated in accordance with the terms and conditions of this decision, will not substantially impair the health, safety or welfare of the inhabitants in the siting area.

7. The Project, if constructed and operated in accordance with the terms and conditions of this decision, will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government.

8. The standard of proof is by the preponderance of evidence. The Applicant has met its burden of proof pursuant to SDCL 49-41B-22 and is entitled to a permit as provided in SDCL 49-41B-25.

9. The Commission has authority to revoke or suspend any permit granted under the South Dakota Energy Facility Permit Act for failure to comply with the terms and conditions of the permit pursuant to SDCL 49-41B-33 and must approve any transfer of the permit granted by this Order pursuant to SDCL 49-41B-29.

10. To the extent that any of the Findings of Fact in this decision are determined to be conclusions of law or mixed findings of fact and conclusions of law, the same are incorporated herein by this reference as a Conclusion of Law as if set forth in full herein.

11. Because a federal EIS will be required and completed for the Project and because the federal EIS complies with the requirements of SDCL Chapter 34A-9, the Commission appropriately exercised its discretion under SDCL 49-41B-21 in determining not to prepare or require the preparation of a second EIS.

12. PHMSA is delegated exclusive authority over the establishment and enforcement of safety-orientated design and operational standards for hazardous materials pipelines. 49 U.S.C. 60101, et seq.

13. SDCL 49-41B-36 explicitly states that SDCL Chapter 49-41B "shall not be construed as a delegation to the Public Utilities Commission of the authority to route a facility." The

Commission accordingly concludes that it lacks authority (i) to compel the Applicant to select an alternative route or (ii) to base its decision on whether to grant or deny a permit for a proposed facility on whether the selected route is the route the Commission might itself select.

14. The Commission concludes that it needs no other information to assess the impact of the proposed facility or to determine if Applicant or any Intervenor has met its burden of proof.

15. The Commission concludes that the Application and all required filings have been filed with the Commission in conformity with South Dakota law and that all procedural requirements under South Dakota law, including public hearing requirements, have been met or exceeded.

16. The Commission concludes that it possesses the authority under SDCL 49-41B-25 to impose conditions on the construction, operation and maintenance of the Project, that the Conditions set forth in Exhibit A are supported by the record, are reasonable and will help ensure that the Project will meet the standards established for approval of a construction permit for the Project set forth in SDCL 49-41B-22 and that the Conditions are hereby adopted.

It is therefore

ORDERED, that a permit to construct the Keystone Pipeline Project is granted to TransCanada Keystone Pipeline, LP, subject to the Conditions set forth in Exhibit A.

NOTICE OF ENTRY AND OF RIGHT TO APPEAL

PLEASE TAKE NOTICE that this Amended Final Decision and Order was duly issued and entered on the ____ day of June, 2010. Pursuant to SDCL 1-26-32, this Final Decision and Order will take effect 10 days after the date of receipt or failure to accept delivery of the decision by the parties. Pursuant to ARSD 20:10:01:30.01, an application for a rehearing or reconsideration may be made by filing a written petition with the Commission within 30 days from the date of issuance of this Final Decision and Order; Notice of Entry. Pursuant to SDCL 1-26-31, the parties have the right to appeal this Final Decision and Order to the appropriate Circuit Court by serving notice of appeal of this decision to the circuit court within thirty (30) days after the date of service of this Notice of Decision.

Dated at Pierre, South Dakota, this 29th of June, 2010.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that this document has been served today upon all parties of record in this docket, as listed on the docket service list, electronically.

By: _____

Date: 06/29/10

(OFFICIAL SEAL)

BY ORDER OF THE COMMISSION:

DUSTIN M. JOHNSON, Chairman

STEVE KOLBECK, Commissioner

GARY HANSON, Commissioner

Exhibit A

AMENDED PERMIT CONDITIONS

I. Compliance with Laws, Regulations, Permits, Standards and Commitments

1. Keystone shall comply with all applicable laws and regulations in its construction and operation of the Project. These laws and regulations include, but are not necessarily limited to: the federal Hazardous Liquid Pipeline Safety Act of 1979 and Pipeline Safety Improvement Act of 2002, as amended by the Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006, and the various other pipeline safety statutes currently codified at 49 U.S.C. § 60101 et seq. (collectively, the "PSA"); the regulations of the United States Department of Transportation implementing the PSA, particularly 49 C.F.R Parts 194 and 195; temporary permits for use of public water for construction, testing or drilling purposes, SDCL 46-5-40.1 and ARSD 74:02:01:32 through 74:02:01:34.02 and temporary discharges to waters of the state, SDCL 34A-2-36 and ARSD Chapters 74:52:01 through 74:52:11, specifically, ARSD § 74:52:02:46 and the General Permit issued thereunder covering temporary discharges of water from construction dewatering and hydrostatic testing.

2. Keystone shall obtain and shall thereafter comply with all applicable federal, state and local permits, including but not limited to: Presidential Permit from the United States Department of State, Executive Order 11423 of August 16, 1968 (33 Fed. Reg. 11741) and Executive Order 13337 of April 30, 2004 (69 Fed. Reg. 25229), for the construction, connection, operation, or maintenance, at the border of the United States, of facilities for the exportation or importation of petroleum, petroleum products, coal, or other fuels to or from a foreign country; Clean Water Act § 404 and Rivers and Harbors Act Section 10 Permits; Special Permit if issued by the Pipeline and Hazardous Materials Safety Administration; Temporary Water Use Permit, General Permit for Temporary Discharges and federal, state and local highway and road encroachment permits. Any of such permits not previously filed with the Commission shall be filed with the Commission upon their issuance. To the extent that any condition, requirement or standard of the Presidential Permit, including the Final EIS Recommendations, or any other law, regulation or permit applicable to the portion of the pipeline in this state differs from the requirements of these Conditions, the more stringent shall apply.

3. Keystone shall comply with and implement the Recommendations set forth in the Final Environmental Impact Statement when issued by the United States Department of State pursuant to its Amended Department of State Notice of Intent To Prepare an Environmental Impact Statement and To Conduct Scoping Meetings and Notice of Floodplain and Wetland Involvement and To Initiate Consultation Under Section 106 of the National Historic Preservation Act for the Proposed Transcanada Keystone XL Pipeline; Notice of Intent--Rescheduled Public Scoping Meetings in South Dakota and extension of comment period (FR vol. 74, no. 54, Mar. 23, 2009). The Amended Notice and other Department of State and Project Documents are available on-line at: http://www.keystonepipeline-xl.state.gov/clientsite/keystonexl.nsf?Open.

4. The permit granted by this Order shall not be transferable without the approval of the Commission pursuant to SDCL 49-41B-29.

5. Keystone shall undertake and complete all of the actions that it and its affiliated entities committed to undertake and complete in its Application as amended, in its testimony and

exhibits received in evidence at the hearing, and in its responses to data requests received in evidence at the hearing.

II. Reporting and Relationships

6. The most recent and accurate depiction of the Project route and facility locations is found on the maps in Exhibit TC-14. The Application indicates in Section 4.2.3 that Keystone will continue to develop route adjustments throughout the pre-construction design phase. These route adjustments will accommodate environmental features identified during surveys, property-specific issues, and civil survey information. The Application states that Keystone will file new aerial route maps that incorporate any such route adjustments prior to construction. Ex TC-1.4.2.3, p. 27. Keystone shall notify the Commission and all affected landowners, utilities and local governmental units as soon as practicable if material deviations are proposed to the route. Keystone shall notify affected landowners of any change in the route on their land. At such time as Keystone has finalized the pre-construction route, Keystone shall file maps with the Commission depicting the final pre-construction route. If material deviations are proposed from the route depicted on Exhibit TC-14 and accordingly approved by this Order, Keystone shall advise the Commission and all affected landowners, utilities and local governmental units prior to implementing such changes and afford the Commission the opportunity to review and approve such modifications. At the conclusion of construction, Keystone shall file detail maps with the Commission depicting the final as-built location of the Project facilities.

7. Keystone shall provide a public liaison officer, approved by the Commission, to facilitate the exchange of information between Keystone, including its contractors, and landowners, local communities and residents and to promptly resolve complaints and problems that may develop for landowners, local communities and residents as a result of the Project. Keystone shall file with the Commission its proposed public liaison officer's credentials for approval by the Commission prior to the commencement of construction. After the public liaison officer has been approved by the Commission, the public liaison officer may not be removed by Keystone without the approval of the Commission. The public liaison officer shall be afforded immediate access to Keystone's on-site project manager, its executive project manager and to contractors' on-site managers and shall be available at all times to the Staff via mobile phone to respond to complaints and concerns communicated to the Staff by concerned landowners and others. Keystone shall also implement and keep an up-dated web site covering the planning and implementation of construction and commencement of operations in this state as an informational medium for the public. As soon as the Keystone's public liaison officer has been appointed and approved, Keystone shall provide contact information for him/her to all landowners crossed by the Project and to law enforcement agencies and local governments in the vicinity of the Project. The public liaison officer's contact information shall be provided to landowners in each subsequent written communication with them. If the Commission determines that the public liaison officer has not been adequately performing the duties set forth for the position in this Order, the Commission may, upon notice to Keystone and the public liaison officer, take action to remove the public liaison officer.

8. Until construction of the Project, including reclamation, is completed, Keystone shall submit quarterly progress reports to the Commission that summarize the status of land acquisition and route finalization, the status of construction, the status of environmental control activities, including permitting status and Emergency Response Plan and Integrity Management Plan development, the implementation of the other measures required by these conditions, and the overall percent of physical completion of the project and design changes of a substantive nature. Each report shall include a summary of consultations with the South Dakota Department of Environment and Natural Resources and other agencies concerning the issuance of permits. The

reports shall list dates, names, and the results of each contact and the company's progress in implementing prescribed construction, land restoration, environmental protection, emergency response and integrity management regulations, plans and standards. The first report shall be due for the period ending June 30, 2010. The reports shall be filed within 31 days after the end of each quarterly period and shall continue until the project is fully operational.

9. Until one year following completion of construction of the Project, including reclamation, Keystone's public liaison officer shall report quarterly to the Commission on the status of the Project from his/her independent vantage point. The report shall detail problems encountered and complaints received. For the period of three years following completion of construction, Keystone's public liaison officer shall report to the Commission annually regarding post-construction landowner and other complaints, the status of road repair and reconstruction and land and crop restoration and any problems or issues occurring during the course of the year.

10. Not later than six months prior to commencement of construction, Keystone shall commence a program of contacts with state, county and municipal emergency response, law enforcement and highway, road and other infrastructure management agencies serving the Project area in order to educate such agencies concerning the planned construction schedule and the measures that such agencies should begin taking to prepare for construction impacts and the commencement of project operations.

11. Keystone shall conduct a preconstruction conference prior to the commencement of construction to ensure that Keystone fully understands the conditions set forth in this order. At a minimum, the conference shall include a Keystone representative, Keystone's construction supervisor and Staff.

12. Once known, Keystone shall inform the Commission of the date construction will commence, report to the Commission on the date construction is started and keep the Commission updated on construction activities as provided in Condition 8.

III. Construction

13. Except as otherwise provided in the conditions of this Order and Permit, Keystone shall comply with all mitigation measures set forth in the Construction Mitigation and Reclamation Plan (CMR Plan) as set forth in Exhibit TC-1, Exhibit B. If modifications to the CMR Plan are made by Keystone as it refines its construction plans or are required by the Department of State in its Final EIS Record of Decision or the Presidential Permit, the CMR Plan as so modified shall be filed with the Commission and shall be complied with by Keystone.

14. Keystone shall incorporate environmental inspectors into its CMR Plan and obtain follow-up information reports from such inspections upon the completion of each construction spread to help ensure compliance with this Order and Permit and all other applicable permits, laws, and rules.

15. Prior to construction, Keystone shall, in consultation with area NRCS staff, develop specific construction/reclamation units (Con/Rec Units) that are applicable to particular soil and subsoil classifications, land uses and environmental settings. The Con/Rec Units shall contain information of the sort described in response to Staff Data Request 3-25 found in Exhibit TC-16.

a) In the development of the Con/Rec Units in areas where NRCS recommends, Keystone shall conduct analytical soil probing and/or soil boring and analysis in areas of

particularly sensitive soils where reclamation potential is low. Records regarding this process shall be available to the Commission and to the specific land owner affected by such soils upon request.

b) Through development of the Con/Rec Units and consultation with NRCS, Keystone shall identify soils for which alternative handling methods are recommended. Alternative soil handling methods shall include but are not limited to the "triple-lift" method where conditions justify such treatment. Keystone shall thoroughly inform the landowner regarding the options applicable to their property, including their respective benefits and negatives, and implement whatever reasonable option for soil handling is selected by the landowner. Records regarding this process shall be available to the Commission upon request.

c) Keystone shall, in consultation with NCRS, ensure that its construction planning and execution process, including Con/Rec Units, CMR Plan and its other construction documents and planning shall adequately identify and plan for areas susceptible to erosion, areas where sand dunes are present, areas with high concentrations of sodium bentonite, areas with sodic, saline and sodic-saline soils and any other areas with low reclamation potential.

d) The Con/Rec Units shall be available upon request to the Commission and affected landowners. Con/Rec Units may be evaluated by the Commission upon complaint or otherwise, regarding whether proper soil handling, damage mitigation or reclamation procedures are being followed.

e) Areas of specific concern or of low reclamation potential shall be recorded in a separate database. Action taken at such locations and the results thereof shall also be recorded and made available to the Commission and the affected property owner upon request.

16. Keystone shall provide each landowner with an explanation regarding trenching and topsoil and subsoil/rock removal, segregation and restoration method options for his/her property consistent with the applicable Con/Rec Unit and shall follow the landowner's selected preference as documented on its written construction agreement with the landowner, as modified by any subsequent amendments, or by other written agreement(s).

a) Keystone shall separate and segregate topsoil from subsoil in agricultural areas, including grasslands and shelter belts, as provided in the CMR Plan and the applicable Con/Rec Unit.

b) Keystone shall repair any damage to property that results from construction activities.

c) Keystone shall restore all areas disturbed by construction to their preconstruction condition, including their original preconstruction topsoil, vegetation, elevation, and contour, or as close thereto as is feasible, except as is otherwise agreed to by the landowner.

d) Except where practicably infeasible, final grading and topsoil replacement and installation of permanent erosion control structures shall be completed in non-residential areas within 20 days after backfilling the trench. In the event that seasonal or other weather conditions, extenuating circumstances, or unforeseen developments beyond Keystone's control prevent compliance with this time frame, temporary erosion controls shall be maintained until conditions allow completion of cleanup and reclamation. In the event

Keystone can not comply with the 20-day time frame as provided in this Condition, it shall give notice of such fact to all affected landowners, and such notice shall include an estimate of when such restoration is expected to be completed.

e) Keystone shall draft specific crop monitoring protocols for agricultural lands. If requested by the landowner, Keystone shall provide an independent crop monitor to conduct yield testing and/or such other measurements of productivity as he shall deem appropriate. The independent monitor shall be a qualified agronomist, rangeland specialist or otherwise qualified with respect to the species to be restored. The protocols shall be available to the Commission upon request and may be evaluated for adequacy in response to a complaint or otherwise.

f) Keystone shall work closely with landowners or land management agencies to determine a plan to control noxious weeds. Landowner permission shall be obtained before the application of herbicides.

g) Keystone's adverse weather plan shall apply to improved hay land and pasture lands in addition to crop lands.

h) The size, density and distribution of rock within the construction right-of-way following reclamation shall be similar to adjacent undisturbed areas. Keystone shall treat rock that cannot be backfilled within or below the level of the natural rock profile as construction debris and remove it for disposal offsite except when the landowner agrees to the placement of the rock on his property. In such case, the rock shall be placed in accordance with the landowner's directions.

i) Keystone shall utilize the proposed trench line for its pipe stringing trucks where conditions allow and shall employ adequate measures to decompact subsoil as provided in its CMR Plan. Topsoil shall be decompacted if requested by the landowner.

j) Keystone shall monitor and take appropriate mitigative actions as necessary to address salinity issues when dewatering the trench, and field conductivity and/or other appropriate constituent analyses shall be performed prior to disposal of trench water in areas where salinity may be expected. Keystone shall notify landowners prior to any discharge of saline water on their lands or of any spills of hazardous materials on their lands of one pint or more or of any lesser volume which is required by any federal, state, or local law or regulation or product license or label to be reported to a state or federal agency, manufacturer, or manufacturer's representative.

k) Keystone shall install trench and slope breakers where necessary in accordance with the CMR Plan as augmented by Staff's recommendations in Post Hearing Commission Staff Brief, pp. 26-27.

l) Keystone shall apply mulch when reasonably requested by landowners and also wherever necessary following seeding to stabilize the soil surface and to reduce wind and water erosion. Keystone shall follow the other recommendations regarding mulch application in Post Hearing Commission Staff Brief, p. 27.

m) Keystone shall reseed all lands with comparable crops to be approved by landowner in landowner's reasonable discretion, or in pasture, hay or native species areas with comparable grass or forage crop seed or native species mix to be approved by landowner in

landowner's reasonable discretion. Keystone shall actively monitor revegetation on all disturbed areas for at least two years.

n) Keystone shall coordinate with landowners regarding his/her desires to properly protect cattle, shall implement such protective measures as are reasonably requested by the landowner and shall adequately compensate the landowner for any loss.

o) Prior to commencing construction, Keystone shall file with the Commission a confidential list of property owners crossed by the pipeline and update this list if route changes during construction result in property owner changes.

p) Except in areas where fire suppression resources as provided in CMR Plan 2.16 are in close proximity, to minimize fire risk, Keystone shall, and shall cause its contractor to, equip each of its vehicles used in pre-construction or construction activities, including off-road vehicles, with a hand held fire extinguisher, portable compact shovel and communication device such as a cell phone, in areas with coverage, or a radio capable of achieving prompt communication with Keystone's fire suppression resources and emergency services.

17. Keystone shall cover open-bodied dump trucks carrying sand or soil while on paved roads and cover open-bodied dump trucks carrying gravel or other materials having the potential to be expelled onto other vehicles or persons while on all public roads.

18. Keystone shall use its best efforts to not locate fuel storage facilities within 200 feet of private wells and 400 feet of municipal wells and shall minimize and exercise vigilance in refueling activities in areas within 200 feet of private wells and 400 feet of municipal wells.

19. If trees are to be removed that have commercial or other value to affected landowners, Keystone shall compensate the landowner for the fair market value of the trees to be cleared and/or allow the landowner the right to retain ownership of the felled trees. Except as the landowner shall otherwise agree in writing, the width of the clear cuts through any windbreaks and shelterbelts shall be limited to 50 feet or less, and he width of clear cuts through extended lengths of wooded areas shall be limited to 85 feet or less. The environmental inspection in Condition 14 shall include forested lands.

20. Keystone shall implement the following sediment control practices:

a) Keystone shall use floating sediment curtains to maintain sediments within the construction right of way in open water bodies with no or low flow when the depth of non-flowing water exceeds the height of straw bales or silt fence installation. In such situations the floating sediment curtains shall be installed as a substitute for straw bales or silt fence along the edge or edges of each side of the construction right-of-way that is under water at a depth greater than the top of a straw bale or silt fence as portrayed in Keystone's construction Detail #11 included in the CMR Plan.

b) Keystone shall install sediment barriers in the vicinity of delineated wetlands and water bodies as outlined in the CMR Plan regardless of the presence of flowing or standing water at the time of construction.

c) The Applicant should consult with South Dakota Game, Fish and Parks (SDGFP) to avoid construction near water bodies during fish spawning periods in which in-stream

construction activities should be avoided to limit impacts on specific fisheries, if any, with commercial or recreational importance.

21. Keystone shall develop frac-out plans specific to areas in South Dakota where horizontal directional drilling will occur. The plan shall be followed in the event of a frac-out. If a frac-out event occurs, Keystone shall promptly file a report of the incident with the Commission. Keystone shall also, after execution of the plan, provide a follow-up report to the Commission regarding the results of the occurrence and any lingering concerns.

22. Keystone shall comply with the following conditions regarding construction across or near wetlands, water bodies and riparian areas:

a) Unless a wetland is actively cultivated or rotated cropland or unless site specific conditions require utilization of Keystone's proposed 85 foot width and the landowner has agreed to such greater width, the width of the construction right-of-way shall be limited to 75 feet in non-cultivated wetlands unless a different width is approved or required by the United States Army Corps of Engineers.

b) Unless a wetland is actively cultivated or rotated cropland, extra work areas shall be located at least 50 feet away from wetland boundaries except where site-specific conditions render a 50-foot setback infeasible. Extra work areas near water bodies shall be located at least 50 feet from the water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land or where site-specific conditions render a 50-foot setback infeasible. Clearing of vegetation between extra work space areas and the water's edge shall be limited to the construction right-of-way.

c) Water body crossing spoil, including upland spoil from crossings of streams up to 30 feet in width, shall be stored in the construction right of way at least 10 feet from the water's edge or in additional extra work areas and only on a temporary basis.

d) Temporary in-stream spoil storage in streams greater than 30 feet in width shall only be conducted in conformity with any required federal permit(s) and any applicable federal or state statutes, rules and standards.

e) Wetland and water body boundaries and buffers shall be marked and maintained until ground disturbing activities are complete. Keystone shall maintain 15-foot buffers where practicable, which for stream crossings shall be maintained except during the period of trenching, pipe laying and backfilling the crossing point. Buffers shall not be required in the case of non-flowing streams.

f) Best management practices shall be implemented to prevent heavily silt-laden trench water from reaching any wetland or water body directly or indirectly.

g) Erosion control fabric shall be used on water body banks immediately following final stream bank restoration unless riprap or other bank stabilization methods are utilized in accordance with federal or state permits.

h) The use of timber and slash to support equipment crossings of wetlands shall be avoided.

i) Subject to Conditions 37 and 38, vegetation restoration and maintenance adjacent to water bodies shall be conducted in such manner to allow a riparian strip at least 25 feet wide as measured from the water body's mean high water mark to permanently re-vegetate with native plant species across the entire construction right-of way.

23. Keystone shall comply with the following conditions regarding road protection and bonding:

a) Keystone shall coordinate road closures with state and local governments and emergency responders and shall acquire all necessary permits authorizing crossing and construction use of county and township roads.

b) Keystone shall implement a regular program of road maintenance and repair through the active construction period to keep paved and gravel roads in an acceptable condition for residents and the general public.

c) Prior to their use for construction, Keystone shall videotape those portions of all roads which will be utilized by construction equipment or transport vehicles in order to document the pre-construction condition of such roads.

d) After construction, Keystone shall repair and restore, or compensate governmental entities for the repair and restoration of, any deterioration caused by construction traffic, such that the roads are returned to at least their preconstruction condition.

e) Keystone shall use appropriate preventative measures as needed to prevent damage to paved roads and to remove excess soil or mud from such roadways.

f) Pursuant to SDCL 49-41B-38, Keystone shall obtain and file for approval by the Commission prior to construction in such year a bond in the amount of $15.6 million for the year in which construction is to commence and a second bond in the amount of $15.6 million for the ensuing year, including any additional period until construction and repair has been completed, to ensure that any damage beyond normal wear to public roads, highways, bridges or other related facilities will be adequately restored or compensated. Such bonds shall be issued in favor of, and for the benefit of, all such townships, counties, and other governmental entities whose property is crossed by the Project. Each bond shall remain in effect until released by the Commission, which release shall not be unreasonably denied following completion of the construction and repair period. Either at the contact meetings required by Condition 10 or by mail, Keystone shall give notice of the existence and amount of these bonds to all counties, townships and other governmental entities whose property is crossed by the Project.

