BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

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-o-o-o-o

HP 14-001

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 PROJECT

REBUTTAL TESTIMONY OF JEFF MACKENZIE

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-o-o-o-o

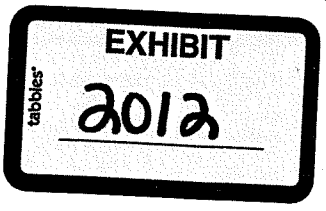
Pursuant to the Commission's Order Granting Motion to Define Issues and Setting Procedural Schedule, Petitioner TransCanada Keystone Pipeline, LP, offers the following rebuttal testimony of Jeff Mackenzie.

1. Please state your name and occupation.

A. Jeff Mackenzie, Senior Emergency Preparedness and Response Specialist with TransCanada.

2. Did you provide direct testimony in this proceeding?

A. No. I'm a highly-skilled Senior Emergency Manager with more than 20 years' experience in Emergency Management & Preparedness, Risk Management, Facilities and H&S. I have specialized knowledge in Emergency Services Management, EH&S Programs Development, Risk Management and Emergency Services Administration. A current copy of my resume is attached as Exhibit A.



3. To whose direct testimony are you responding in your rebuttal testimony?

A. I am responding to the direct testimony of Richard Kuprewicz and Dr. Arden Davis.

4. Mr. Kuprewicz's testimony (pg. 1) states "effective cleanup/remediation of ruptures into the rivers would be most unlikely, despite extensive and expensive efforts in this challenging terrain, and could be devastating to the state." Can you comment on this statement?

A. While the likelihood of a release is very low, TransCanada takes full responsibility for emergency response and clean-up for any of the pipelines that we own and operate. TransCanada will assume the responsibility for managing spill events and will pay for remediating any environmental impact or for any property damage that may result from a spill. Section 1002 of the Oil Pollution Act of 1990 states that TransCanada is liable for: (1) certain specified damages resulting from the discharged oil; and (2) removal costs incurred in a manner consistent with the National Contingency Plan (NCP). Additionally, PHMSA regulations at 49 CFR 194.115 require each operator to identify and ensure the resources necessary to remove a worst case discharge, to the maximum extent practicable, and to mitigate or prevent a substantial threat of a worst case discharge. This capability is demonstrated through the Keystone Pipeline System Emergency Response Plan. The Keystone Pipeline System Emergency Response Plan describes various techniques for containing spilled oil in water (e.g. deflection/diversion boom, containment boom). The Response Plan also describes the techniques used to recover spilled product using weir skimmers, oleophilic skimmers, and suction skimmers. These tactics are proven to be the most effective means to recover spilled product, and TransCanada has access to

all of the resources required to employ these tactics through internally owned equipment, trained company personnel, and contact resources. More detail specific to emergency response in rivers is provided in response to Question 9 herein.

TransCanada has extensive, recent experience working in challenging terrain where site access was challenging. In those instances, TransCanada proved it has ability to gain access and appropriately respond. For example, in 2013, TransCanada experienced a natural gas pipeline rupture in northern Alberta where swamp and muskeg made access to the site extremely challenging. TransCanada successfully responded to the incident by building roads with rig mats, using tracked vehicles to navigate swamps and sloughs, and employing heavy-lift helicopters to transport equipment to the isolated location. In addition, TransCanada is constructing pipelines in some of the most rugged mountains in Mexico. There, TransCanada has used winches and cable systems to transport personnel and equipment up and down steep, isolated, mountainous terrain. TransCanada has contractual agreements in place with helicopter companies in the United States having the ability to sling and lift emergency response equipment and resources into remote areas.

In addition to challenging terrain, TransCanada is prepared to respond to emergencies in harsh climates and weather conditions. Since the Keystone Pipeline has been in service, TransCanada has conducted emergency response exercises in extremely cold weather allowing personnel to test such tactics as ice slotting for product containment under frozen waterways. Similarly, TransCanada has responded to actual emergencies in Canada where ambient temperatures were dangerously low; still TransCanada was able to respond safely in those

conditions, which are comparable to those experienced in western South Dakota during the winter season.

5. Mr. Kuprewicz's testimony (pg. 2) references what he calls "past failures of [oil spill response] plans to be truly effective." Can you comment on this assertion?

A. Oil spill response plans are developed by pipeline operators as required by PHMSA regulations at 49 CFR Section 194.115. PHMSA is the federal agency with the technical expertise to review the adequacy of these plans. To the extent Mr. Kuprewicz has concerns with the efficacy of oil spill response plans across the industry, that would be an issue to be addressed with PHMSA.

The existing Keystone Pipeline System Emergency Response Plan was developed in accordance with 49 CFR Part 194. The Keystone ERP was reviewed and approved by PHMSA prior to Keystone commencing operations in 2010. Required Worst Case Discharge scenarios were calculated using the U.S. Coast Guard criteria. Using these figures, TransCanada identified and ensured, by contract or other approved means, the resources necessary to remove, to the maximum extent practicable, a worst case discharge and to mitigate or prevent a substantial threat of a worst case discharge. Keystone will augment the Keystone Pipeline System ERP to address these same issues along the route of the Keystone XL Pipeline. The augmented plan will be reviewed by PHMSA.

In the course of reviewing Keystone's Presidential Permit application, the State Department (DOS) tendered a data request to Keystone in which it required Keystone to describe its response to two spill scenarios. These scenarios are presented in the excerpt from the August 2011 Final Environmental Impact Statement, which is attached as Appendix A to my testimony.

DOS stated that Keystone's response