24. Although no residential property is expected to be encountered in connection with the Project, in the event that such properties are affected and due to the nature of residential property, Keystone shall implement the following protections in addition to those set forth in its CMR Plan in areas where the Project passes within 500 feet of a residence:

a) To the extent feasible, Keystone shall coordinate construction work schedules with affected residential landowners prior to the start of construction in the area of the residences.

b) Keystone shall maintain access to all residences at all times, except for periods when it is infeasible to do so or except as otherwise agreed between Keystone and the occupant. Such periods shall be restricted to the minimum duration possible and shall be coordinated with affected residential landowners and occupants, to the extent possible.

c) Keystone shall install temporary safety fencing, when reasonably requested by the landowner or occupant, to control access and minimize hazards associated with an open trench and heavy equipment in a residential area.

d) Keystone shall notify affected residents in advance of any scheduled disruption of utilities and limit the duration of such disruption.

e) Keystone shall repair any damage to property that results from construction activities.

f) Keystone shall separate topsoil from subsoil and restore all areas disturbed by construction to at least their preconstruction condition.

g) Except where practicably infeasible, final grading and topsoil replacement, installation of permanent erosion control structures and repair of fencing and other structures shall be completed in residential areas within 10 days after backfilling the trench. In the event that seasonal or other weather conditions, extenuating circumstances, or unforeseen developments beyond Keystone's control prevent compliance with this time frame, temporary erosion controls and appropriate mitigative measures shall be maintained until conditions allow completion of cleanup and reclamation.

25. Construction must be suspended when weather conditions are such that construction activities will cause irreparable damage, unless adequate protection measures approved by the Commission are taken. At least two months prior to the start of construction in South Dakota, Keystone shall file with the Commission an adverse weather land protection plan containing appropriate adverse weather land protection measures, the conditions in which such measures may be appropriately used, and conditions in which no construction is appropriate, for approval of or modification by the Commission prior to the start of construction. The Commission shall make such plan available to impacted landowners who may provide comment on such plan to the Commission.

26. Reclamation and clean-up along the right-of-way must be continuous and coordinated with ongoing construction.

27. All pre-existing roads and lanes used during construction must be restored to at least their pre-construction condition that will accommodate their previous use, and areas used as temporary roads during construction must be restored to their original condition, except as otherwise requested or agreed to by the landowner or any governmental authority having jurisdiction over such roadway.

28. Keystone shall, prior to any construction, file with the Commission a list identifying private and new access roads that will be used or required during construction and file a description of methods used by Keystone to reclaim those access roads.

29. Prior to construction, Keystone shall have in place a winterization plan and shall implement the plan if winter conditions prevent reclamation completion until spring. The plan shall be provided to affected landowners and, upon request, to the Commission.

30. Numerous Conditions of this Order, including but not limited to 16, 19, 24, 25, 26, 27 and 51 relate to construction and its effects upon affected landowners and their property. The Applicant may encounter physical conditions along the route during construction which make compliance with certain of these Conditions infeasible. If, after providing a copy of this order, including the Conditions, to the landowner, the Applicant and landowner agree in writing to modifications of one or more requirements specified in these conditions, such as maximum clearances or right-of-way widths, Keystone may follow the alternative procedures and specifications agreed to between it and the landowner.

IV. Pipeline Operations, Detection and Emergency Response

31. Keystone shall construct and operate the pipeline in the manner described in the application and at the hearing, including in Keystone's exhibits, and in accordance with the conditions of this permit, the PHMSA Special Permit, if issued, and the conditions of this Order and the construction permit granted herein.

32. Keystone shall require compliance by its shippers with its crude oil specifications in order to minimize the potential for internal corrosion.

33. Keystone's obligation for reclamation and maintenance of the right-of-way shall continue throughout the life of the pipeline. In its surveillance and maintenance activities, Keystone shall, and shall cause its contractor to, equip each of its vehicles, including off-road vehicles, with a hand held fire extinguisher, portable compact shovel and communication device such as a cell phone, in areas with coverage, or a radio capable of achieving prompt communication with emergency services.

34. In accordance with 49 C.F.R. 195, Keystone shall continue to evaluate and perform assessment activities regarding high consequence areas. Prior to Keystone commencing operation, all unusually sensitive areas as defined by 49 CFR 195.6 that may exist, whether currently marked on DOT's HCA maps or not, should be identified and added to the Emergency Response Plan and Integrity Management Plan. In its continuing assessment and evaluation of environmentally sensitive and high consequence areas, Keystone shall seek out and consider local knowledge, including the knowledge of the South Dakota Geological Survey, the Department of Game Fish and Parks and local landowners and governmental officials.

35. The evidence in the record demonstrates that in some reaches of the Project in southern Tripp County, the High Plains Aquifer is present at or very near ground surface and is overlain by highly permeable sands permitting the uninhibited infiltration of contaminants. This aquifer serves as the water source for several domestic farm wells near the pipeline as well as public water supply system wells located at some distance and upgradient from the pipeline route. Keystone shall identify the High Plains Aquifer area in southern Tripp County as a hydrologically sensitive area in its Integrity Management and Emergency Response Plans. Keystone shall similarly treat any other similarly vulnerable and beneficially useful surficial aquifers of which it becomes aware during construction and continuing route evaluation.

36. Prior to putting the Keystone Pipeline into operation, Keystone shall prepare, file with PHMSA and implement an emergency response plan as required under 49 CFR 194 and a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies as required under 49 CFR 195.402. Keystone shall also prepare and implement a written integrity management program in the manner and at such time as required under 49 CFR 195.452. At such time as Keystone files its Emergency Response Plan and

Integrity Management Plan with PHMSA or any other state or federal agency, it shall also file such documents with the Commission. The Commission's confidential filing rules found at ARSD 20:10:01:41 may be invoked by Keystone with respect to such filings to the same extent as with all other filings at the Commission. If information is filed as "confidential," any person desiring access to such materials or the Staff or the Commission may invoke the procedures of ARSD 20:10:01:41 through 20:10:01:43 to determine whether such information is entitled to confidential treatment and what protective provisions are appropriate for limited release of information found to be entitled to confidential treatment.

37. To facilitate periodic pipeline leak surveys during operation of the facilities in wetland areas, a corridor centered on the pipeline and up to 15 feet wide shall be maintained in an herbaceous state. Trees within 15 feet of the pipeline greater than 15 feet in height may be selectively cut and removed from the permanent right-of-way.

38. To facilitate periodic pipeline leak surveys in riparian areas, a corridor centered on the pipeline and up to 10 feet wide shall be maintained in an herbaceous state.

V. Environmental

39. Except to the extent waived by the owner or lessee in writing or to the extent the noise levels already exceed such standard, the noise levels associated with Keystone's pump stations and other noise-producing facilities will not exceed the L10=55dbA standard at the nearest occupied, existing residence, office, hotel/motel or non-industrial business not owned by Keystone. The point of measurement will be within 100 feet of the residence or business in the direction of the pump station or facility. Post-construction operational noise assessments will be completed by an independent third-party noise consultant, approved by the Commission, to show compliance with the noise level at each pump station or other noise-producing facility. The noise assessments will be performed in accordance with applicable American National Standards Institute standards. The results of the assessments will be filed with the Commission. In the event that the noise level exceeds the limit set forth in this condition at any pump station or other noise producing facility, Keystone shall promptly implement noise mitigation measures to bring the facility into compliance with the limits set forth in this condition and shall report to the Commission concerning the measures taken and the results of post-mitigation assessments demonstrating that the noise limits have been met.

40. At the request of any landowner or public water supply system that offers to provide the necessary access to Keystone over his/her property or easement(s) to perform the necessary work, Keystone shall replace at no cost to such landowner or public water supply system, any polyethylene water piping located within 500 feet of the Project with piping that is resistant to permeation by BTEX. Keystone shall not be required to replace that portion of any piping that passes through or under a basement wall or other wall of a home or other structure. At least forty-five (45) days prior to commencing construction, Keystone shall publish a notice in each newspaper of general circulation in each county through which the Project will be constructed advising landowners and public water supply systems of this condition.

41. Keystone shall follow all protection and mitigation efforts as identified by the US Fish and Wildlife Service ("USFWS") and SDGFP. Keystone shall identify all greater prairie chicken and greater sage and sharp-tailed grouse leks within the buffer distances from the construction right of way set forth for the species in the FEIS and Biological Assessment (BA) prepared by DOS and USFWS. In accordance with commitments in the FEIS and BA, Keystone shall avoid or restrict

construction activities as specified by USFWS within such buffer zones between March 1 and June 15 and for other species as specified by USFWS and SDGFP.

42. Keystone shall keep a record of drain tile system information throughout planning and construction, including pre-construction location of drain tiles. Location information shall be collected using a sub-meter accuracy global positioning system where available or, where not available by accurately documenting the pipeline station numbers of each exposed drain tile. Keystone shall maintain the drain tile location information and tile specifications and incorporate it into its Emergency Response and Integrity Management Plans where drains might be expected to serve as contaminant conduits in the event of a release. If drain tile relocation is necessary, the applicant shall work directly with landowner to determine proper location. The location of permanent drain tiles shall be noted on as-built maps. Qualified drain tile contractors shall be employed to repair drain tiles.

VI. Cultural and Paleontological Resources

43. In accordance with Application, Section 6.4, Keystone shall follow the "Unanticipated Discoveries Plan," as reviewed by the State Historical Preservation Office ("SHPO") and approved by the DOS and provide it to the Commission upon request. Ex TC-1.6.4, pp. 94-96; Ex S-3. If during construction, Keystone or its agents discover what may be an archaeological resource, cultural resource, historical resource or gravesite, Keystone or its contractors or agents shall immediately cease work at that portion of the site and notify the DOS, the affected landowner(s) and the SHPO. If the DOS and SHPO determine that a significant resource is present, Keystone shall develop a plan that is approved by the DOS and commenting/signatory parties to the Programmatic Agreement to salvage avoid or protect the archaeological resource. If such a plan will require a materially different route than that approved by the Commission, Keystone shall obtain Commission and landowner approval for the new route before proceeding with any further construction. Keystone shall be responsible for any costs that the landowner is legally obligated to incur as a consequence of the disturbance of a protected cultural resource as a result of Keystone's construction or maintenance activities.

44. Keystone shall implement and comply with the following procedures regarding paleontological resources:

a) Prior to commencing construction, Keystone shall conduct a literature review and records search, and consult with the BLM and Museum of Geology at the S.D. School of Mines and Technology ("SDSMT") to identify known fossil sites along the pipeline route and identify locations of surface exposures of paleontologically sensitive rock formations using the BLM's Potential Fossil Yield Classification system. Any area where trenching will occur into the Hell Creek Formation shall be considered a high probability area.

b) Keystone shall at its expense conduct a pre-construction field survey of each area identified by such review and consultation as a known site or high probability area within the construction ROW. Following BLM guidelines as modified by the provisions of Condition 44, including the use of BLM permitted paleontologists, areas with exposures of high sensitivity (PFYC Class 4) and very high sensitivity (PFYC Class 5) rock formations shall be subject to a 100% pedestrial field survey, while areas with exposures of moderately sensitive rock formations (PFYC Class 3) shall be spot-checked for occurrences of scientifically or economically significant surface fossils and evidence of subsurface fossils. Scientifically or economically significant surface fossils shall be avoided by the Project or mitigated by collecting them if avoidance is not feasible. Following BLM guidelines for the assessment

and mitigation of paleontological resources, scientifically significant paleontological resources are defined as rare vertebrate fossils that are identifiable to taxon and element, and common vertebrate fossils that are identifiable to taxon and element and that have scientific research value; and scientifically noteworthy occurrences of invertebrate, plant and trace fossils. Fossil localities are defined as the geographic and stratigraphic locations at which fossils are found.

c) Following the completion of field surveys, Keystone shall prepare and file with the Commission a paleontological resource mitigation plan. The mitigation plan shall specify monitoring locations, and include BLM permitted monitors and proper employee and contractor training to identify any paleontological resources discovered during construction and the procedures to be followed following such discovery. Paleontological monitoring will take place in areas within the construction ROW that are underlain by rock formations with high sensitivity (PFYC Class 4) and very high sensitivity (PFYC Class 5), and in areas underlain by rock formations with moderate sensitivity (PFYC Class 3) where significant fossils were identified during field surveys.

d) If during construction, Keystone or its agents discover what may be a paleontological resource of economic significance, or of scientific significance, as defined in subparagraph (b) above, Keystone or its contractors or agents shall immediately cease work at that portion of the site and, if on private land, notify the affected landowner(s). Upon such a discovery, Keystone's paleontological monitor will evaluate whether the discovery is of economic significance, or of scientific significance as defined in subparagraph (b) above. If an economically or scientifically significant paleontological resource is discovered on state land, Keystone will notify SDSMT and if on federal land, Keystone will notify the BLM or other federal agency. In no case shall Keystone return any excavated fossils to the trench. If a qualified and BLM-permitted paleontologist, in consultation with the landowner, BLM, or SDSMT determines that an economically or scientifically significant paleontological resource is present, Keystone shall develop a plan that is reasonably acceptable to the landowner(s), BLM, or SDSMT, as applicable, to accommodate the salvage or avoidance of the paleontological resource to protect or mitigate damage to the resource. The responsibility for conducting such measures and paying the costs associated with such measures, whether on private, state or federal land, shall be borne by Keystone to the same extent that such responsibility and costs would be required to borne by Keystone on BLM managed lands pursuant to BLM regulations and guidelines, including the BLM Guidelines for Assessment and Mitigation of Potential Impacts to Paleontological Resources, except to the extent factually inappropriate to the situation in the case of private land (e.g. museum curation costs would not be paid by Keystone in situations where possession of the recovered fossil(s) was turned over to the landowner as opposed to curation for the public). If such a plan will require a materially different route than that approved by the Commission, Keystone shall obtain Commission approval for the new route before proceeding with any further construction. Keystone shall, upon discovery and salvage of paleontological resources either during pre-construction surveys or construction and monitoring on private land, return any fossils in its possession to the landowner of record of the land on which the fossil is found. If on state land, the fossils and all associated data and documentation will be transferred to the SDSM; if on federal land, to the BLM.

e) To the extent that Keystone or its contractors or agents have control over access to such information, Keystone shall, and shall require its contractors and agents to, treat the locations of sensitive and valuable resources as confidential and limit public access to this information.

VII. Enforcement and Liability for Damage

45. Keystone shall repair or replace all property removed or damaged during all phases of construction and operation of the proposed transmission facility, including but not limited to, all fences, gates and utility, water supply, irrigation or drainage systems. Keystone shall compensate the owners for damages or losses that cannot be fully remedied by repair or replacement, such as lost productivity and crop and livestock losses or loss of value to a paleontological resource damaged by construction or other activities.

46. In the event that a person's well is contaminated as a result of construction or pipeline operation, Keystone shall pay all costs associated with finding and providing a permanent water supply that is at least of similar quality and quantity; and any other related damages, including but not limited to any consequences, medical or otherwise, related to water contamination.

47. Any damage that occurs as a result of soil disturbance on a persons' property shall be paid for by Keystone.

48. No person will be held responsible for a pipeline leak that occurs as a result of his/her normal farming practices over the top of or near the pipeline.

49. Keystone shall pay commercially reasonable costs and indemnify and hold the landowner harmless for any loss, damage, claim or action resulting from Keystone's use of the easement, including any resulting from any release of regulated substances or from abandonment of the facility, except to the extent such loss, damage claim or action results from the gross negligence or willful misconduct of the landowner or its agents.

50. The Commission's complaint process as set forth in ARSD 20:10:01 shall be available to landowners, other persons sustaining or threatened with damage or the consequences of Keystone's failure to abide by the conditions of this permit or otherwise having standing to obtain enforcement of the conditions of this Order and Permit.

Exhibit B

RULINGS ON PROPOSED FINDINGS OF FACT

Rulings on Applicants' Proposed Findings of Fact

As Applicant is the prevailing party, most of Applicant's Proposed Findings of Fact have been accepted in their general substance and incorporated in the Findings of Fact, with additions and modifications to reflect the Commission's understanding of the record.

List of IARC Group 1 carcinogens

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This article is **outdated**. Please update this article to reflect recent events or newly available information. *(June 2012)*

Substances, mixtures and exposure circumstances in this list have been classified by the IARC as ***Group 1**: The agent (mixture) is carcinogenic to humans. The exposure circumstance entails exposures that are carcinogenic to humans.* This category is used when there is *sufficient evidence* of carcinogenicity in humans. Exceptionally, an agent (mixture) may be placed in this category when evidence of carcinogenicity in humans is less than sufficient but there is *sufficient evidence* of carcinogenicity in experimental animals and strong evidence in exposed humans that the agent (mixture) acts through a relevant mechanism of carcinogenicity.

Contents

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Agents and groups of agents[edit]

- Acetaldehyde[1]
- 4-Aminobiphenyl
- Aristolochic acids, and plants containing them
- Arsenic and arsenic compounds[1]
- Asbestos
- Azathioprine
- Benzene
- Benzidine
- Benzo[*a*]pyrene
- Beryllium and beryllium compounds[2]
- Chlornapazine (*N*,*N*-Bis(2-chloroethyl)-2-naphthylamine)
- Bis(chloromethyl)ether
- Chloromethyl methyl ether
- 1,3-Butadiene
- 1,4-Butanediol dimethanesulfonate (Busulphan, Myleran)

- Cadmium and cadmium compounds[2]
- Chlorambucil
- Methyl-CCNU (1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea; Semustine)
- Chromium(VI) compounds[2]
- Ciclosporin
- Contraceptives, hormonal, combined forms (those containing both estrogen and a progestogen)3
- Contraceptives, oral, sequential forms of hormonal contraception (a period of estrogen-only followed by a period of both estrogen and a progestogen)
- Cyclophosphamide
- Diethylstilboestrol
- Dyes metabolized to benzidine
- Epstein-Barr virus
- Estrogens, nonsteroidal 1
- Estrogens, steroidal 1
- Estrogen therapy, postmenopausal
- Ethanol in alcoholic beverages 4,[1]
- Erionite
- Ethylene oxide
- Etoposide alone and in combination with cisplatin and bleomycin
- Formaldehyde
- Gallium arsenide
- *Helicobacter pylori* (infection with)
- Hepatitis B virus (chronic infection with)
- Hepatitis C virus (chronic infection with)
- Herbal remedies containing plant species of the genus *Aristolochia*
- Human immunodeficiency virus type 1 (infection with)
- Human papillomavirus type 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59 and 66
- Human T-cell lymphotropic virus type I
- Melphalan
- Methoxsalen (8-Methoxypsoralen) plus ultraviolet A radiation
- 4,4'-methylene-bis(2-chloroaniline) (MOCA)
- MOPP and other combined chemotherapy including alkylating agents
- Mustard gas (Sulfur mustard)
- 2-Naphthylamine
- Neutron radiation
- Nickel compounds[2]
- 4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)
- N-Nitrosonornicotine (NNN)
- Opisthorchis viverrini (infection with)
- Outdoor air pollution
- Particulate matter in outdoor air pollution
- Phosphorus-32, as phosphate
- Plutonium-239 and its decay products (may contain plutonium-240 and other isotopes), as aerosols

- Radioiodines, short-lived isotopes, including iodine-131, from atomic reactor accidents and nuclear weapons detonation (exposure during childhood)
- Radionuclides, α-particle-emitting, internally deposited[5]
- Radionuclides, β-particle-emitting, internally deposited[5]
- Radium-224 and its decay products
- Radium-226 and its decay products
- Radium-228 and its decay products
- Radon-222 and its decay products
- *Schistosoma haematobium* (infection with)
- Silica, crystalline (inhaled in the form of quartz or cristobalite from occupational sources)
- Solar radiation
- Talc containing asbestiform fibres
- Tamoxifen[6]
- 2,3,7,8-Tetrachlorodibenzo-para-dioxin
- Thiotepa (1,1',1"-Phosphinothioylidynetrisaziridine)
- Thorium-232 and its decay products, administered intravenously as a colloidal dispersion of thorium-232 dioxide
- Treosulfan
- *ortho*-Toluidine
- Vinyl chloride
- Ultraviolet Radiation
- X-Radiation and Gamma radiation

PUBLIC HEALTH STATEMENT
Benzene
CAS#: 71-43-2

Division of Toxicology and Environmental Medicine **August 2007**

This Public Health Statement is the summary chapter from the Toxicological Profile for Benzene. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-800-232-4636.

This public health statement tells you about benzene and the effects of exposure to it.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. Benzene has been found in at least 1,000 of the 1,684 current or former NPL sites. Although the total number of NPL sites evaluated for this substance is not known, the possibility exists that the number of sites at which benzene is found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure and exposure to this substance may harm you.

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to benzene, many factors will determine whether you will be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS BENZENE?

Benzene, also known as benzol, is a colorless liquid with a sweet odor. Benzene evaporates into air very quickly and dissolves slightly in water. Benzene is highly flammable. Most people can begin to smell benzene in air at approximately 60 parts of benzene per million parts of air (ppm) and recognize it as benzene at 100 ppm. Most people can begin to taste benzene in water at 0.5–4.5 ppm. One part per million is approximately equal to one drop in 40 gallons. Benzene is found in air, water, and soil. Benzene comes from both industrial and natural sources.

Industrial Sources and Uses. Benzene was first discovered and isolated from coal tar in the 1800s. Today, benzene is made mostly from petroleum. Because of its wide use, benzene ranks in the top 20 in production volume for chemicals produced in the United States. Various industries use benzene to make other chemicals, such as styrene (for Styrofoam® and other plastics), cumene (for various resins), and cyclohexane (for nylon and synthetic fibers). Benzene is also used in the

manufacturing of some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides.

Natural Sources. Natural sources of benzene, which include gas emissions from volcanoes and forest fires, also contribute to the presence of benzene in the environment. Benzene is also present in crude oil and gasoline and cigarette smoke.

1.2 WHAT HAPPENS TO BENZENE WHEN IT ENTERS THE ENVIRONMENT?

Benzene is commonly found in the environment. Industrial processes are the main sources of benzene in the environment. Benzene levels in the air can be elevated by emissions from burning coal and oil, benzene waste and storage operations, motor vehicle exhaust, and evaporation from gasoline service stations. Tobacco smoke is another source of benzene in air, particularly indoors. Industrial discharge, disposal of products containing benzene, and gasoline leaks from underground storage tanks release benzene into water and soil.

Benzene can pass into air from water and soil surfaces. Once in the air, benzene reacts with other chemicals and breaks down within a few days. Benzene in the air can also be deposited on the ground by rain or snow.

Benzene in water and soil breaks down more slowly. Benzene is slightly soluble in water and can pass through the soil into underground water. Benzene in the environment does not build up in plants or animals.

1.3 HOW MIGHT I BE EXPOSED TO BENZENE?

Everyone is exposed to a small amount of benzene every day. You are exposed to benzene in the outdoor environment, in the workplace, and in the home. Exposure of the general population to benzene mainly occurs through breathing air that contains benzene. The major sources of benzene exposure are tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions. Vapors (or gases) from products that contain benzene, such as glues, paints, furniture wax, and detergents, can also be a source of exposure. Auto exhaust and industrial emissions account for about 20% of the total national exposure to benzene. About half of the exposure to benzene in the United States results from smoking tobacco or from exposure to tobacco smoke. The average smoker (32 cigarettes per day) takes in about 1.8 milligrams (mg) of benzene per day. This amount is about 10 times the average daily intake of benzene by nonsmokers.

Measured levels of benzene in outdoor air have ranged from 0.02 to 34 parts of benzene per billion parts of air (ppb) (1 ppb is 1,000 times less than 1 ppm). People living in cities or industrial areas are generally exposed to higher levels of benzene in air than those living in rural areas. Benzene levels in the home are usually higher than outdoor levels. People may be exposed to higher levels of benzene in air by living near hazardous waste sites, petroleum refining operations, petrochemical manufacturing sites, or gas stations.

For most people, the level of exposure to benzene through food, beverages, or drinking water is not as

high as through air. Drinking water typically contains less than 0.1 ppb benzene. Benzene has been detected in some bottled water, liquor, and food. Leakage from underground gasoline storage tanks or from landfills and hazardous waste sites that contain benzene can result in benzene contamination of well water. People with benzene-contaminated tap water can be exposed from drinking the water or eating foods prepared with the water. In addition, exposure can result from breathing in benzene while showering, bathing, or cooking with contaminated water.

Individuals employed in industries that make or use benzene may be exposed to the highest levels of benzene. As many as 238,000 people may be occupationally exposed to benzene in the United States. These industries include benzene production (petrochemicals, petroleum refining, and coke and coal chemical manufacturing), rubber tire manufacturing, and storage or transport of benzene and petroleum products containing benzene. Other workers who may be exposed to benzene include coke oven workers in the steel industry, printers, rubber workers, shoe makers, laboratory technicians, firefighters, and gas station employees.

1.4 HOW CAN BENZENE ENTER AND LEAVE MY BODY?

Benzene can enter your body through your lungs, gastrointestinal tract, and across your skin. When you are exposed to high levels of benzene in air, about half of the benzene you breathe in passes through the lining of your lungs and enters your bloodstream. When you are exposed to benzene in food or drink, most of the benzene you take in by mouth passes through the lining of your gastrointestinal tract and enters your bloodstream. A small amount will enter your body by passing through your skin and into your bloodstream during skin contact with benzene or benzene-containing products. Once in the bloodstream, benzene travels throughout your body and can be temporarily stored in the bone marrow and fat. Benzene is converted to products, called metabolites, in the liver and bone marrow. Some of the harmful effects of benzene exposure are caused by these metabolites. Most of the metabolites of benzene leave the body in the urine within 48 hours after exposure.

1.5 HOW CAN BENZENE AFFECT MY HEALTH?

Scientists use many tests to protect the public from harmful effects of toxic chemicals and to find ways for treating persons who have been harmed.

One way to learn whether a chemical will harm people is to determine how the body absorbs, uses, and releases the chemical. For some chemicals, animal testing may be necessary. Animal testing may also help identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method for getting information needed to make wise decisions that protect public health. Scientists have the responsibility to treat research animals with care and compassion. Scientists must comply with strict animal care guidelines because laws today protect the welfare of research animals.

After exposure to benzene, several factors determine whether harmful health effects will

occur, as well as the type and severity of such health effects. These factors include the amount of benzene to which you are exposed and the length of time of the exposure. Most information on effects of long-term exposure to benzene are from studies of workers employed in industries that make or use benzene. These workers were exposed to levels of benzene in air far greater than the levels normally encountered by the general population. Current levels of benzene in workplace air are much lower than in the past. Because of this reduction and the availability of protective equipment such as respirators, fewer workers have symptoms of benzene poisoning.

Brief exposure (5–10 minutes) to very high levels of benzene in air (10,000–20,000 ppm) can result in death. Lower levels (700–3,000 ppm) can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. In most cases, people will stop feeling these effects when they are no longer exposed and begin to breathe fresh air.

Eating foods or drinking liquids containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, coma, and death. The health effects that may result from eating foods or drinking liquids containing lower levels of benzene are not known. If you spill benzene on your skin, it may cause redness and sores. Benzene in your eyes may cause general irritation and damage to your cornea.

Benzene causes problems in the blood. People who breathe benzene for long periods may experience harmful effects in the tissues that form blood cells, especially the bone marrow. These effects can disrupt normal blood production and cause a decrease in important blood components. A decrease in red blood cells can lead to anemia. Reduction in other components in the blood can cause excessive bleeding. Blood production may return to normal after exposure to benzene stops. Excessive exposure to benzene can be harmful to the immune system, increasing the chance for infection and perhaps lowering the body's defense against cancer.

Long-term exposure to benzene can cause cancer of the blood-forming organs. This condition is called leukemia. Exposure to benzene has been associated with development of a particular type of leukemia called acute myeloid leukemia (AML). The Department of Health and Human Services has determined that benzene is a known carcinogen (can cause cancer). Both the International Agency for Cancer Research and the EPA have determined that benzene is carcinogenic to humans.

Exposure to benzene may be harmful to the reproductive organs. Some women workers who breathed high levels of benzene for many months had irregular menstrual periods. When examined, these women showed a decrease in the size of their ovaries. However, exact exposure levels were unknown, and the studies of these women did not prove that benzene caused these effects. It is not known what effects exposure to benzene might have on the developing fetus in pregnant women or on fertility in men. Studies with pregnant animals show that breathing benzene has harmful effects on the developing fetus. These effects include low birth weight, delayed bone formation, and bone marrow damage.

We do not know what human health effects might occur after long-term exposure to food and water

contaminated with benzene. In animals, exposure to food or water contaminated with benzene can damage the blood and the immune system and can cause cancer.

1.6 HOW CAN BENZENE AFFECT CHILDREN?

This section discusses potential health effects in humans from exposures during the period from conception to maturity at 18 years of age.

Children can be affected by benzene exposure in the same ways as adults. Benzene can pass from the mother's blood to a fetus. It is not known if children are more susceptible to benzene poisoning than adults.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO BENZENE?

If your doctor finds that you have been exposed to substantial amounts of benzene, ask whether your children might also have been exposed. Your doctor might need to ask your state health department to investigate.

Gasoline and cigarette smoke are two main sources of human exposure to benzene. Benzene exposure can be reduced by limiting contact with these sources. People are exposed to benzene from both active and passive second-hand smoke. Average smokers take in about 10 times more benzene than nonsmokers each day. Families are encouraged not to smoke in their house, in enclosed environments, or near their children.

Benzene is a major component of gasoline and used in many manufacturing processes. Increased levels of benzene can be found at fueling stations, and in air emissions from manufacturing plants and hazardous waste sites. Living near gasoline fueling stations or hazardous waste sites may increase exposure to benzene. People are advised not to have their families play near fueling stations, manufacturing plants, or hazardous waste sites.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO BENZENE?

Several tests can show whether you have been exposed to benzene. Some of these tests may be available at your doctor's office. All of these tests are limited in what they can tell you. The test for measuring benzene in your breath must be done shortly after exposure. This test is not very helpful for detecting very low levels of benzene in your body. Benzene can be measured in your blood. However, because benzene rapidly disappears in the blood, measurements may be useful only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites of benzene, such as phenol, muconic acid, and *S*-phenylmercapturic acid can be measured in the urine. The amount of phenol in urine has been used to check for benzene exposure in workers. The test is useful only when you are exposed to benzene in air at levels of 10 ppm or greater. However, this test must also be done shortly after exposure, and it is not a reliable indicator of how much benzene you have been

exposed to, because phenol is present in the urine from other sources (diet, environment). Measurements of muconic acid or *S*-phenylmercapturic acid in the urine are more sensitive and reliable indicators of benzene exposure. The measurement of benzene in blood or of metabolites in urine cannot be used for making predictions about whether you will experience any harmful health effects. Blood counts of all components of the blood and examination of bone marrow are used to determine benzene exposure and its health effects.

For people exposed to relatively high levels of benzene, complete blood analyses can be used to monitor possible changes related to exposure. However, blood analyses are not useful when exposure levels are low.

1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations *can* be enforced by law. The EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations provide valuable guidelines to protect public health, but *cannot* be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as "not-to-exceed" levels, that is, levels of a toxic substance in air, water, soil, or food that do not exceed a critical value that is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are also updated periodically as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for benzene include the following:

EPA has set 5 ppb as the maximum permissible level of benzene in drinking water. EPA has set a goal of 0 ppb for benzene in drinking water and in water such as rivers and lakes because benzene can cause leukemia. EPA estimates that 10 ppb benzene in drinking water that is consumed regularly or exposure to 0.4 ppb in air over a lifetime could cause a risk of one additional cancer case for every 100,000 exposed persons. EPA recommends 200 ppb as the maximum permissible level of benzene in water for short-term exposures (10 days) for children.

EPA requires that the National Response Center be notified following a discharge or spill into the environment of 10 pounds or more of benzene.

OSHA regulates levels of benzene in the workplace. The maximum allowable amount of benzene in workroom air during an 8-hour workday, 40-hour workweek is 1 ppm. Because benzene can cause

cancer, NIOSH recommends that all workers wear special breathing equipment when they are likely to be exposed to benzene at levels exceeding the recommended (8-hour) exposure limit of 0.1 ppm.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below.

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses that result from exposure to hazardous substances.

Toxicological profiles are also available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and technical assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at cdcinfo@cdc.gov, or by writing to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Environmental Medicine
1600 Clifton Road NE
Mailstop F-32
Atlanta, GA 30333
Fax: 1-770-488-4178

Organizations for-profit may request copies of final Toxicological Profiles from the following:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000
Web site: http://www.ntis.gov/

Nexen spill discovered by worker walking by

Company investigating why pipeline break technology did not work

BY BILL MAH, EDMONTON JOURNALJULY 17, 2015

Crews work to clean an oil spill near Nexen's Long Lake facility by Fort McMurray on Friday July 17, 2015. The spill was discovered by a contractor after the safety system designed to detect ruptures failed.

Photograph by: Garrett Barry, Fort McMurray Today

Technology designed to detect leaks failed to alert Nexen of a pipeline break that spilled five million litres of bitumen and water south of Fort McMurray, the company said Friday.

"We did have a contractor actually walking the pipeline and that's how we discovered it," said Ron Bailey, senior vice-president of Canadian operations for Nexen Energy ULC, which was acquired by China's CNOOC Ltd. in 2013.

The company is investigating why a warning system designed to detect ruptures did not work and how a double-walled pipe less than a year old broke, he said.

After the worker found the break on Wednesday, which Bailey described as looking like a "fish mouth," the high-pressure line was shut down and the Alberta Energy Regulator notified. The Long Lake Kinosis operation where the leak occurred was also shut down.

The pipeline goes from Kinosis, a set of well pads drilled about 10 or 12 kilometres south of the Long Lake facility. The line transports the emulsion from that operation to Long Lake. The operation uses steam to heat up the oilsands bitumen deep underground, enabling it to flow to the surface.

“We’ve walked the entire pipeline length looking for signs of any other leaks and there aren’t any,” Bailey said.

The rupture occurred in a double-layered, 20-inch pipe that was laid in 2014, Bailey said.

There have been no other incidents on that line, he added.

The emulsion contained about 33 per cent bitumen. Water and materials such as sand make up the rest.

The spill was mostly contained to the pipeline right of way by remaining berms left over from construction. The affected area includes muskeg.

The spill, covering an area of about 16,000 square metres, has been “stabilized,” Bailey told reporters in the company’s first news conference since the spill was revealed on Thursday.

“Our response team has been on-site 24-7 since we identified this, looking to minimize the environmental damage and to work on-site cleanup.”

It’s not known how long cleanup will take.

“When bitumen cools, it solidifies so the bitumen is on the surface (of the ground). There’s produced water with it and the produced water is in a pool and we’re looking to get that off as quickly as possible.”

Although a lake is situated about 100 metres from the pipeline, Bailey said there’s no immediate impact to it.

Because of the remoteness of the site at Nexen’s Long Lake steam-assisted gravity drainage operation about 36 kilometres southeast of Fort McMurray, there was no immediate human impact, Bailey said.

The closest aboriginal community of Anzac, part of Fort McMurray First Nation’s Reserve #176, 15 kilometres north of the spill, was notified, Bailey said.

In a statement, Counc. Byron Bates said the spill occurred on traditional territory, “where members of [the] Nation have hunted, fished, trapped and gathered for over a 1000 years.”

The statement from the community also stated that the First Nation community must be included “more directly” in the response.

The spill site is accessible by winter-access road only so crews had to construct an all-weather road to reach the spill.

“That’s taken us some time. We do have that now and we will be starting to vacuum here this morning to take up the spill,” Bailey said.

Another road is being constructed directly to the break to bring in equipment. The company has hired pipeline spill response experts and is setting up equipment to keep wildlife away.

Bailey promised a transparent response to the spill.

“We are deeply concerned with this. I’d just say we sincerely apologize for the impact that this has caused.

“We will take every step that we see as reasonable and as the regulators help us decide what to do to respond to this.”

Melina Laboucan-Massimo, a Greenpeace campaigner, said Nexen’s spill is even bigger than the one in 2011 near her home community of Little Buffalo that spilled about 4.5 million litres into marshland when a Plains Midstream pipe ruptured.

It was then the largest spill on an Energy Resources Conservation Board-regulated pipeline in Alberta in more than three decades.

“It’s quite concerning that they don’t know what the root cause is or how long it was leaking even when companies have newly built pipelines,” she said.

The Athabasca Chipewyan First Nation called the break a milestone in the oilsands.

“It is now home to the largest spill in Canadian history,” the First Nation said in a release.

“A spill this size into the muskeg, which is an important part of the eco-system and houses many of our medicines, berries and habitat for species our people rely on for sustenance, is extremely serious,” said Chief Allan Adam in the statement.

The muskeg feeds into the groundwater system and the spill is dangerously close to the Clearwater River, he said.

Alberta Energy Regulator (AER) staff are at the Nexen spill to assess the situation, investigate and ensure all safety and environmental requirements are met, the agency has said.

There are no Alberta Environment and Parks staff at the scene and AER is taking the lead according to protocol, said spokeswoman Lisa Glover.

Alberta Premier Rachel Notley called the pipeline break “very troubling.”

Notley was in St. John’s, NL for a meeting of premiers and territorial leaders who agreed to a new national energy strategy when news of the spill broke.

“What we need to do is have a rigorous and fulsome investigation into what went wrong here and ensure it is sufficiently rigorous that it can produce clear, meaningful recommendations to ensure that it doesn’t happen again,” she said.

She said it was premature to talk about penalties and enforcement.

The leaders’ agreement won’t force other provinces to automatically accept pipelines across their jurisdictions, but sets out the importance of the energy industry to all of Canada.

While the Nexen break was bad timing and unfortunate, it didn’t alter the views of her fellow premiers that pipelines are still the safest way to transport hydrocarbon products, Notley said.

Notley, who has raised concerns about the “conflicting mandates” of the AER, said she has confidence in the ability of the oilpatch watchdog to conduct a thorough investigation.

“Going forward is there work that can be done to beef up the enforcement and environmental protection work that is done through the AER? Probably,” she said.

With files from Darcy Henton, Calgary Herald

bmah@edmontonjournal.com

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Crews work to clean an oil spill near Nexen's Long Lake facility by Fort McMurray on Friday July 17, 2015. The spill was discovered by a contractor after the safety system designed to detect ruptures failed.

Photograph by: Garrett Barry, Fort McMurray Today

49-41B-22. Applicant's burden of proof. The applicant has the burden of proof to establish that:

(1) The proposed facility will comply with all applicable laws and rules;

(2) The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area;

(3) The facility will not substantially impair the health, safety or welfare of the inhabitants; and

(4) The facility will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government.

Source: SL 1977, ch 390, § 17; SL 1981, ch 340, § 3; SL 1991, ch 386, § 6.

Acute Health Effects of the Enbridge Oil Spill

November 2010
(Minor revisions 12/20/2010)

Michigan Department of Community Health
MDCH

CALHOUN COUNTY MICHIGAN
ORGANIZED 1833

Acute Health Effects of the Enbridge Oil Spill

November 2010
(Minor revisions December 20, 2010)

Martha Stanbury,[1] MSPH, Kim Hekman, MPH,[1] Eden Wells, MD, MPH,[1] Corinne Miller, DDS, PhD,[1] Susan Smolinske, PharmD,[2] James Rutherford, RS, MPA [3]

Address correspondence to:
Martha Stanbury, MSPH
Division of Environmental Health
Michigan Department of Community Health
PO Box 30195, Lansing, MI 48909
stanburym@michigan.gov 517-335-8364.

1. Michigan Department of Community Health, Lansing, MI
2. Poison Control Center, Children's Hospital of Michigan, Detroit, MI
3. Calhoun County Public Health Department, Battle Creek, MI

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Executive Summary

On Monday July 26, 2010, Enbridge Energy Partners, L.P., reported the burst of a 30-inch pipeline near Marshall, Michigan, in Calhoun County. In response to concerns about acute health effects from exposure to spilled oil in this major disaster, state and local public health in Michigan quickly set up a multi-faceted public health surveillance system that included health care provider reporting, community surveys, calls from the public to the Poison Control Center, and analysis of data submitted to the state's syndromic surveillance system. The surveillance system received 147 health care provider reports on 145 patients, identified 320 (58%) of 550 individuals with adverse health effects from four community surveys along the impacted waterways, identified one small worksite symptomatic employees, and tracked 41 calls that were placed to the poison center by the public. Headache, nausea, and respiratory symptoms were the predominant symptoms reported by exposed individuals in all reporting systems. These symptoms are consistent with the published literature regarding potential health effects associated with acute exposure to crude oil.

I. Background

On Monday July 26, 2010, Enbridge Energy Partners, L.P., reported the burst of a 30-inch pipeline near Marshall, Michigan, in Calhoun County. The spill started at least a day earlier based on 911 calls and other reports of strong odors starting July 25. Approximately 800,000 gallons of crude oil spilled into the Talmadge Creek, a waterway that feeds the Kalamazoo River. The contamination ultimately affected 25 miles of the creek and river. While the greatest impact was in Calhoun County, the spill also affected an area of Kalamazoo County encompassing five miles of the river downstream from the border of Calhoun County to a dam just upstream from the city of Kalamazoo (See map in the appendix). The U.S. Environmental Protection Agency (EPA), Calhoun County Public Health Department (CCPHD), Calhoun County Emergency Management, the Michigan Department of Community Health (MDCH) and many other agencies and organizations quickly became involved with public health and environmental response to this massive spill.

Beginning July 26, when the spill was reported to authorities, individuals near Talmadge Creek and the Kalamazoo River began complaining of strong, noxious odors and associated health symptoms in calls to CCPHD and the Michigan PCC. Subsequently, once it had been established, citizen concerns and complaints were routed to a phone hotline developed by Enbridge. Callers reported respiratory, gastrointestinal, and neurological symptoms, predominantly headache and nausea.

To adequately characterize the impact of the oil spill on the public's health, CCPHD, MDCH, and the Kalamazoo County Health and Community Services Department (KCHCS) developed and implemented a public health surveillance system to collect data on individuals with adverse health outcomes secondary to exposure to spilled oil and its vapors. The goal of this surveillance was to describe the magnitude and distribution of human health impacts due to exposure to the spilled oil, so that decision-makers could make informed decisions about actions needed to protect the public.

The surveillance system included four components: (1) active solicitation of health care provider reports, under legal authority of the Public Health Code, and (2) door-to-door health surveys in selected communities self-identified as particularly impacted by the spill, (3) monitoring daily counts of self-reported illnesses based on calls to the PCC, and (4) utilization of MDCH's syndromic surveillance system.

In order to protect personal confidential medical information, MDCH obtained a "Medical Research Designation".[1] This designation legally protected individual identifying information from disclosure by the participating public health authorities to other parties, including those situations in which the information could be requested under the Michigan Freedom of Information Act or by subpoena.

This report describes the methods and results of the public health surveillance system established to measure and monitor health impacts from the Enbridge oil spill. Information about environmental sampling, clean-up efforts and other aspects of the spill response are available elsewhere.[2]

II. Methods and Results

A. Health care provider reporting

Methods

Initially, contacts were made at the two hospitals in the area, and they were asked to provide a daily count of the number of patients seen in the Emergency Department (ED) or admitted with oil exposure-related complaints. Then, on August 5, the CCPHD and the KCHHS sent out "blast faxes" to all health care providers in their respective counties requesting that clinicians and healthcare facilities formally report any patients seen due to illness or symptoms associated with oil spill exposure. Providers were advised that this reporting is required under the Michigan Public Health Code (R 325.71-75), and they were provided reporting information and forms.[3] To gather data on patients who were seen at the local ED prior to establishment of this healthcare reporting system, medical records of patients identified as exposed to the oil or its vapors were abstracted by the MDCH medical epidemiologist.

The Michigan PCC was authorized as a legal agent of the state to receive the reports from health care providers for the purposes of this investigation. This allowed for 24/7 reporting, and allowed for PCC medical toxicologists to provide consultation to health care providers regarding oil spill-related patient diagnosis or treatment. Patient information collected included name, contact information and demographics, medical encounter date, clinical effects, laboratory test results, diagnosis, treatment, and contact information for the reporting provider.

Reported information was entered into Toxicall®, the electronic case management system used by the Michigan PCC. Each case was given a "medical outcome" classification based on information about reported clinical effects as follows: no effect (no symptoms due to exposure); minor effect (some minimally troublesome symptoms); moderate effect (more pronounced, prolonged symptoms); major effect (symptoms that are life-threatening or cause significant disability or disfigurement); death; not followed, judged as nontoxic exposure (clinical effects not expected); not followed, minimal clinical effects possible (no more than minor effect possible); unable to follow, judged as a potentially toxic exposure; unrelated effect, the exposure was probably not responsible for the effect(s); or, confirmed non-exposure.

Daily summary reports were provided by the PCC to MDCH, CCPHD, and KCHHS on numbers of reports and severity of illness (i.e. "medical outcome"). A spreadsheet of all case information was provided to MDCH for data analysis. Analysis was performed using SAS® version 9.2 (SAS Institute, Cary, NC).[4]

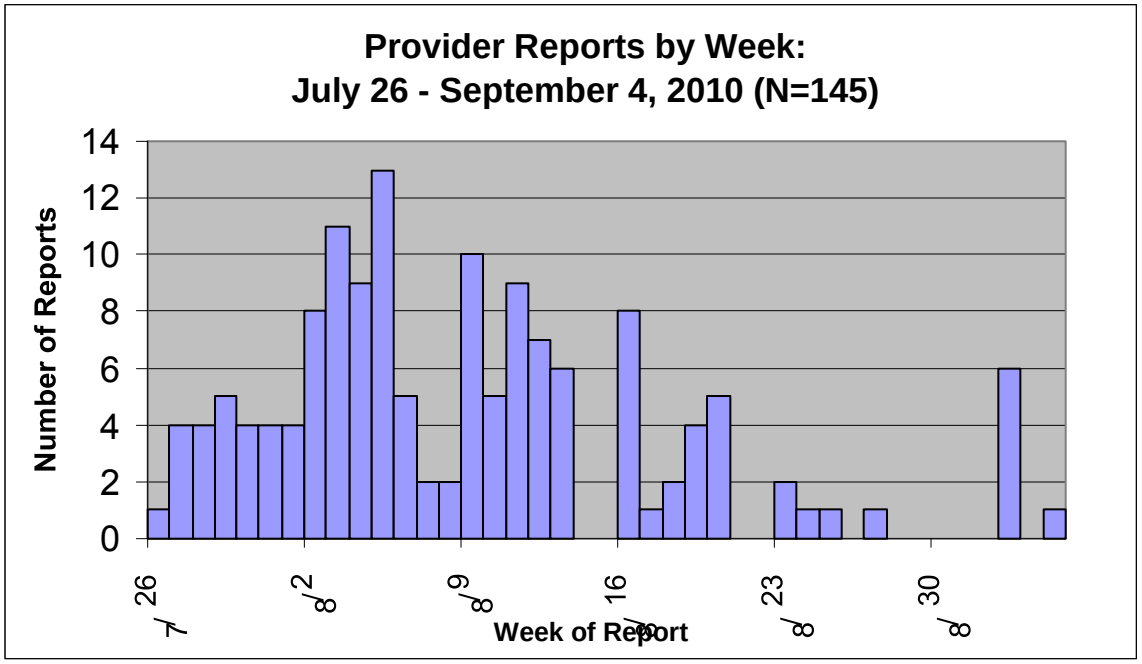
Results

Between July 26 and September 4, 2010, one hundred forty-seven health care visits for 145 individuals were reported by health care providers. (Two individuals were reported twice, by different providers, for separate visits.) One hundred seventeen (80.7%) of the 145 individuals lived and/or worked in areas near the affected waterways, 24 (16.5%) were oil-spill response workers, and four (2.7%) were transients/visitors.

The average age of these 145 individuals was 38. There were slightly more females (77/53.1%) than males (68/46.9%) reported. Adults age 18 to 64 predominated (100/69%), with the remainder being children under age 18 (36/24.8%), and a small number of adults over age 65 (9/6.2%).

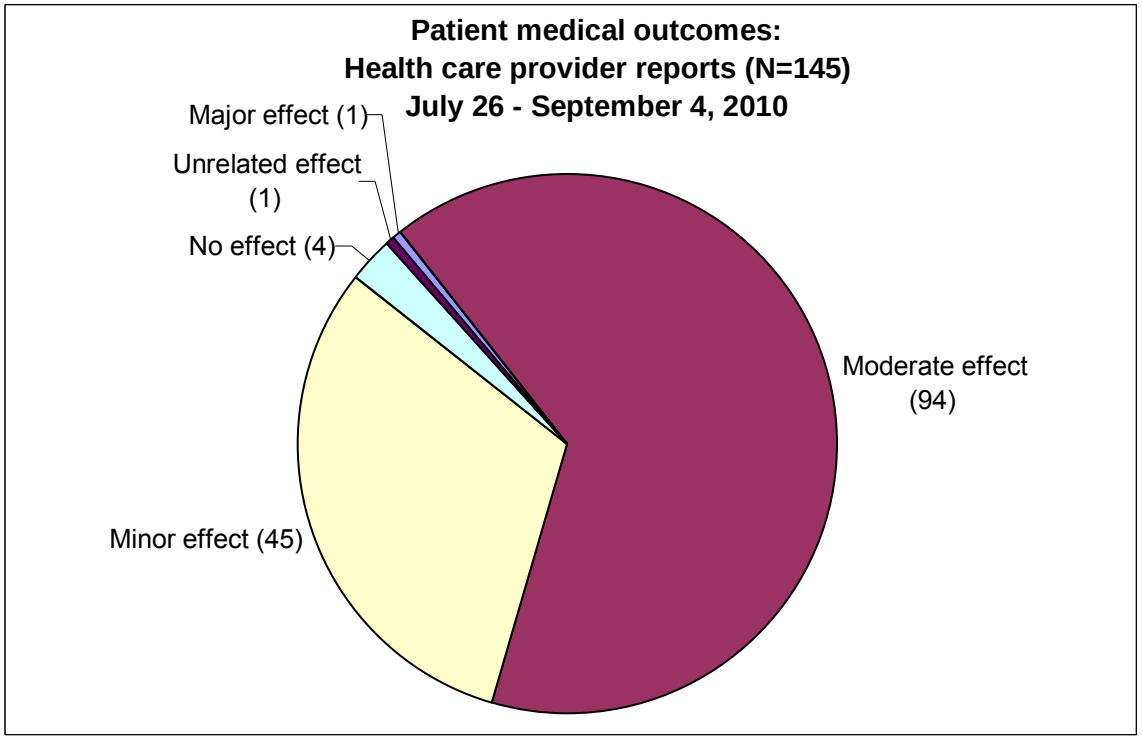
The date of the reported visit to the health care provider is shown in **Figure 1**. (The two individuals reported twice are counted for date of their first visit.) The frequency of reported health care provider visits peaked in the second week after the spill, coinciding with the week providers were notified of the new reporting requirements. These visits included outpatient (N=77; 53%), hospital emergency department (N=64; 44%), hospital inpatient (N=1; 0.6%), and 3 (2%) where type of facility was unknown.

Figure 1



Approximately one-third (31%) of the medical outcomes of these individuals were classified as minor and two-thirds (64.8%) as moderate. There were no deaths. **(Figure 2**) The one individual with medical outcome classified as "major" had significant exposure and had 8 reported clinical effects. Those with a medical outcome of "moderate" had on average 3.7 clinical effects whereas those classified as "minor" had 2.4 clinical effects.

Figure 2



Four (2.8%) of the reported individuals had no clinical effects. The remainder had from one to more than six clinical effects each (**Table 1**).

Table 1

Number of Clinical Effects in Health Care Provider Visits		
	Total	
	N	%
Number of Clinical Effects		
0 symptoms	4	2.8%
1 symptom	21	14.5%
2 symptoms	38	26.2%
3 symptoms	26	17.9%
4-5 symptoms	37	25.5%
6+ symptoms	19	13.1%

Neurological effects were reported most frequently (94/ 64.8%), with headache being the predominant of all neurological effects reported 83 (57.2%). Eighty-six individuals (59.3%) had at least one gastrointestinal clinical effect, with nausea predominating, and 68 (46.9%) had with at least one respiratory clinical effect with cough and choke predominating (**Table 2**).

Table 2

Frequency of Clinical Effect Categories in Health Care Provider Visits		
	Total	
	N	%
Clinical Effect Category		
Cardiovascular	11	7.6
Dermal	9	6.2
Gastrointestinal	86	59.3
Nausea	*57*	*39.3*
Neurological	94	64.8
Headache	*83*	*57.2*
Ocular	23	15.9
Renal	1	0.7
Respiratory	68	46.9
Cough/Choke	*47*	*32.4*
Other	41	28.3

B. Community and Workplace Surveys

Methods: Four communities along the Talmadge Creek and Kalamazoo River and one small workplace were identified (from calls to the toll-free number and the CCPHD) as having multiple reports of adverse health effects and concerns about oil spill impacts.

A door-to-door health survey was conducted by MDCH and the CCPHD in each community. The community survey obtained information on whether the household had, or were planning to, relocate because of the spill; observations about the intensity and duration of the odor since July 25; and, for all members of the household, information about chronic/pre-existing health conditions that made them sensitive to fumes or odors. They were also asked about new or exacerbated health symptoms after the spill event. After the first survey, a question was added to assess whether those who had symptoms had seen a physician for their symptoms. For the most part, answers were provided by the person answering the door for all household members. Answers were provided in an open-ended format. Where no one was home, information was left at the door; in the second, third, and fourth communities, including a fact sheet from EPA on the oil spill and a cover letter that invited someone in the household to call a toll-free number at MDCH to answer the survey questions by telephone. In order to have an approximate measure of socio-economic status for each of these communities, a local realtor was asked to provide his estimate of the range of home prices that could be expected in each community.

The first health survey was conducted on August 6, 11 days after the spill was reported, in a neighborhood approximately 14 miles downstream from the spill origin and immediately adjacent to an area of wetland fed by the Kalamazoo River. Previously, on August 2, the CCPHD had visited the neighborhood to assess the need for temporary relocation of individuals concerned about the odors and their health, and to give information about how Enbridge would cover the costs of that relocation. However, information about health symptoms was not requested at that initial visit. Home prices in the neighborhood, which is referred to as “Neighborhood” in the tables, are estimated to range from $500 to $15,000.

The second community survey was conducted 16 days after the spill in a subdivision approximately two miles downstream. Home prices in the “Subdivision” are estimated to range from $120,000 to $325,000.

The third community, referred to as “Spill Site” in the tables, was surveyed in two parts, 22 and 24 days after the spill. This community included the homes surrounding the immediate area on the Creek where the pipeline burst. It was the only community where a voluntary evacuation notice had been issued, due to air sampling indicating elevated levels of benzene– a potential concern for longterm health. Each of these two surveys took place within 24 hours after the evacuation notice was lifted for that area. A environmental contractor accompanied the survey team and offered air monitoring outside and inside homes to each of the interviewees, using a real-time monitoring instrument.

Home values in this community are estimated to range from $75,000 to $350,000.

The fourth survey occurred 23 days after the spill in a small village of approximately 80 homes, situated directly on the river about five miles downstream from the spill's origin. Home values in the "Village" are estimated to range from $10,000 to $125,000.

For comparison purposes, a door-to-door survey was conducted 25 days after the spill in a community approximately fifteen miles stream upstream of the spill, in order to obtain information on the occurrence of health symptoms in the previous four weeks. The six neighborhoods surveyed in this community were on the Kalamazoo River; they were similar to the exposed communities in demographics and the range of home prices, encompassed homes valued from $5,000 to $225,000.

All 12 workers at the small workplace located a little less than one mile northeast of the confluence of Talmadge Creek and the Kalamazoo River were interviewed using the same open-ended format as the community surveys.

Results

Community Surveys

Table 3 shows the survey completion rates by community and in the Comparison community. Overall, 201 (59.6%) of the 337 homes visited provided information for a total of 550 household members in the exposed communities, and 51 (27.9%) of the 183 homes surveyed in the Comparison community provided information on 137 individuals. The average number of household members ranged from 2.5 to 3.1 in the exposed communities and was 2.7 in the Comparison community.

Table 3

Survey Completion by Community						
	Neighborhood	Subdivision	Spill Site	Village	Total	Comparison
Total Number of Homes Visited	78	121	55	83	337	183
Number of Homes that Completed Survey	45	75	37	44	201	51
Number of Homes that Refused Survey	0	0	0	1	1	18
Number of Homes with No One Home	33	46	18	38	135	114
Percentage of Homes Surveyed	57.7%	62.0%	67.3%	53.0%	59.6%	27.9%
Number of Individuals with Survey Information	117	233	92	108	550	137
Average Number of Individuals per Household	2.6	3.1	2.5	2.5	2.7	2.7

In terms of race/ethnicity, all communities were almost entirely white. There were some differences between communities in other demographics. The community at the spill site was on average older, had fewer children, and was over 50% male, in contrast to the other three exposed communities and the Comparison group. Smoking prevalence, which was asked in all surveys except at the Neighborhood, was notably different, with the two communities with more expensive homes reporting much lower smoking rates in adults (Spill site: 5.1%; Subdivision: 6.0%) than the other one (Village) at 20.7%. Smoking prevalence in the Comparison community was 19.8% (**Table 4**).

Table 4

Demographics and Smoking Profile by Community						
	Neighborhood	Subdivision	Spill Site	Village	Total	Comparison
Gender (%)						
Male	47.8%	44.2%	53.3%	46.3%	46.9%	45.3%
Female	52.2%	55.8%	46.7%	53.7%	53.1%	54.7%
Average Age (yrs)	32.1	35.8	48.9	41.9	38.4	39.1
Age Distribution (%)						
0-7 yrs	13.9%	12.2%	2.2%	5.7%	9.6%	9.0%
8-17 yrs	15.6%	21.8%	13.0%	16.2%	17.9%	14.3%
18-30 yrs	20.0%	6.5%	6.5%	9.5%	9.95%	10.5%
31-50 yrs	28.7%	31.3%	16.3%	29.5%	27.85%	34.6%
51-65 yrs	18.3%	17.8%	43.5%	26.7%	24.0%	19.6%
66+ yrs	3.5%	10.4%	18.5%	12.4%	10.7%	12.0%
Missing (n)	2	3	0	3	8	4
Smoker (age 18 and older)	not asked	6.0%	5.1%	20.7%		19.8%

The percent of residents that reported symptoms according to smoking status is shown in **Table 5**. A higher proportion of non-smokers reported no symptoms (39.6%) compared to smokers (25.0%). Similarly, a higher proportion of smoker reported 1 symptom and 4+ symptoms (39.3%, 10.7%), compared to nonsmokers (26.8%, 5.4%). The proportion of residents that report 2-3 symptoms was very similar between smokers and non-smokers.

Table 5

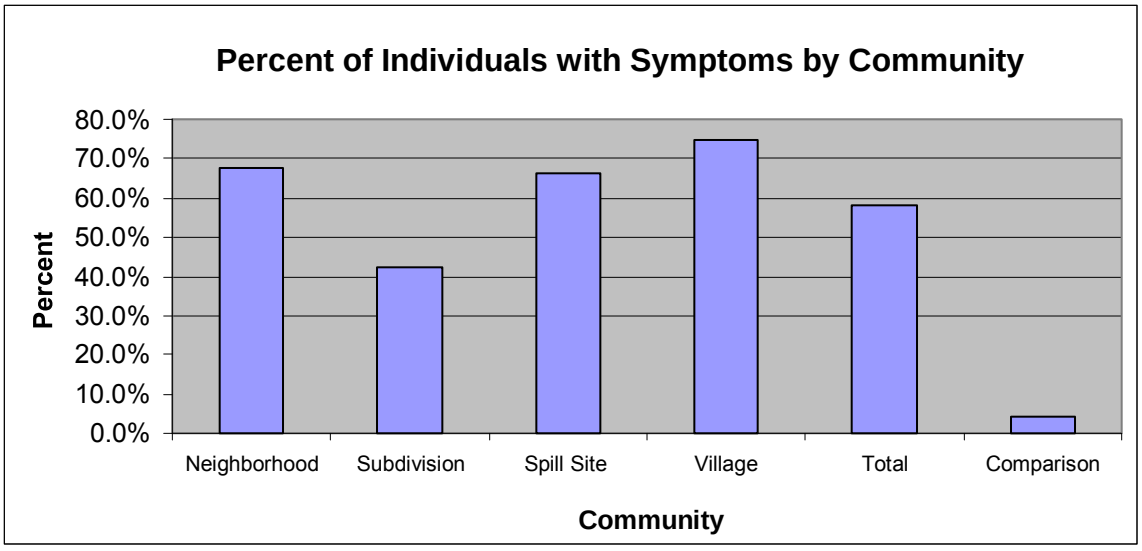
Symptoms by Smoking Status among Adults

	Smoker	
	Yes	No
Percent with Symptom		
0 symptoms	25.0%	39.6%
1 symptom	39.3%	26.8%
2-3 symptoms	25.0%	28.2%
4+ symptoms	10.7%	5.4%

Nearly all of the households in each of the four exposed communities reported noticing an odor since July 25, 2010 (Neighborhood: 100%, Subdivision: 97.3%, Spill Site: 97.2%, Village: 100%). In comparison, only a small minority of households in the Comparison community reported smelling an odor at any time after July 25 (15.7%).

Overall, 320 (58.2%) of the 550 individuals reported at least one new or exacerbated symptom after July 25 in contrast to 4.4% in the Comparison community. The frequency of symptoms varied by community. The Subdivision, which has homes more widely spread out from the river than any of the others, reported the lowest frequency (42.5%), and the Village had the highest (75.7%). By contrast, only 6 (4.4%) of the 131 individuals in the Comparison community reported any new or worsened symptoms in the timeframe following the spill (**Figure 3**).

Figure 3



Of the 320 individuals in the exposed communities who reported symptoms, 42.8% reported only one symptom, 44.7% reported 2-3 symptoms, and 12.5% reported 4 or more symptoms (**Table 6).** The proportion of exposed residents reporting symptoms was significantly greater than the proportion in the comparison community ($p < .0001$).

Table 6

Frequency of Symptoms by Community												
	Neighborhood		Subdivision		Spill Site		Village		Total		Comparison	
	N	%	N	%	N	%	N	%	N	%	N	%
Number/percent without any Symptoms	38	32.5%	134	57.5%	31	33.7%	27	25.0%	230	41.8%	131	95.6%
Number/percent with any Symptom	79	67.5%	99	42.5%	61	66.3%	81	75.0%	320	58.2%	6	4.4%
1 symptom	27	34.2%	49	49.5%	27	44.3%	34	42.0%	137	42.8%	5	83.3%
2-3 symptoms	37	46.8%	44	44.4%	28	45.9%	34	42.0%	143	44.7%	1	16.7%
4+ symptoms	15	19.0%	6	6.1%	6	9.8%	13	16.0%	40	12.5%	0	0.0%

Headache was the most frequently reported symptom (34.5%) in all exposed communities, ranging from 25.3% in the Subdivision to 42.6% in the Village. This was followed by respiratory symptoms (e.g., breathing difficulty, cough) at 29.6% and gastrointestinal complaints (e.g., nausea and vomiting), 21.6% (**Table 7**). In the Comparison community, only 1 resident reported headache symptoms and respiratory symptoms, respectively. None of the comparison residents reported gastrointestinal or skin/eyes symptoms. New onset or worsened anxiety was reported by 4.9% of all exposed residents. The Subdivision reported the least amount of anxiety (1.3%) and the Neighborhood reported the most (11.1%). There were no reports of anxiety among any of the residents in the Comparison community. Data on other symptoms were also included and compiled into an 'other' category, with 24.7% of residents in the exposed communities reporting other new or worsened symptoms and only 3.6% in the Comparison community.

Overall, 12.2% of exposed residents visited a doctor for new or worsened symptoms, and doctor visits ranged from 9.8% in the Spill Site to 14.8% in the Village. While only 6 individuals in the Comparison community reported new or worsened symptoms, 4 (66.7%) saw a health care provider for these symptoms.

Table 7

Frequency of Types of Symptoms and Doctor Visits by Community												
	Neighborhood		Subdivision		Spill Site		Village		Total		Comparison	
	N	%	N	%	N	%	N	%	N	%	N	%
Symptoms												
Headache	48	41.0%	59	25.3%	37	40.2%	46	42.6%	190	34.5%	1	0.7%
Respiratory (breathing diff., cough, sore throat/nose)	34	29.1%	53	22.7%	23	25.0%	53	49.1%	163	29.6%	1	0.7%
Gastrointestinal (nausea, vomiting, stomach ache)	41	35.0%	31	13.3%	15	16.3%	32	29.6%	119	21.6%	0	0.0%
Skin/Eyes	10	8.5%	11	4.7%	11	12.0%	23	21.3%	55	10.0%	0	0.0%
Anxiety	13	11.1%	3	1.3%	7	7.6%	4	3.7%	27	4.9%	0	0.0%
Other (dizziness, fatigue, chest pain, & other)	51	43.6%	20	8.6%	25	27.2%	40	37.0%	136	24.7%	5	3.6%
Individuals with One or more Symptoms	79	67.5%	99	42.5%	61	66.3%	81	75.0%	320	58.2%	6	4.4%
Individuals who Visited a Doctor for these Symptoms	11	13.9%	10	10.1%	6	9.8%	12	14.8%	39	12.2%	4	66.7%

The prevalence of reported chronic conditions/pregnancy potentially causing increased sensitivity to odors ranged from 23.6% in the Subdivision, to 26.1% (Spill site), 40.7% (Village), and 61% (Neighborhood), including four pregnancies. The prevalence of chronic conditions in the Comparison community was 40.7%. (It should be noted that some individuals reported chronic conditions that were

not likely to increase sensitivity to odor, e.g., musculoskeletal disorders.) Individuals with chronic conditions reported proportionally more symptoms than individuals without chronic conditions (**Table 8**).

Table 8

Frequency of Symptoms by Chronic Condition		
	Chronic Condition	
	Yes	No
Number of Symptoms (%)		
0 symptoms	30.9%	47.1%
1 symptom	27.0%	23.9%
2-3 symptoms	29.8%	24.2%
4+ symptoms	12.3%	4.8%

Information was available on 501 of the 550 individuals in the four communities on relocation after the spill and 169 (33.7%) of the 501 relocated. These included 50 households where everyone left and 10 households where only some members left. Thus, relocation impacted 60 (29.9%) of the 201 households surveyed. Symptoms were more prevalent overall in the 169 individuals who relocated (71.6%) than the 332 individuals who did not (50.9%). A greater percent of those with symptoms who relocated saw a physician (11.8%) than those who did not relocate (5.1%) (**Table 9**).

Table 9

Symptoms by Relocation Status				
	Relocated (n=169)		Didn't Relocate (n=332)	
Number/percent without Symptoms	48	28.4%	163	49.1%
Number/percent with any Symptom	121	71.6%	169	50.9%
1 symptom	44	26.0%	77	23.2%
2-3 symptoms	58	34.3%	72	21.7%
4+ symptoms	19	11.2%	20	6.0%
Number/percent that Visited Doctor/ED	20	11.8%	17	5.1%

Workplace survey

At the small worksite where the symptom survey was conducted, 100%[1] of the workers noted the odor. Eighty-three percent noted that the worst days for odor were early in the first week following the oil release (the week of July 26). The others did not identify the worst days.

- 92% said they still smelled the odor when they were interviewed, which was three weeks after the spill.

[1] Because of the small number of employees, numbers are not presented.

- 33% noted that they had pre-existing chronic health conditions that made them sensitive to fumes or odors.
- 92% noted a variety of new onset or worsened symptoms after the release, including: headache (92%), respiratory symptoms (33%); dizziness (50%); gastrointestinal symptoms (33%); fatigue (33%); eye, nose, throat irritation (75%); and anxiety (42%).
- 17% noted that they were planning to see a physician for these symptoms.

C. Calls to the PCC from the public

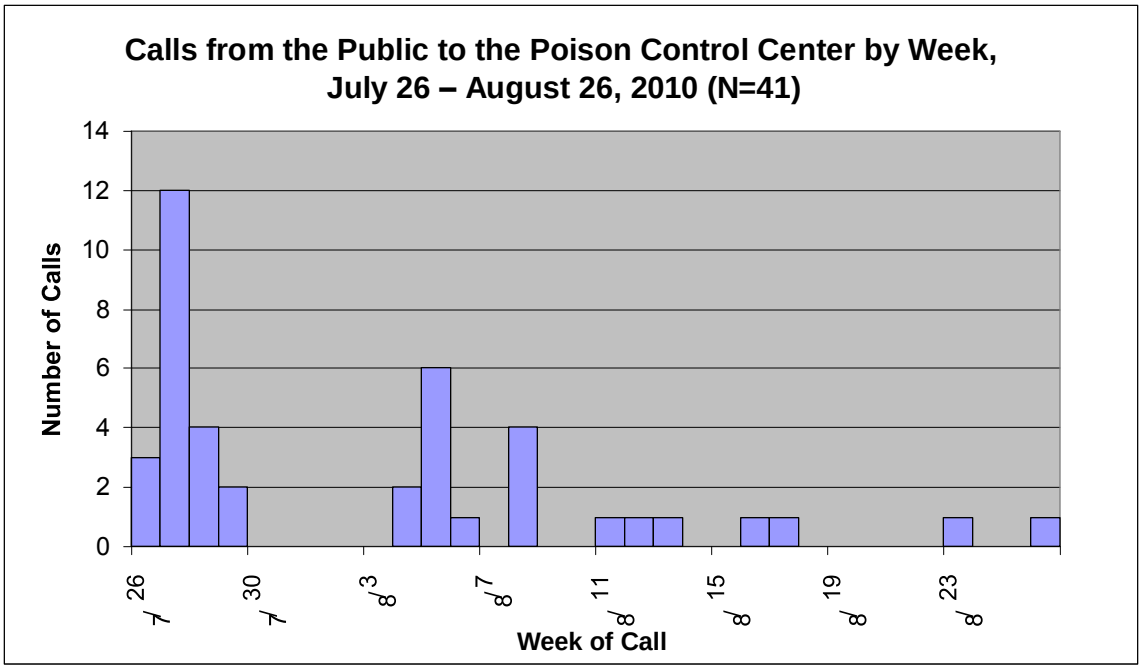
Methods

As noted above, within a few days of the spill, individuals began making calls to the PCC with concerns about the oil spill, using the nationwide poison control toll-free number. Although the PCC toll-free number and its services were not publicized to the public in Calhoun and Kalamazoo Counties during the spill event, these calls were consistent with the understanding among the general public that poison centers are available to answer questions about chemicals, poisonings, and toxic exposures. All calls were logged according to PCC standard operating procedures. They were coded so that they could be identified as related to the Enbridge spill event. Daily summaries of citizen calls were provided by the Michigan PCC to MDCH, in conjunction with the daily summaries of health care provider reports.

Results

Between July 26 and August 26, 41 calls were received by the PCC from individuals reporting health effects from exposure to the oil spill. No calls were received after August 26. **Figure 4** shows the number of calls by day of call. Over half (51%) of the calls (21 of 41) were received in the first week of the spill; July 27 was the day with the greatest number of calls (N= 12; 29%).

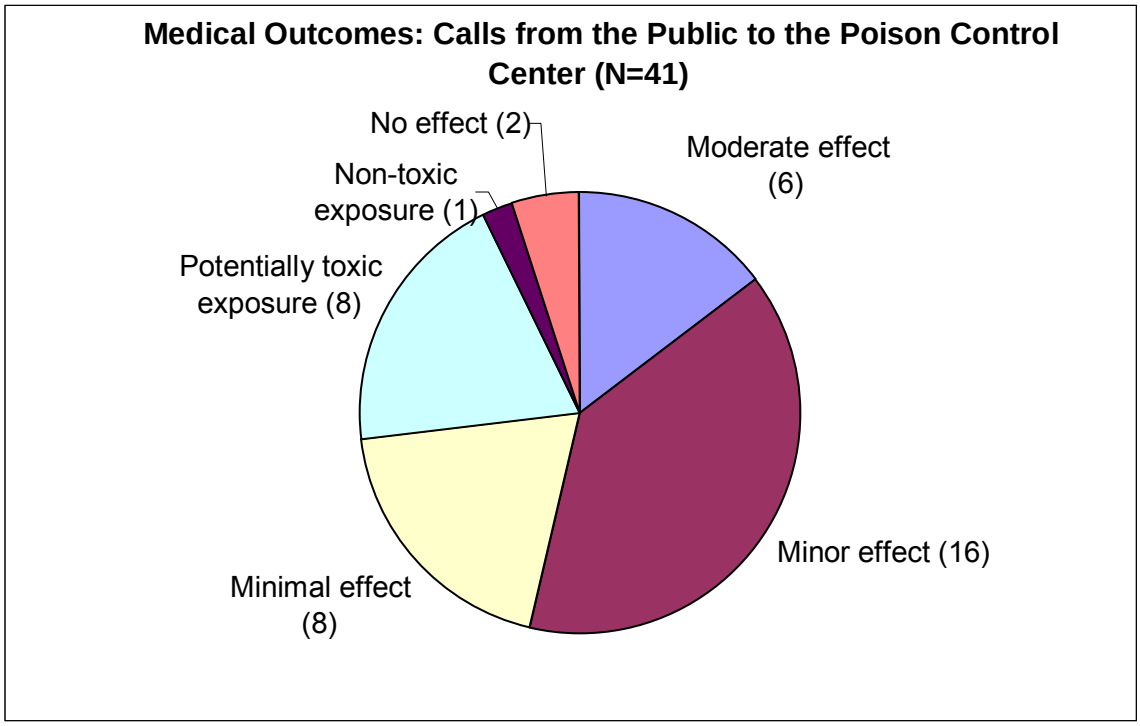
Figure 4



The ages of the individuals for whom a call was made ranged from 1 month to 60 years, with a mean of 26 years. Twenty-three (57.5%) of the 40 reports that documented gender were female.

The medical outcome classification assigned by the PCC for these calls included 39% with minor outcomes; 19.5% had possible minimal effects and 14.6% were classified with moderate effects (**Figure 5**). Nine (22%) individuals noted that they had seen a health care provider for their clinical effects, but no health care provider reports were received about these individuals.

Figure 5



D. Syndromic surveillance

Methods

The MDCH maintains a syndromic surveillance system designed to facilitate early and rapid detection and response to outbreaks that may be the result of bioterrorism, natural and/or emerging infectious disease, or other public health threats and emergencies. Real-time detection of significant increases in patients presenting with similar symptoms at designated Michigan hospital EDs is done through the use of statistical algorithms; these are applied to data obtained from hourly electronic searches through patient "chief complaints" in the electronic medical records. An "alert" is triggered when the proportion of visits for defined syndromes or geographic areas exceeds three standard deviations above predicted values, which are based on historical data. MDCH identified those potentially associated with oil exposure, which included rash, neurological, respiratory, and gastrointestinal syndromes. In addition, MDCH added an ad hoc query in order to detect chief complaints in the ED that contained "oil" and/or "spill". A limitation of this method, however, is that not all hospitals in the impacted communities participate in the MDCH ED syndromic surveillance system.

MDCH also monitors over-the counter pharmaceutical sales from several hundred retail pharmacies throughout the state, using computer algorithms to detect statistically significant increases in daily sales of: anti-diarrheal and antifever medications, cough syrup and other respiratory medications; child electrolytes; and thermometers; and related products. This system was

continually monitored with attention to the communities within the area of the Enbridge oil spill.

Results

One “alert” was recorded in Kalamazoo County for rash several days after the spill. Otherwise there were no notable changes in the frequencies of syndromes of interest in the area compared to overall daily rolling averages and yearly comparisons.

There were no notable increases in sales of over-the-counter pharmaceutical products; numbers of sales remained within typical levels for the season.

III. Discussion

MDCH and the impacted local health departments quickly established a multicomponent public health surveillance system to assess and measure the health impacts associated with exposure to crude oil, its vapors, and/or its odors resulting from the Enbridge pipeline spill in July 2010. The surveillance system received 147 health care provider reports on 145 patients; identified 320 (58%) of 550 individuals with adverse health effects from four community surveys along the impacted waterways, and tracked forty-one calls that were placed to the poison center by the public.

Headache, nausea, and respiratory symptoms were the predominant symptoms reported by exposed individuals in all reporting systems. These symptoms are consistent with the published literature and the Enbridge Material Safety Data Sheet regarding potential health effects associated with acute exposure to crude oil.[5,6] A number of epidemiologic studies performed in the weeks or months following major oil spills have reported similar types of symptoms to those identified in our community surveys. Studies of acute health effects from an oil spill in Shetland, Scotland and Wales documented significant differences in similar sets of self-reported symptoms between exposed residents and control groups.[7,8] The post-spill prevalence of headache in the exposed for these two studies was similar to our that in our community surveys (Shetland: 32%; Wales: 38%; Enbridge communities: 34.5%) but higher in their control groups than our Comparison group (Shetland: 8%; Wales: 14.1%; Enbridge: 0.7%). This pattern was similar for other symptoms. In a study of a spill near Karachi Pakistan, the frequency of one or more symptoms was markedly higher in both the exposed and the control groups (96% in exposed and 70% in controls) than in our populations.[9] In a comprehensive review of all studies regarding the impact of oil exposure on human health, Aguilera et al. concluded that most studies “…provide evidence on the relationship between exposure and the appearance of acute physical, psychological, genotoxic and endocrine effects in the exposed individuals.”[10]

Symptom prevalence as determined by our community surveys was significantly greater overall in the exposed communities than in the comparison community

upstream from the spill. At the same time, there were some differences between the four communities regarding symptom prevalence. These differences may be associated with differences in geographical proximity to the river or health risk factors, including prevalence of chronic health conditions and smoking, both of which are inversely associated with socio-economic status. Symptom prevalence was lowest in the community (the Subdivision) with the lowest smoking and chronic disease prevalence, and the highest home values; and it was highest in the "Neighborhood", which had the highest chronic disease prevalence as well as the lowest home values.

There are a number of potential biases and limitations to the data obtained using this surveillance system. Regarding health care provider reporting, it is very likely that there was a significant amount of under-reporting by clinicians, a common problem with public health surveillance systems based on health care provider reporting. Reasons for under-reporting may include: not making a diagnosis that associates the oil exposure (either to the oil itself or to odors from the spill) to the symptoms, lack of understanding of reporting requirements, or lack of compliance because of barriers (e.g., time, office staffing, or concerns about patient confidentiality).

In the community surveys, there may have been response biases in the exposed communities associated with exaggerated reporting of symptoms, due to the considerable publicity surrounding the event and attendant legal issues. At the same time, there could have been underreporting of symptoms given the possibility that most affected individuals and households had relocated and were not at home when the door-to-door surveys were completed. Additionally, underreporting could have occurred because the respondents at the households were not completely familiar with the range of symptoms experienced by other household members about whom they provided information during the survey.

The lower completion rates in the Village and Comparison communities may have been because the survey teams started earlier in the evening than at the other sites, and thus missed people not yet home from work. It is unknown how this might have affected results. However, the very low refusal rate in the exposed communities suggested that these individuals understood why they were being interviewed and that it may have been in their best interest to participate. There was a much higher refusal rate in the Comparison community than the exposed communities (15% vs. 0.5%). We did not determine the reasons for refusing and therefore we do not know how this would have biased results from the comparison community survey. It could have reflected that there was no self-motivation for individuals in the Comparison community to participate other than general concern and good will, and thus some people were not willing to take the time to talk with the interviewers, but there could have been a variety of reasons.

The survey of the workers in the one small worksite should be interpreted with caution. Results are subject to the instability of small numbers and there are no comparison data by which to judge the significance of the findings. Additionally,

like the community surveys, there are a number of factors that could have contributed to recall bias, resulting in over- or under-reporting of symptoms. Because these individuals worked closely together, individual responses could have been influenced by prior discussions and concerns about the release. Further, overstated reporting of symptoms could have resulted from the considerable publicity surrounding the event and attendant legal issues. On the other hand, the open-ended format of the questions, rather than a structured list of possible responses, could have resulted in individuals being less likely to remember and report on specific types of symptoms.

A number of studies of the health effects of previous oil spills have focused on acute and chronic health effects to responders.[11,12,13] Current surveillance of response workers in the Deepwater Horizon spill in the Gulf of Mexico is tracking all injuries and illnesses of response workers, not just illnesses associated with oil exposure.[14] Our surveillance system, which was established to provide rapid detection of and response to acute health effects of oil exposure, was not designed to evaluate all injuries and illnesses, short or long term, in response workers. Other systems were in place within the Unified Command structure of the response to track all illnesses, injuries and "near-misses" among the response workers. Nevertheless, approximately 18% of the health care provider reports were of response workers experiencing health effects apparently associated with exposure to the oil.

Mental health effects of disasters, including anxiety, post-traumatic stress disorder, and depression have been an area of particular concern. Studies following the *Exxon-Valdes* oil spill in Alaska[15] and the *Sea Empress* in Wales[6] found that post-spill prevalence of a number of psychiatric disorders was significantly higher in exposed populations than unexposed individuals. Likewise, there was a greater proportion of individuals with self-reported psychiatric symptoms in our exposed communities than our Comparison community (4.7% vs. 0%), but overall prevalence was much lower than other studies. Unlike some other studies, which used validated mental health survey methodologies, our survey included only an open-ended question about symptoms, thus psychological symptoms were captured only if volunteered. Therefore, our assessment may have not fully captured the mental health effects of the spill.

Use of the PCC as the surveillance data center was an effective and responsive approach to the need for a rapidly functioning data collection and analysis system. Daily reports of numbers and types of reports were thus able to be provided by the PCC to the Command Center from where the spill response was coordinated. The ED syndromic surveillance system was not notably sensitive, but this was not surprising because the hospital ED closest to the spill site does not participate in the system.

Beyond the significance of the health data itself for documenting the health impacts of the spill, the value of the face-to-face encounters between public health officials and the families coping with feelings of ill health, plummeting home values, and anxieties about their safety should be noted. These personal

encounters provided some assurance to families that their needs and concerns were being heard and provided public health with an in-depth understanding of the situation. Combining a rapid community needs assessment and a health assessment is an approach that is being used more and more frequently during disasters.[16] Currently, the Centers for Disease Control and Prevention and the Council of State and Territorial Epidemiologists are organizing a series of trainings and workshops in "disaster epidemiology."[17] Results of these efforts will help inform future responses in Michigan to disasters.

IV. Conclusion

In response to concerns about acute health effects from exposure to spilled oil in this major disaster, state and local public health in Michigan quickly set up a multi-faceted public health surveillance system that included health care provider reporting, community surveys, calls from the public to the poison control center, and analysis of data submitted to the state's syndromic surveillance system. In spite of the limitations noted above, these data appear to provide a reasonable picture of the oil spill's acute health impacts, and these findings are consistent with other studies of oil spills.

A number of aspects to the public health surveillance response are noteworthy for consideration by public health agencies that are refining their non-infectious disease surveillance emergency response plans.

- A multi-component surveillance system was necessary to support the response.
- Chemical poisoning reporting regulations, which Michigan had put in place in 2007, were essential to support mandated health care provider reporting of oil-spill related illnesses.
- Use of the poison center as the data repository for reports by health care providers was an innovation that was effective and efficient. Daily summaries from the poison center provided the responders and public health agencies with sufficient information to understand the magnitude of the actual on-going health impacts of the spill, rather than relying on rumors or anecdotes.
- Epidemiologic competencies necessary for a quick response included survey design, data management, and analytic skills in descriptive epidemiology.
- Having the surveillance response take place in the oil-spill's Command Center, rather than public health offices at the state or county level, was critical for ensuring that surveillance activities supported the daily needs of the Unified Command.

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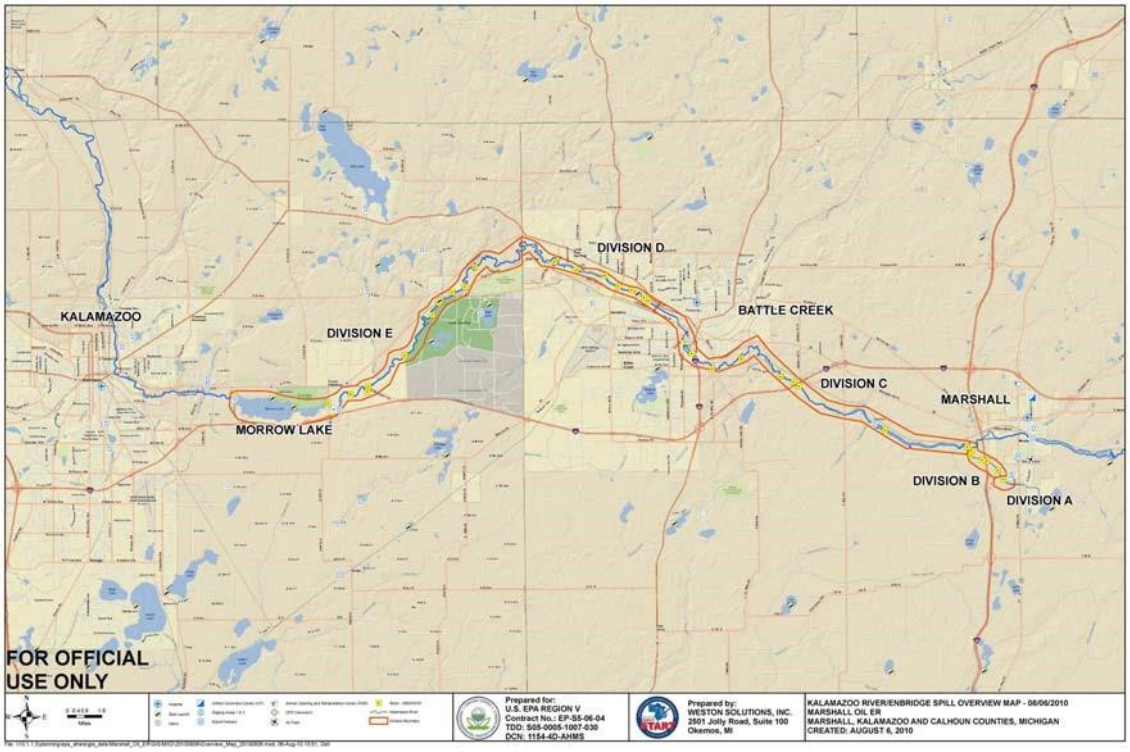
Michigan State University: Joanna Kica
We also thank Matthew Davis of Rosemary Davis Realtors, Marshall MI for providing home price estimates.

Appendix: Map of the oil spill in Michigan (source: EPA[18])



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[17] See http://www.cste.org/dnn/ProgramsandActivities/DisasterEpiWorkshop/tabid/404/Default.aspx

[18] http://www.epa.gov/enbridgespill/images/enbridge_overview_map_20100806.pdf

BILLINGS GAZETTE

86°

Breach in pipeline found; cancer-causing agent detected in water

JANUARY 20, 2015 7:40 AM • BY CHRIS CIOFFI

GLENDIVE — Eastern Montana residents rushed to stock up on bottled water Tuesday after authorities detected a cancer-causing component of oil in public water supplies downstream of a Yellowstone River pipeline spill.

Elevated levels of benzene were found in water samples from a treatment plant that serves about 6,000 people in the agricultural community of Glendive, near North Dakota.

Scientists from the federal Centers for Disease Control and Prevention said the benzene levels were above those recommended for long-term consumption, but did not pose a short-term health hazard. Residents were warned not to drink or cook with water from their taps.

Some criticized the timing of Monday's advisory, which came more than two days after 50,000 gallons of oil spilled from the 12-inch Poplar pipeline owned by Wyoming-based Bridger Pipeline Co. The spill occurred about 5 miles upstream from the city.

Adding to the frustrations was uncertainty over how long the water warning would last. Also, company and government officials have struggled to come up with an

effective way to recover the crude, most of which appears to be trapped beneath the ice-covered Yellowstone River.

A mechanical inspection of the damaged line Tuesday revealed the breach occurred directly beneath the river, about 50 feet from the south shore, Bridger Pipeline spokesman Bill Salvin said.

The cause remained undetermined.

By Tuesday, oil sheens were reported as far away as Williston, North Dakota, below the Yellowstone's confluence with the Missouri River, officials said.

"It's scary," said 79-year-old Mickey Martini of Glendive. "I don't know how they're going to take care of this."

Martini said she first noticed a smell similar to diesel fuel coming from her tap water Monday night. Officials previously didn't know whether the spill happened beneath the iced-over river or somewhere on the riverbank.

Martini said she was unable to take her daily medicines for a thyroid condition and high cholesterol until she picked up water from a public distribution center later in the day.

Representatives from the state and the U.S. Environmental Protection Agency earlier said preliminary monitoring of the city's water showed no cause for concern. The water treatment plant operated until Sunday afternoon, more than 24 hours after pipeline operator Bridger Pipeline discovered the spill, officials said.

Additional tests were conducted early Monday after residents began complaining of the petroleum- or diesel-like smell from their tap water. That's when the high benzene levels were found.

Benzene in the range of 10 to 15 parts per billion was detected from the city's water, said Paul Peronard with the EPA. Anything above 5 parts per billion is considered a long-term risk, he said.

Peronard acknowledged problems in how officials addressed the city's water supply, including not having the right testing equipment on hand right away to pick up contamination. But Peronard and others involved in the spill response said officials acted based on the best information available.

"Emergencies don't work in a streamlined fashion," said Bob Habeck with the Montana Department of Environmental Quality. "It's a process of discovery and response."

Several residents interviewed by The Associated Press said they first heard about the water problems through friends and social media sites, not the official advisory.

"They could have been more on top of it," Whitney Schipman said as she picked up several cases of bottled water for her extended family from a water distribution center. "As soon as there was a spill, they should have told everybody."

Officials took initial steps Tuesday to decontaminate the water system. Glendive Mayor Jerry Jimison said it was unknown when the water treatment plant would be back in operation.

Until that happens, Salvin said the company will provide 10,000 gallons of drinking water a day to Glendive.

The company established a hotline for people with questions about the water supply and to report any wildlife injured by the spill: (888) 959-8351(888) 959-8351 FREE.

Another pipeline spill along the Yellowstone River in Montana released 63,000 gallons of oil in July 2011. An Exxon Mobil Corp. pipeline broke during flooding, and oil washed up along an 85-mile stretch of riverbank.

Exxon Mobil faces state and federal fines of up to $3.4 million from the spill. The company has said it spent $135 million on the cleanup and other work.

The Poplar pipeline involved in Saturday's spill runs from Canada to Baker, Montana, picking up crude along the way from Montana and North Dakota's Bakken oil-producing region.

The pipeline receives oil at four points in Montana: Poplar Station in Roosevelt County, Fisher and Richey stations in Richland County, and at Glendive in Dawson County. The section of pipeline that crosses the Yellowstone River was last inspected in 2012, in response to the Exxon accident, according to company officials.

At that time, the line was at least 8 feet below the riverbed where it crosses the Yellowstone.

No cost estimate for the Glendive spill was yet available.

Drinking water press release

On January 17th at 3:00 pm, Bridger Pipeline, LLC notified local authorities of a potential release from a pipeline that crosses the Yellowstone River

approximately 5 miles upstream from Glendive. Shortly thereafter MDEQ notified municipal water utilities of the potential of crude oil passing by their water intakes. DEQ further advised the water utilities to monitor their intakes for potential impact. Thus far no abnormalities have been reported by the water plant in Glendive. It is unlikely the crude oil would impact Glendive's water intake because the intake is 14 feet below the water surface, and the oil will tend to float on the water surface. This is especially true of the light crude transported by Bridger Pipeline. However, on Sunday, January 18th, Dawson County began receiving some complaints of odor in drinking water from people who use the municipal water supply. Because of this, the incident unified command has decided to take a collection of samples from the municipal drinking water supply and will provide teams to monitor taps along Glendive's water distribution system. This will be done starting on Monday, January 19th. At this point in time, the incident command has no reason to think there has been an adverse impact to the Glendive water system. However, if you feel uncomfortable, use bottled water, although that is not a recommendation at this time. For more information, contact the City of Glendive Public Works Department at 377-3318 ext. 16.

EPA

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Sources of Contaminant in Drinking Water
Acrylamide	zero	TT[8]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/wastewater treatment
Alachlor	zero	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops
Atrazine	0.003	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops
Benzene	zero	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills

Montana DEQ Web Page

On July 1, 2011, an estimated 1,500 barrels, or 63,000 gallons of crude spilled into the fast-moving, flood-stage Yellowstone river when ExxonMobil's Silvertip Pipeline broke near Laurel. At the time of the discharge, the Yellowstone river was at the peak of a 30-year flood and the river was flowing out of its banks.

The pollution was worse near the source of the spill at Laurel, 20 miles upstream from Billings. However, scoping, or SCAT teams, for Shoreline Cleanup Assessment Technique, found oil as far as 70 miles downstream from the spill site.

Following initial emergency response activities, ExxonMobil Pipeline Company (EMPCo) conducted cleanup and other actions with oversight and direction from the U.S. Environmental Protection Agency (EPA), DEQ, and other federal, state, tribal, and local entities. After initial cleanup activities, DEQ and EMPCo entered into an Administrative Order on Consent (AOC) in early 2012 that required EMPCo to conduct additional monitoring efforts and additional cleanup as identified by DEQ, reimburse State agencies' costs regarding the Discharge ($760,390.61), and pay a penalty of $1.6 million, with $300,000 to be paid in cash to the State's General Fund and the remaining $1.3 million to be spend on Supplemental Environmental Projects (SEPs).

DEQ determined that reclamation activities were complete on State lands in August 2013 under the AOC. Reclamation activities included seeding and monitoring trails and other disturbed areas, and scattering woody debris over trails to prevent unauthorized future use. On private property, EMPCo entered into agreements with private property owners regarding reclamation needs.

In May 2013, DEQ determined that no additional sampling of each Public Surface Water Supply (PSWS) along the Yellowstone River starting at Laurel was necessary after tests showed contamination was below screening levels.

Under DEQ's direction, EMPCo conducted "natural attenuation monitoring" to photo-document the oil weathering process over time. The effort started in fall 2011, at 45 locations. By the end of summer 2014, oil was still apparent at only 9 of these locations and is still degrading naturally in these locations. These oil stains do not pose an unacceptable risk to human health or the environment.

DEQ also required EMPCo to conduct groundwater monitoring. Over 300 private wells were sampled and several monitoring wells were installed in locations where crude oil would have been most likely to impact groundwater. Very few petroleum compounds were detected in this monitoring, and those detected were not compounds found in crude oil. In September 2013, DEQ determined that petroleum hydrocarbons from the discharge did not appear to threaten groundwater resources or private water wells.

After the release, EMPCo cleaned up crude oil on surface water. Following surface water cleanup, various entities collected at least 195 surface water samples. In the absence of visible oil, none of the surface water samples exceeded applicable water quality standards or screening levels. In September 2014, DEQ determined that oil from the discharge does not exceed applicable water quality standards and does not pose a continued risk to public health and the environment via surface water.

One of DEQ's primary concerns was the concept of crude oil becoming absorbed or trapped by sediments and debris and settling in the river bed where it might later be released or where it might harm aquatic life. DEQ was also concerned about crude oil that may have deposited in upland areas and impacted surface soils. DEQ has reviewed and analyzed results from approximately 1,325 soil and sediment samples. The results indicate that where oil from the discharge previously deposited in river sediments or soil is now below screening levels or other applicable criteria and does not pose an unacceptable risk to aquatic life or human health.

From December 12, 2014, through January 23, 2015, DEQ asked the public to provide input regarding any remaining concerns about crude oil in soils and sediments. DEQ solicited public comment to inform the public of the status of the Discharge, and to ensure any remaining concerns were addressed. DEQ received no comments from the public.

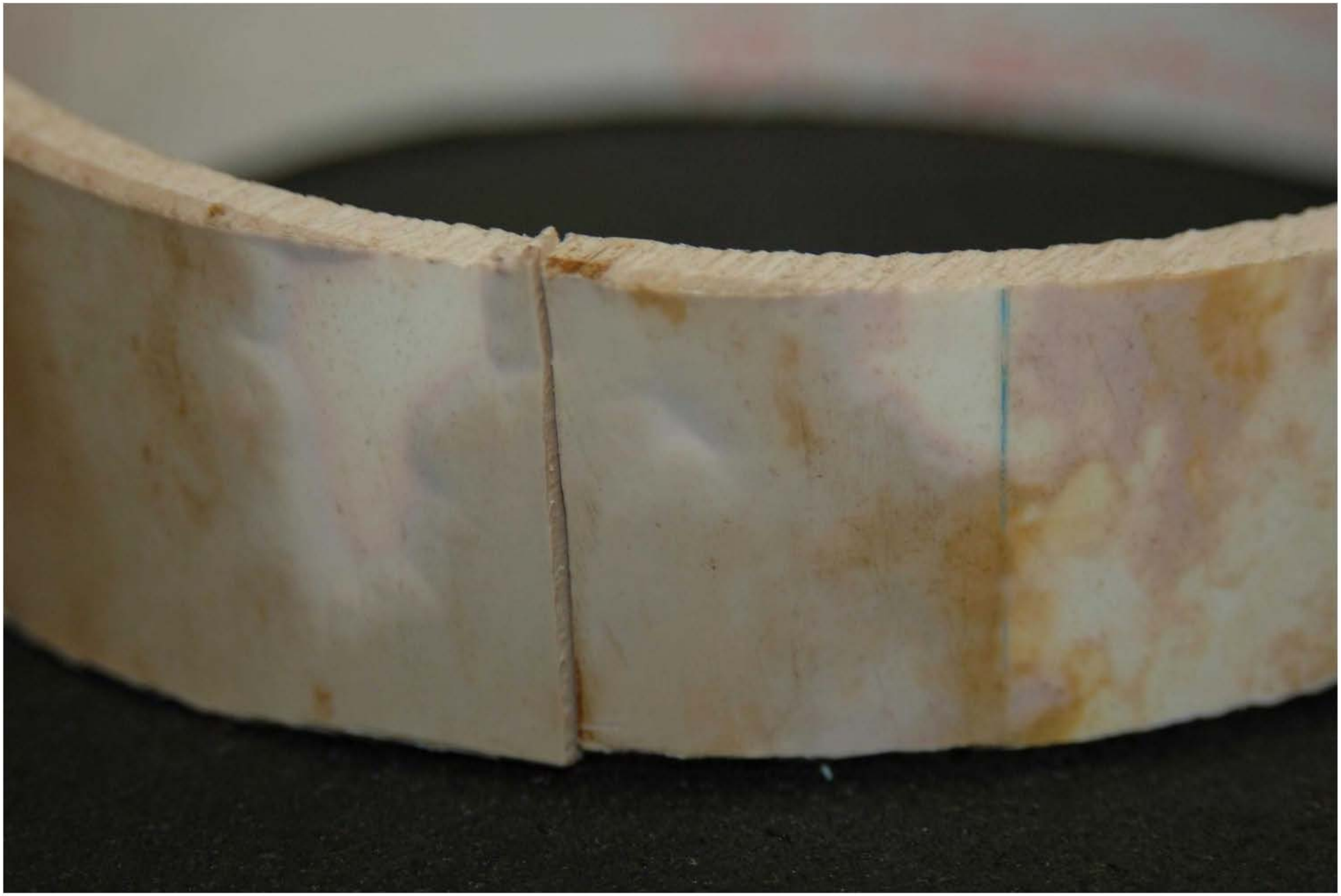
Although unacceptable risks to human health and the environment under the AOC appear to have been adequately addressed and do not pose an ongoing threat, some natural resources have been damaged or lost. The AOC does not address natural resource damages. Natural resource damages will be addressed by the Montana Natural Resource Damage Program and the U.S. Department of Interior.

Iowa Department of Natural Resources

Plastic Water Line Survey Results

Presented By

Tammy Vander Bloemen



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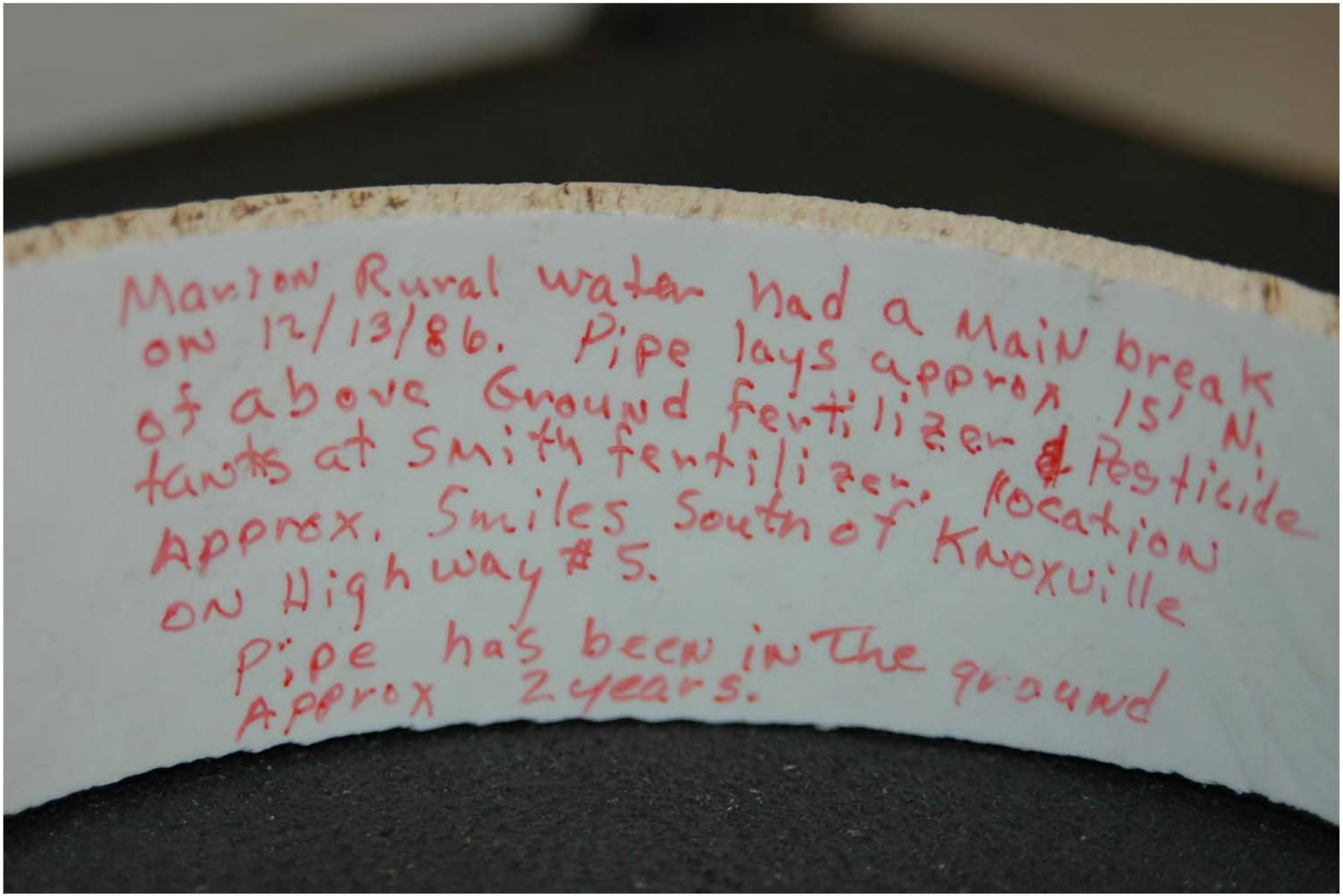
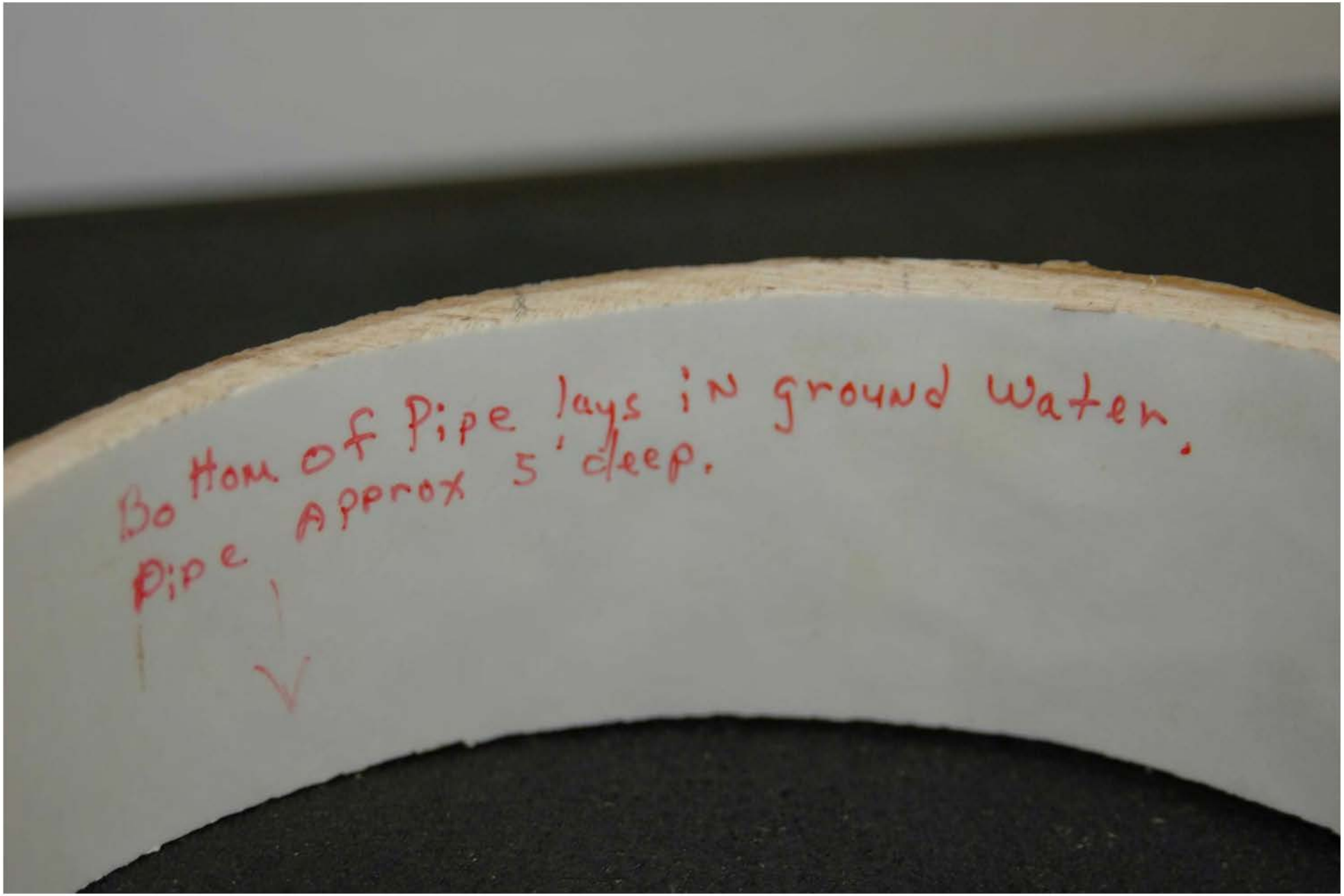

Marion Rural water had a Main break
on 12/13/86. Pipe lays approx 15' N.
of above Ground fertilizer & Pesticide
tanks at Smith fertilizer. Location
Approx. 5miles South of Knoxville
on Highway #5.
Pipe has been in the ground
Approx 2 years.

030969


Bottom of Pipe lays in ground water.
Pipe Approx 5' deep.

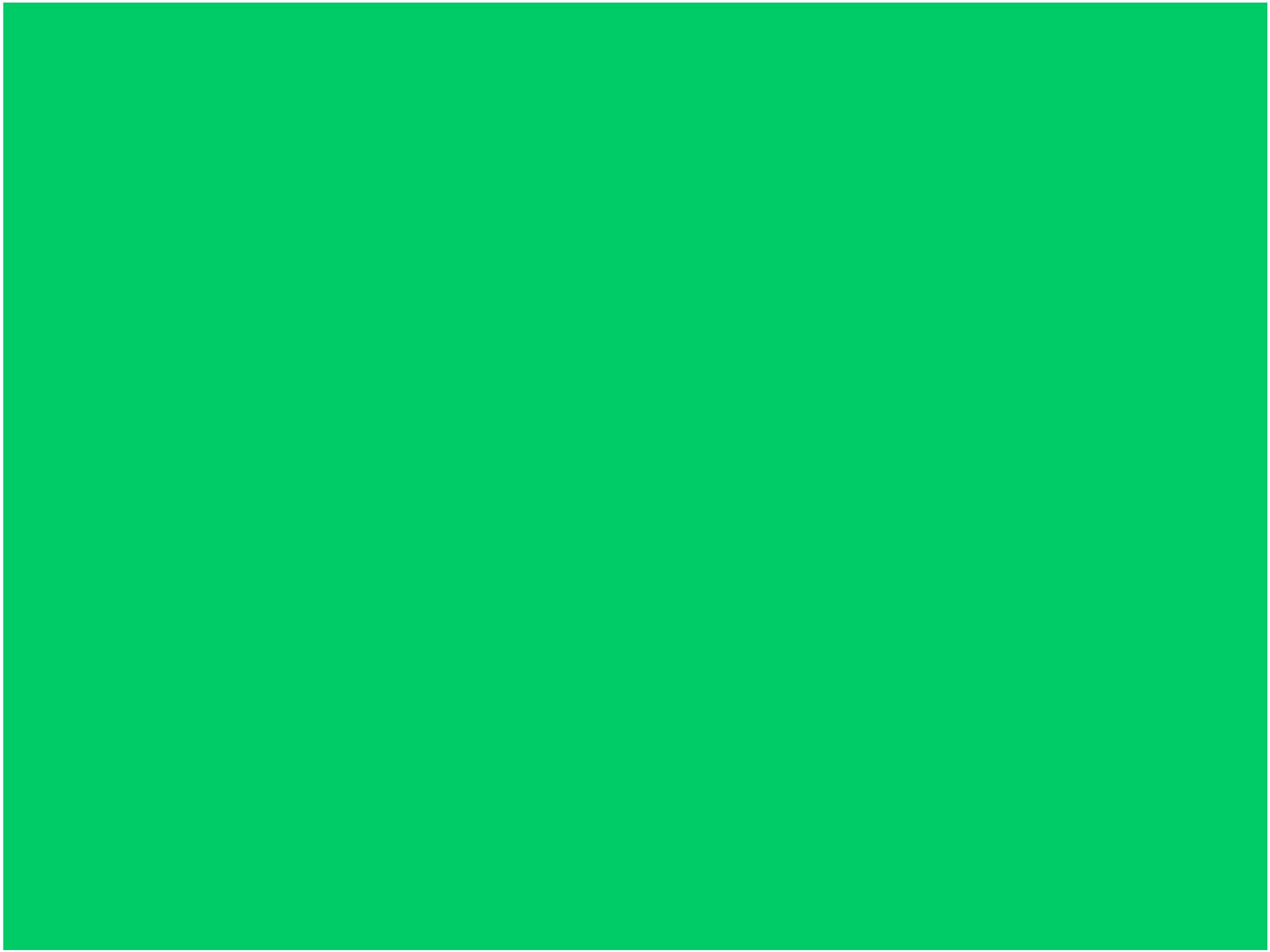
030971

030972

030973

Plastic Water Line Pictures

- It is speculated the plastic water line was weakened by the fertilizer and pesticide.
- Pesticides commonly use petroleum based solvents.
- The pictures show a plastic water line can be impacted at locations other than the joints.
- The pipe was 6 inch diameter and SDR 26 (Standard Dimension Ratio).



Industry Survey

- The Iowa Department of Natural Resources (IDNR) asked six questions to:
  - American Water Works Association
  - National Pipe and Plastics, Inc.
  - Society of Plastics Engineers
  - Engineering Systems, Inc.
  - National Sanitation Foundation

Industry Survey

- Continued
  - American Water Works Association Research Foundation
  - Uni-Bell PVC Pipe Association
  - Ductile Iron Pipe Research Association
  - American Cast Iron Pipe Company
  - Plastic Pipe Institute

Industry Survey

- Question #1 Are you aware of any research papers on petroleum permeation of plastic water lines that would be beneficial to us and readily available? If so, how could we obtain a copy (i.e., internet site, contact information, etc.)?

Industry Survey

- Question #2 Have you evaluated or funded research on the impact of petroleum on plastic pipe including polyvinyl chloride (PVC), polyethylene (PE or black pipe), and polybutylene (PB)? If so, what was your determination?

Industry Survey

- Question #3 If you were aware of a utility project passing through a petroleum contaminated area, would you recommend the use of PVC, PE, or PB pipe? Or would your recommendation depend on the contaminant levels observed in the area (some studies suggest that PVC pipe is permeable by petroleum only at saturated conditions which we assume to mean free product, or grossly contaminated conditions)?

Industry Survey

- Question #4 Have you observed or been made aware of any known problems with petroleum permeation of plastic water lines? If so, can you recall what type of plastic pipe was permeated (i.e.,PVC, PE, PB, HDPE, etc.)? We are particularly interested in permeation of PVC pipe. If you are aware of any occurrences, can you recall if it occurred in a grossly contaminated area?

Industry Survey

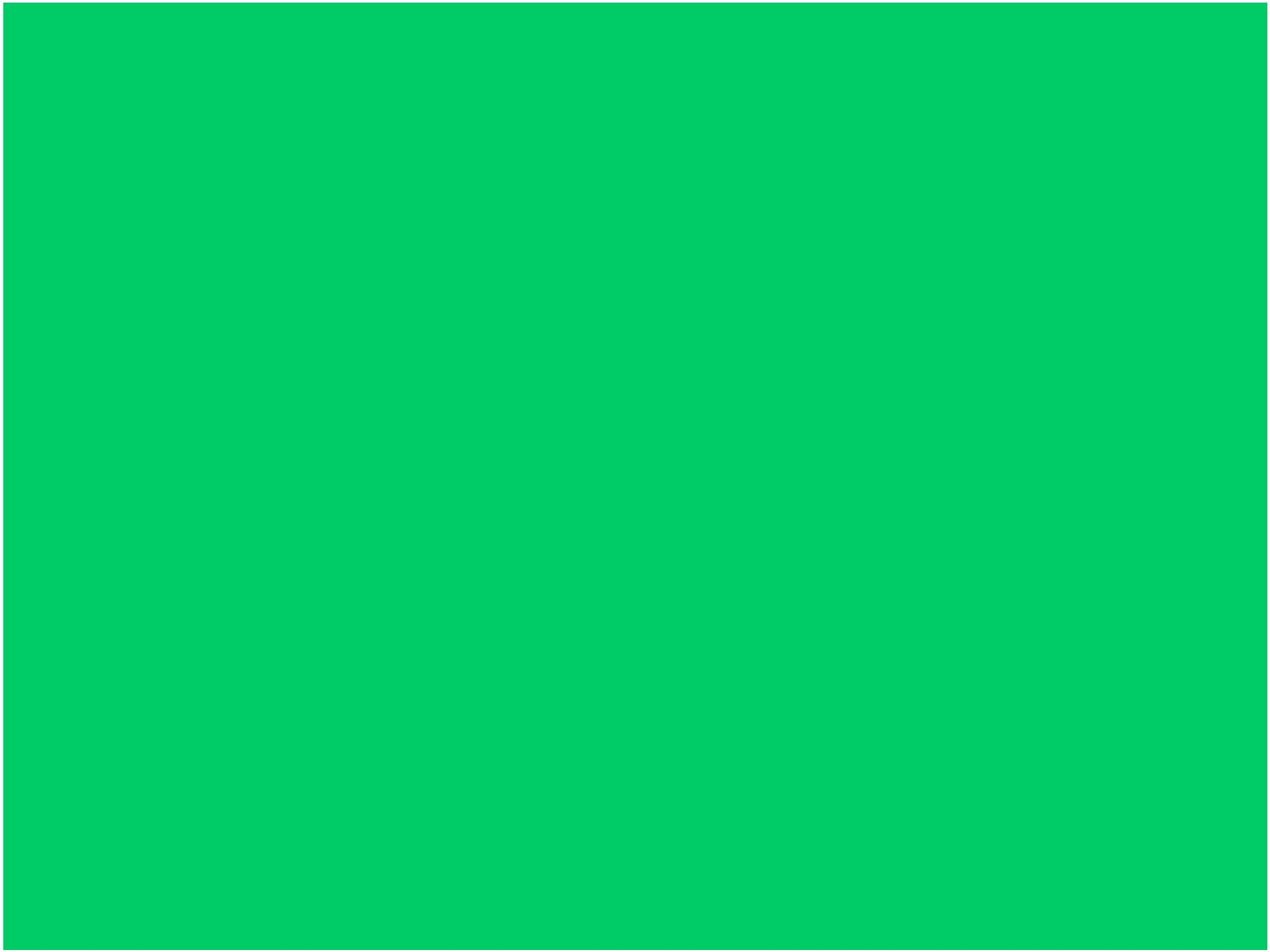
- Question #5 Have you observed or been made aware of any known problems with petroleum permeation through pipe gaskets? Are you aware of any recommendations for the use of special pipe gasket materials in petroleum contaminated areas?

Industry Survey

- Question #6 Are you aware of other contacts from whom we could acquire information on this subject?

Industry Summary

- The American Water Works Association provided the most answers/responses while the majority of the remaining organizations referred the IDNR to another organization. The most common referrals were Unibell PVC Pipe Association and the Plastic Pipe Institute.



IDNR Survey

- The Iowa Department of Natural Resources (IDNR) asked four questions to field office and central office IDNR staff.
  - #1 Have you observed any known problems with petroleum permeation of plastic water lines?

IDNR Survey

- #2 If so, can you recall what type of plastic pipe was permeated (i.e., PVC, PE (black pipe), HDPE (high density polyethylene), etc.)?
- #3 If so, can you recall the site? The contaminant concentration detected in water samples?
- #4 Does your field office have any actual sections of the pipe that was permeated?

IDNR Summary

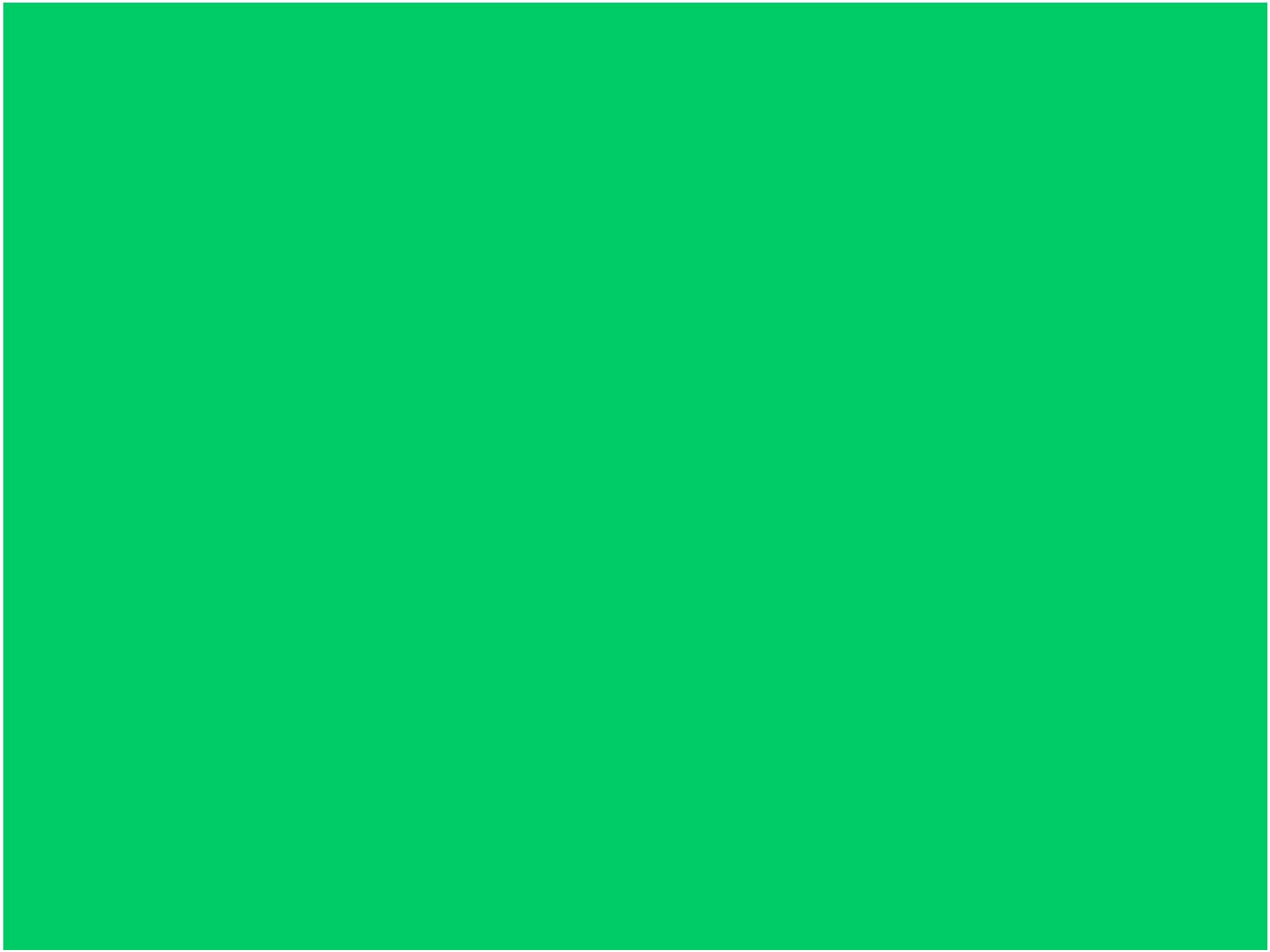
- 24 sites were identified
  - 4 were PVC mains
  - 4 were PVC service
  - 6 were PVC
  - 6 were PE Service
  - 1 was PE
  - 4 were Unknown

IDNR Survey

- Lowest and highest chemical of concern concentrations in water samples
  - benzene 1.4 ppb and 2900 ppb
  - toluene 1.0 ppb and 13.4 ppb
  - ethylbenzene 3.0 ppb and 4.6 ppb
  - xylenes 1.0 ppb and 25.6 ppb
  - TEH-diesel 200 ppb and 14,000 ppb
  - TEH-gasoline 300 ppb and 2400 ppb
  - MTBE 1.7 ppb

IDNR Summary

- The IDNR Underground Storage Tank Section regulates benzene, toluene, ethylbenzene, xylenes, TEH-waste oil, and TEH-diesel in soil and groundwater.
- The 2900 ppb benzene was from a polyethylene (PE) service line to a daycare.



States Survey

- The IDNR sent the state survey through the ASTSWOMO Network and through the ITRC State Point of Contact Network.
- 25 states responded to the survey.

States Survey

- Question #1 Does your state evaluate the impact of petroleum on plastic water lines (PWLs) in your underground storage tank (UST), leaking UST, water supply, and/or other section that might be involved in remediating or permitting of PWLs?

State Summary #1

- Four states have specific procedures for the assessment of plastic water lines.
- Seven states handle these sites on a site-specific basis.
- Ten states do not evaluate plastic water lines.
- Four states did not specifically answer the question.

States Survey

- Question #2 Does your state treat the different types of plastic water lines such as polyvinyl chloride (PVC) or polyethylene (PE) differently? If so, how and why?

States Summary #2

- Six states have procedures for treating types of plastic water lines differently.
- Fourteen states have no procedures for treating types of plastic water lines.
- Five states did not specifically answer the question.

States Survey

- Questions #3 Have you had any known problems with petroleum permeation related to plastic water lines? If yes, what? Was the type of plastic water line known to be PVC or PE?

States Summary #3

- Thirteen states have known problems with permeation of plastic pipe. Of those thirteen states, seven states have specifically had permeation incidents involving PVC.
- Nine states have no known problems.
- Three states did not specifically answer the question.

States Survey

- Question #4 Do you have procedures for addressing pipe gasket materials? If so, how?

States Summary #4

- Five states have specific procedures for addressing gasket materials.
- Six states handle gasket materials on a site-specific basis.
- Eleven states do not evaluate gasket materials.
- Three states did not specifically answer the question.

Survey Summaries

- The industry survey did not provide specific information. People referred IDNR to different organizations.
- The IDNR survey documents impacts to plastic water lines do occur.
- The state survey shows plastic water lines are not evaluated consistently by states.
- The surveys will be posted on www.iowadnr.gov

KXL HP14-001

Cindy Myers, RN

- SDCL 49-41 B-22 states: *The applicant* for a facility construction permit has the burden of proof to establish that:
- "The facility will not substantially impair the health, safety or welfare of the inhabitants."

- Health Impact Assessment
- Emergency Medical Response Plan
- Medical Facilities Unprepared for Dilbit Disasters
- Benzene – Potent Carcinogen
- Drinking Water Contamination
- Water Treatment Plants
- Dr Madden's testimony

No Health Impact Assessment

- The Commission's 2010 permit relies on the federal EIS, prepared by the Department of State
- The Department of State's environmental study does not include a health impact assessment.

Kalamazoo River Spill July, 2010

- The Michigan Dept. of Health identified 320 (58%) of 550 individuals with adverse health effects from four community surveys along the impacted waterways.

- **The “Draft” (Template) TransCanada-Keystone Emergency Response Plan in the FSEIS, Appendix Q does not indicate a specific emergency medical response plan.**

“Oil Pipeline for Emergency Responders”

- Instructs to “Monitor for I-EL, H S and benzene if possible”.
- Do lay people know what that means?
- How available is equipment for benzene testing in air and water?
- Are first responders trained to protect themselves from inhaling benzene fumes?

Kevin Schlosser

Emergency Management Coordinator, Avera McKennan
(Assists Avera St. Mary's in Pierre, SD)

- "What are we dealing with? Give me a (M)SDS, to know the chemicals involved."
- "Time-frame, how fast is it moving, when will it reach water intakes"
- "Would want to know how to slow it down, contain it. I would like to ask industry experts how soon will it reach us. I have not seen any of that."

Kevin Schlosser

- "If they would provide a (M)SDS, it would be kept in the Emergency Department to have readily available."
- "Have not been given any information specific to tar sands oil product."
- "I would rely on the County Emergency Manager, the Sheriff's Dept., and also would rely on a (M)SDS for treatments."

Kevin Schlosser

- Not aware of training to instruct health facilities how to respond to tar sands emergencies/disasters.
- For decontamination, would rely on the Safety Data Sheet for review and instructions.
- "I've checked with the person that does Emergency Preparedness for Avera St. Mary's (Pierre) and they have not seen a SDS to this point."

- **Sample MSDS in FSEIS: “These MSDS do not represent the actual product that would flow through the proposed Keystone XL pipeline”**

- **TransCanada: “TransCanada is not a medical provider and does not provide medical information. The local medical authority has jurisdiction during an incident or emergency.”**

- No communication with Indian Health Services or South Dakota health care facilities
- Staff education needed concerning tar sands oil product, KXL spill scenario drills, and treatment for benzene exposure.
- Treating benzene toxicity is not usual for most health professionals.

FSEIS:

"…benzene was determined to dominate toxicity associated with potential crude oil spills."

4.13-25

International Agency on Cancer Research (IACR)

Benzene is a Group One Carcinogen

Dept of Health and Human Services and EPA have also determined benzene is carcinogenic.

Exposure to Benzene

- **Ingestion** (Water and Food)
- **Inhalation of Vapors** (inhabitants in vicinity of spills, emergency workers)
- **Skin Contact** (emergency workers, bathing and washing clothes with contaminated water)
- **Eye Contact** (splashes)

3.13-4

- EPA has set 5 ppb as the maximum permissible level of benzene in drinking water.
- EPA has set a goal of 0 ppb for benzene in drinking water and in water such as rivers and lakes because benzene can cause leukemia.

Brad Vann, EPA Environmental Scientist

Benzene at 5 ppb~

"you can't smell, taste or see it. It requires laboratory analysis to detect at these concentrations. Therefore, it would be possible to drink dilute Benzene above the MCL unknowingly."

Dr. Arden Davis

"Because of benzene's solubility and its allowable limit of only 5 parts per billion in drinking water, a pipeline leak could contaminate a large volume of surface water or ground water...".

Dr. Arden Davis

"Benzene is soluble in water and can be transported downgradient toward receptors such as public water-supply wells, private wells, and springs or seeps. In certain cases, benzene can be transported more than 500 or 1000 feet downgradient in aquifers."

Dr. Arden Davis

"A crude-oil or diluted bitumen leak could have devastating effects on ground-water supplies, surface water, and environmental resources in South Dakota."

Benzene Toxicity

- Brief exposure (5–10 minutes) to very high levels of benzene in air can result in death.

- Lower levels (air) can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness

Exhibit 6031, ATSDR

- Eating foods or drinking liquids containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, coma, and death.

ATSDR

- Leukemia
- Anemia
- Lowered Immunity
- May be harmful to the reproductive system
- Benzene can pass from the mother's blood to a fetus.

ATSDR

Effects to Fetus?

- Animal studies have shown that benzene can cause low birth weight, delayed bone formation and bone marrow damage.

ATSDR

Dr John Stansbury, UNL

There should have been a human health risk assessment that would have estimated the increased risk of cancer, but there isn't any such assessment. ***They simply indicate that there could be a significant, undetected release of benzene which could be consumed by human receptors*** and leave it at that.

Condition #40 BTEX Concern

- BTEX (benzene, toluene, ethyl benzene, xylene)

- BTEX can permeate polyethylene water piping. TransCanada offers to replace it with more resistant piping within 500 feet of the Project.

Iowa Department of Natural Resources Plastic Water Line Survey

- Have you had any known problems with petroleum permeation related to plastic water lines? If yes, what? Was the type of plastic water line known to be PVC or PE?

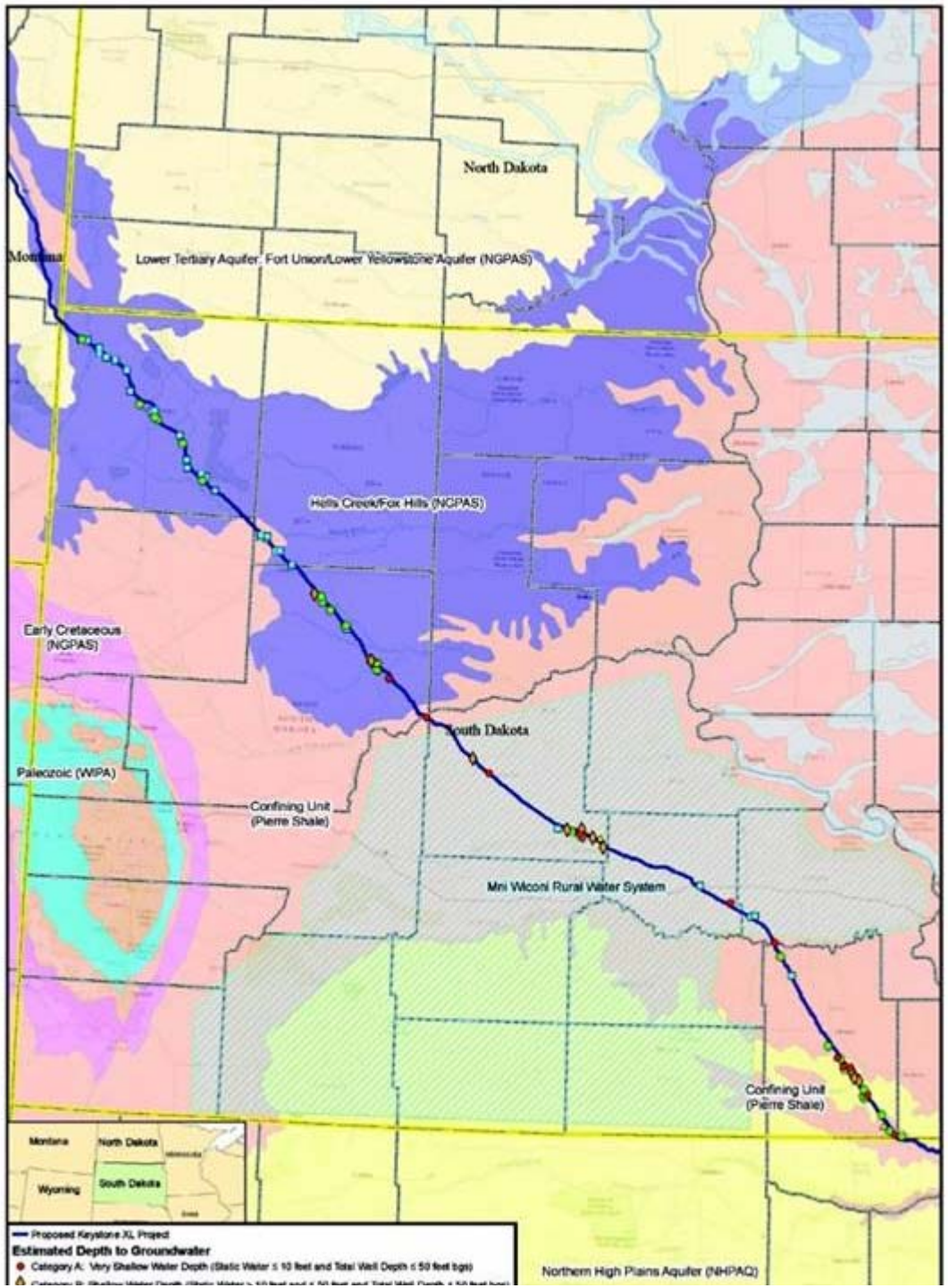
- Thirteen states have known problems with permeation of plastic pipe. Of those thirteen states, seven states have specifically had permeation incidents involving PVC.

Mni Wiconi and KXL Cross at 471

- Mni Wiconi Water Pipe is PVC
- 6 feet apart
- Leaks at this location could saturate the water pipe with benzene, indefinitely if undetected pinhole leaks.

Pinhole leaks can be difficult to detect and yet spill large volumes. Not all leaks will be detected

- ***A pinhole may create a medium to large spill*** due to the difficulties for SCADA or aerial surveillance to detect such a leak. The SCADA system, in conjunction with Computational Pipeline Monitoring or model-based leak detection systems, would detect leaks to a level of approximately 1.5 to 2 percent of the pipeline flow rate. **FSEIS 3.13.5.3**
- Large spills are defined as greater than 1,000 bbl (42,000 gallons) **FSEIS 3.13.5.3**
- Neither TransCanada nor SD will test for water contamination from potential spills not detected by the leak detection system, choosing only to do analyses "in the event of a release."



- In SD, 105 known wells within 1 mile of the proposed project, including Colome's city wells.

Map 3.3-21

Info 4.3-17

Condition #35

- "...in southern Tripp County, the High Plains Aquifer is present at or very near ground surface and is overlain by highly permeable sands permitting the uninhibited infiltration of contaminants."

Tripp County

- "This aquifer serves as the water source for several domestic farm wells near the pipeline as well as public water supply system wells."

- Condition 35

17 drops of benzene enough to contaminate Colome's 50,000 gallon water tower

Calculations reviewed by Dr. Arden Davis.

Carol Moyer, Public Water Contact for Colome, SD

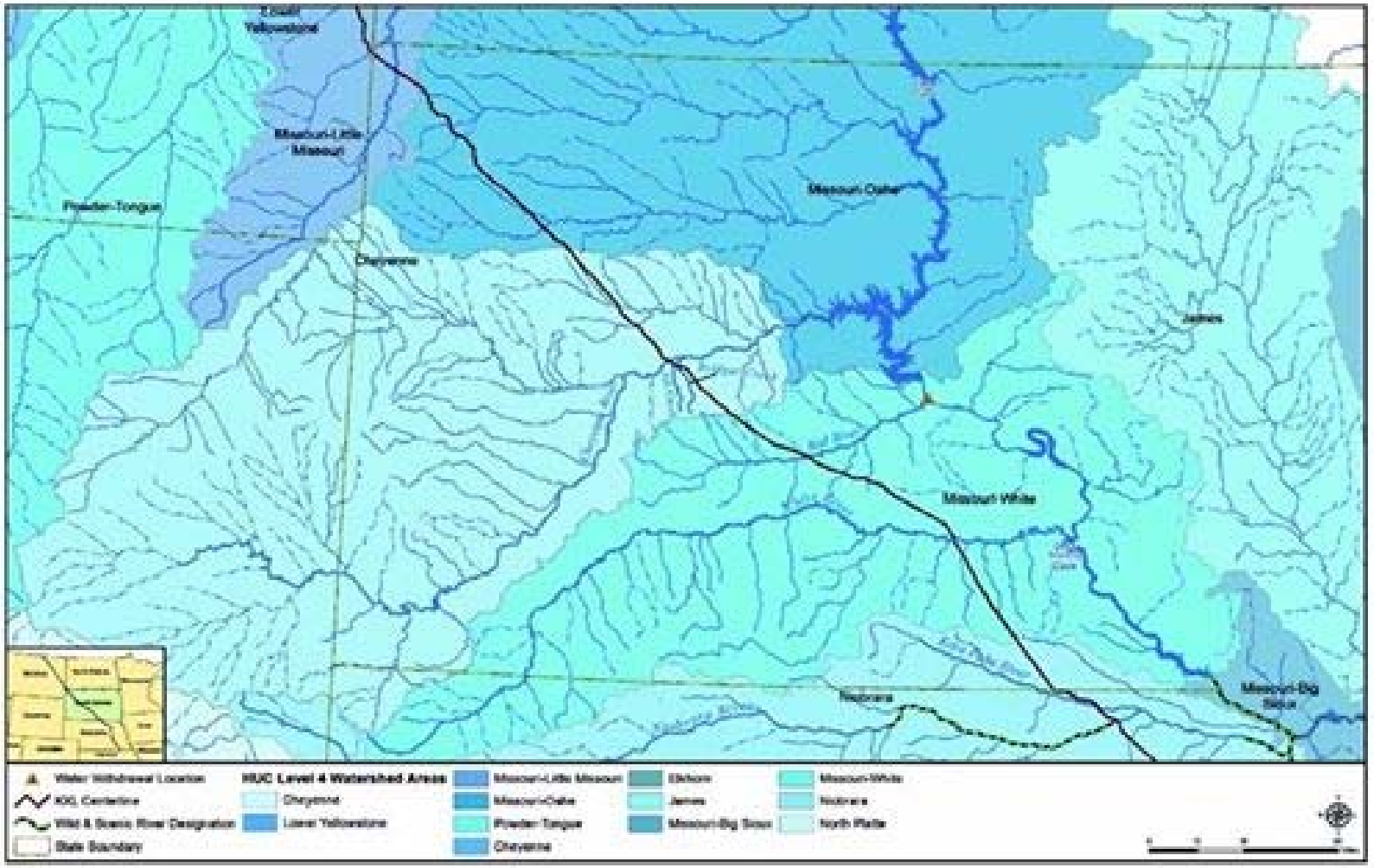
- The first route crossed directly through the 10 acres where Colome's two wells are located. The route was moved approximately 200 yards from the well acreage.
- "I do have concerns"
- "I don't think safety was a concern at all"
- "Moved it just far enough to get an easement"

phone visit 05-13-15

FSEIS, Chapter 4

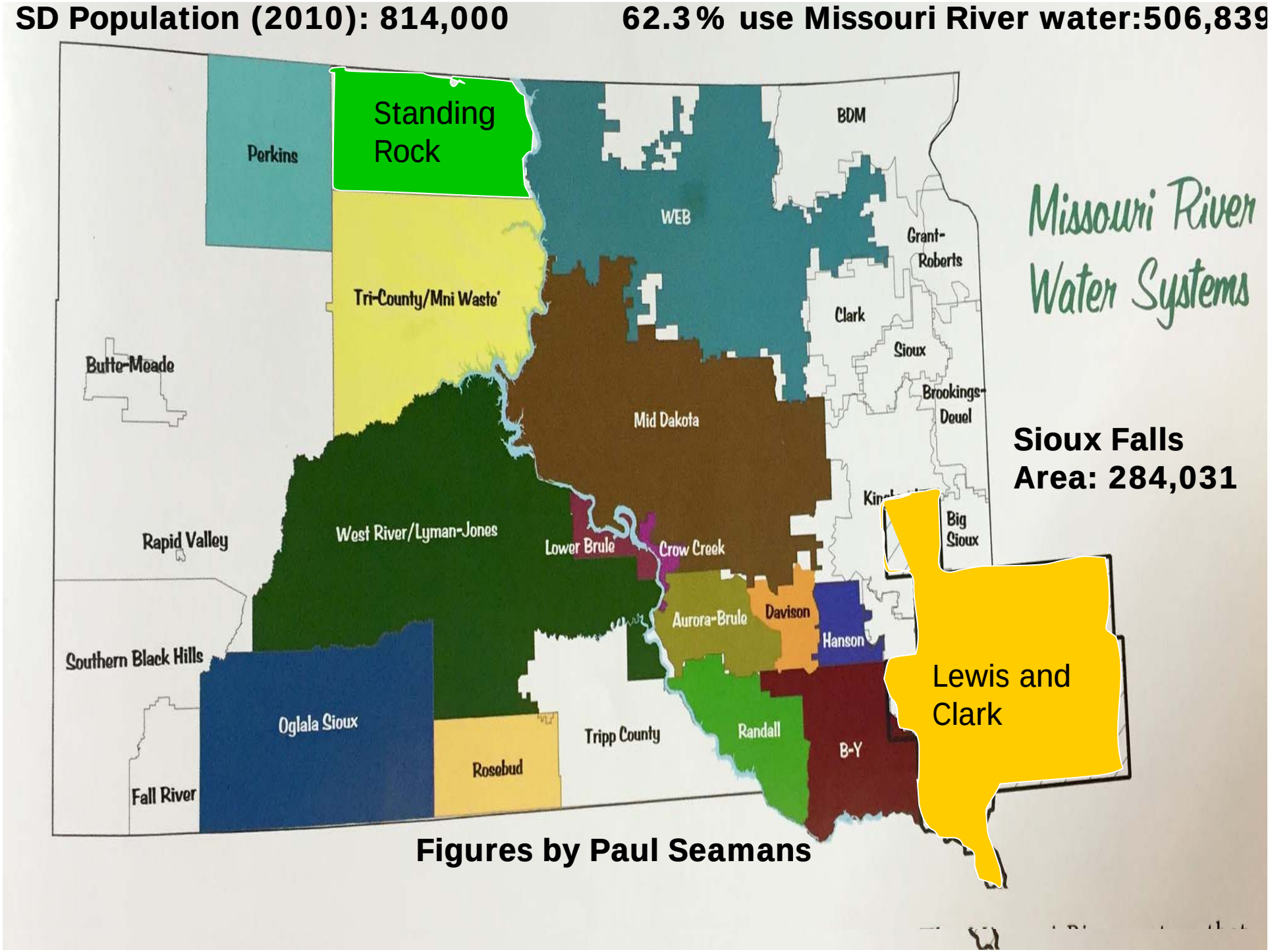
- A large municipal supply well or intake could potentially draw affected water to the well or intake since it would draw from a larger area of groundwater.

"The proposed Project route would cross several tributaries to the Missouri River with the potential to affect the Missouri River" 3.3-3.39



031038

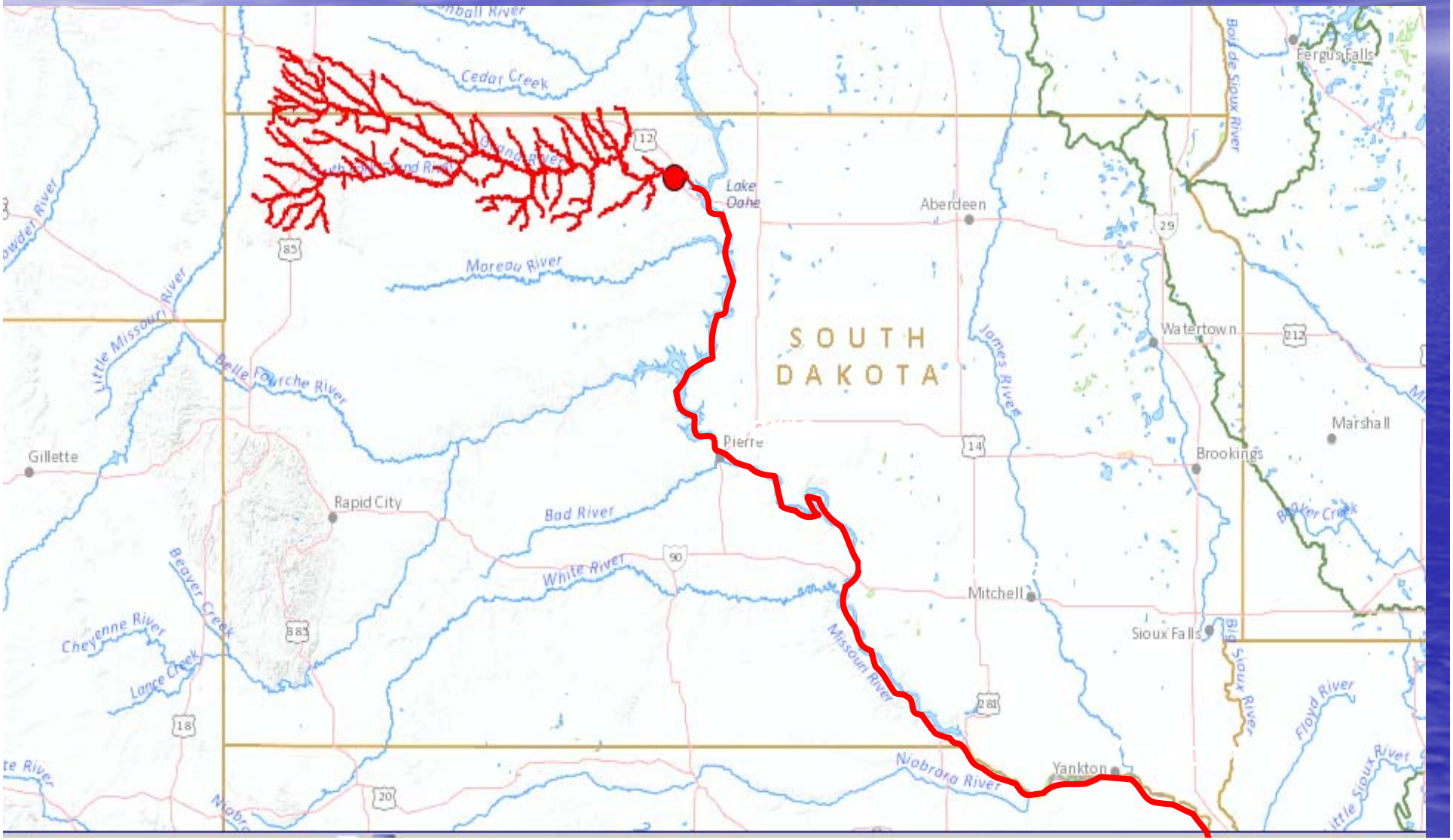
SD Population (2010): 814,000 **62.3% use Missouri River water:506,839**



Figures by Paul Seamans

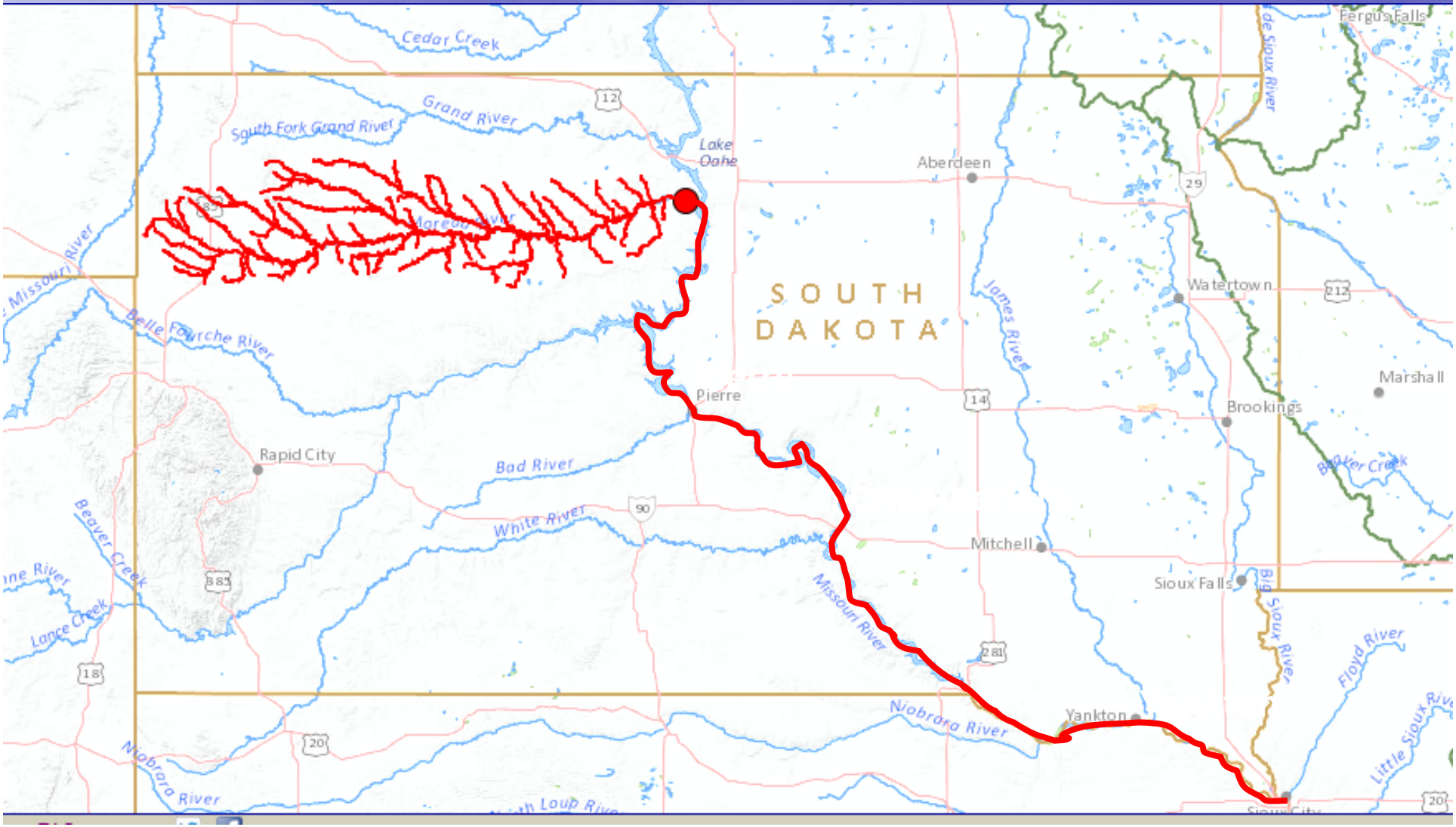
031039

Grand River Drainage Basin



031040

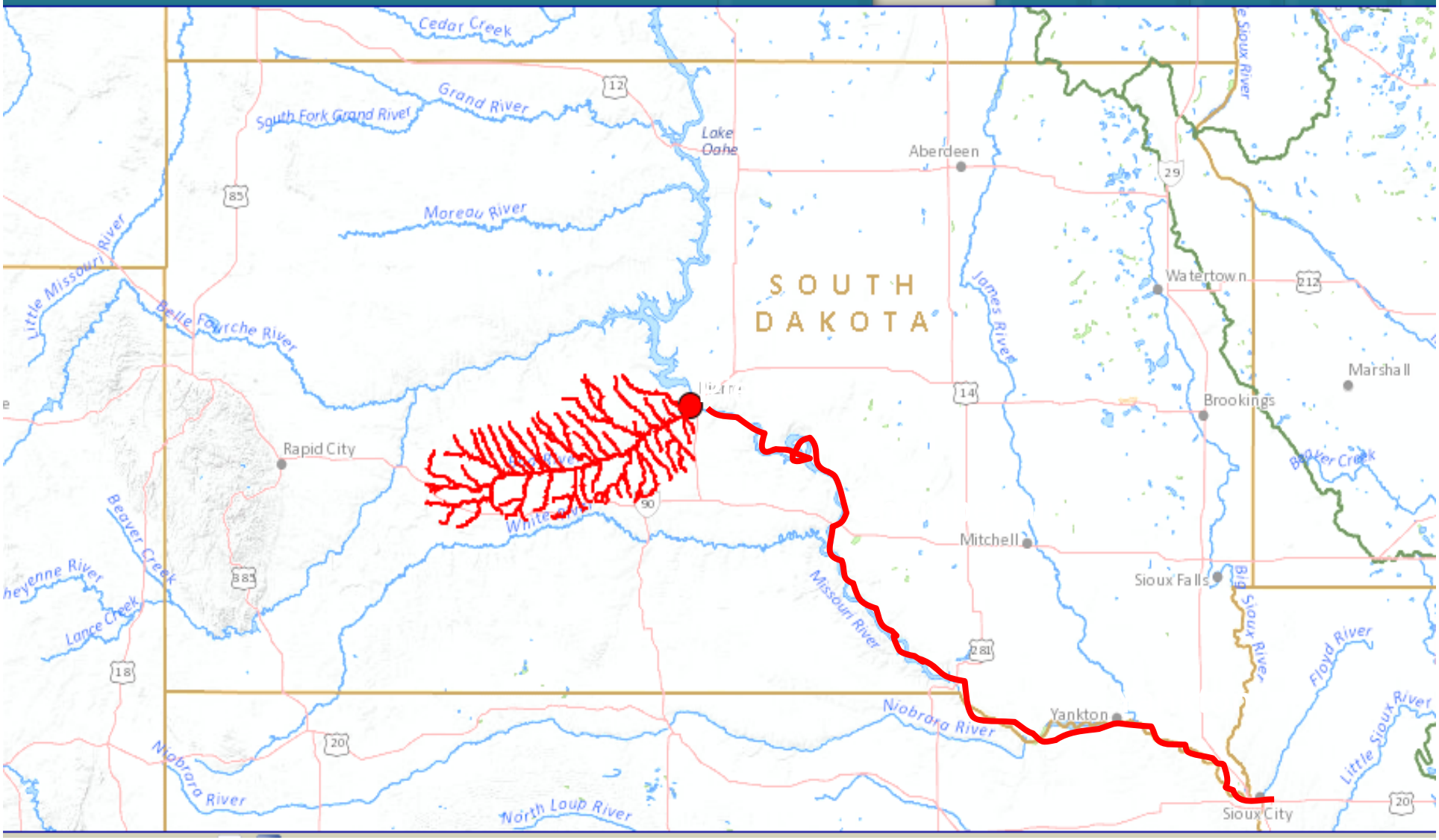
Moreau River Drainage Basin



Cheyenne River Drainage Basin

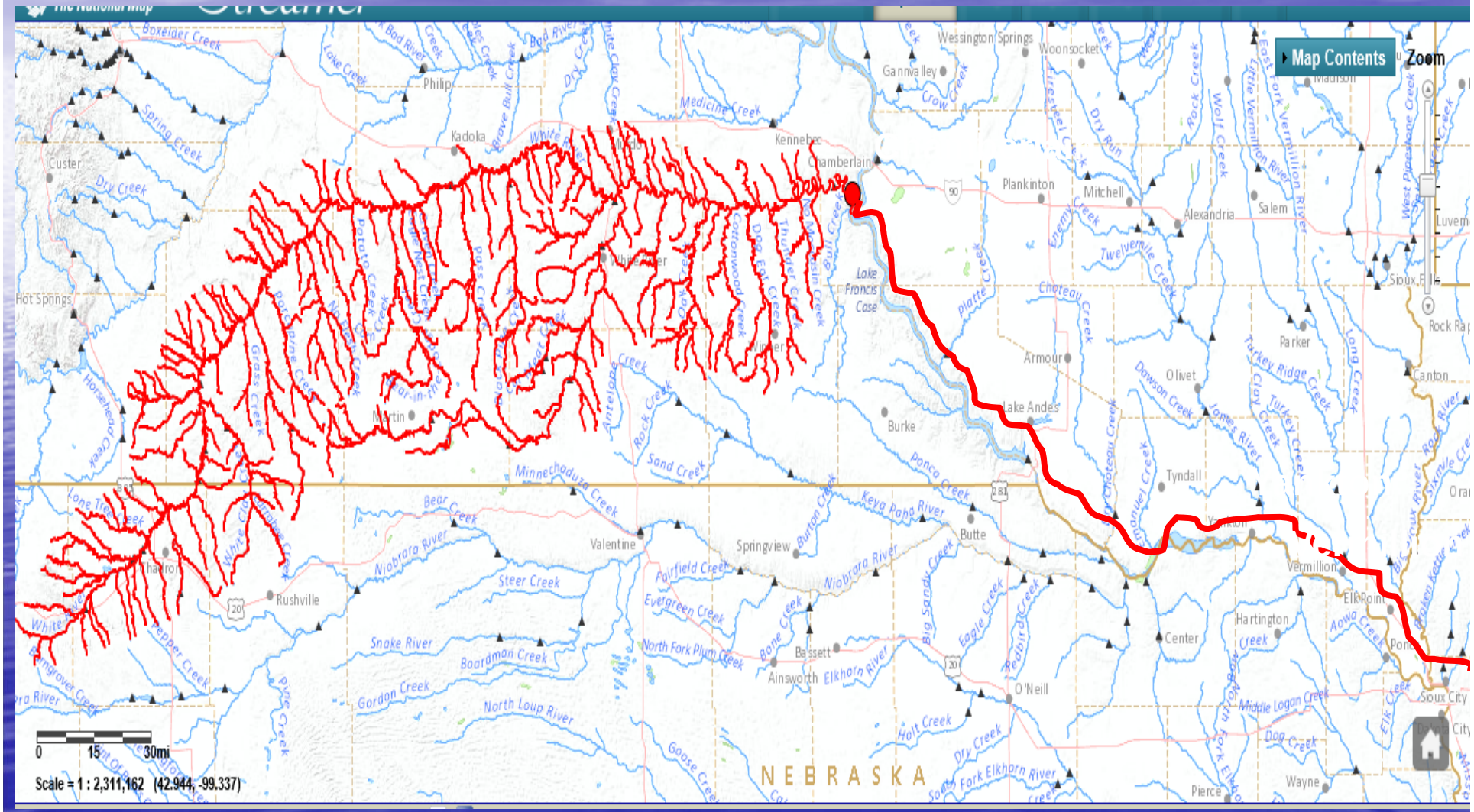
031042

Bad River Drainage Basin



031043

White River Drainage Basin



Dr Arden Davis

"At these river crossings and downstream, the proposed pipeline poses serious risks and could have devastating effects on surface water and associated environmental resources, potentially affecting water supplies and surface-water users."

Dr Arden Davis

- Cheyenne River
- "If a release occurred at this crossing and it could not be controlled or went undetected for 12 to 24 hours, petroleum contaminants could reach the Missouri River, potentially affecting water supplies and surface-water users..."

Dr Arden Davis

- A spill “could potentially be transported about 60 miles downstream in 12 hours. If a leak cannot be controlled or is undetected for 24 hours, it could be transported about 120 miles downstream.”

FSEIS 3.3-42

- "Spills or releases into surface waters could travel through these tributary systems and could potentially result in impacts to affect the Missouri River, aquatic habitats, as well as the MWRWSS."

MT DEQ

- Oil noted 70 miles downstream in Yellowstone River after silvertip pipeline spill July 2011

BREACH IN PIPELINE FOUND; CANCER-CAUSING AGENT DETECTED IN WATER

~ Billings Gazette January 20, 2015

Glendive, MT Jan. 2015

- 50,000 gallons spilled from a 12 inch pipe near Glendive. (KXL is 36 inches)
- Benzene up to triple the mcl in the Glendive public water system.
- Intake from Missouri River was 14 feet below the surface.
- Officials did not warn residents until two days later.
- Did not have equipment on hand right away to pick up contamination.

Current Water Treatment Systems Do Not Remove Benzene

SD Public Water Intakes

- I visited with three SD water treatment plants using water from the Missouri River. Two water treatment plants were unaware of response planning to an oil spill affecting the Missouri River, the third did say a spill kit (for water analysis) is available for emergencies.
- "DNR usually sends out information, but "haven't heard a word from them" when asked what he knew about tar sands spillage into water.
- The Bureau of Reclamation would notify them if an oil spill threatened the water supply.
- One plant thought benzene analysis was done quarterly and another plant thought benzene analysis was done yearly.

FSEIS Appendix P

- "Most spills that enter a waterbody could result in exceedence of the national MCL for benzene."
- "...analysis indicates the need for rapid notification of managers of municipal water intakes downstream of a spill so that any potentially affected drinking water intakes could be closed to bypass river water containing crude oil."

Waterway Crossed by KXL	KXL to Water Intake (estimated)	Public Water Intake
Cheyenne River	50-60 miles	Cheyenne Reservation
Cheynne River	89.5miles	MWRWSS
Cheyenne River	156 miles	Chamberlain
White River	222 miles	Yankton
White River	222 miles, +	Sioux Falls

FSEIS

- “A notable difference between dilbit and other forms of crude is its capacity to precipitate out in water.”

- “Due to the capacity for dilbit to precipitate out in water and its resistance to biodegration, in the event of a release to a waterbody, more difficult cleanup scenarios (dredging) may be expected...”

3.13-10

Socio-Economic Factor 107

Testimonial analysis by Dr. Madden is inadequate to meet SDCL 49-41 B-22. which requires the project must protect the health, safety and welfare of SD residents. He is not a medical doctor, but an economist.

Exhibit 6007

	SOURCE OF ECONOMIC IMPACTS	DIRECTION OF IMPACT	NET IMPACT
HEALTH	Revenue	Positive	Positive
	Labor Costs	None Significant	
	Displacement of Traditional Users	None	

- I firmly believe the risks to drinking water is clearly stated in the FSEIS and testimony by Arden Davis

- The ATSDR, one of the highest authorities concerning toxins, clearly indicates benzene is a serious health threat.

- **This project poses a public health threat, particularly to drinking water sources.**

- **The project could substantially impair the health, safety and welfare of South Dakotans.**

031061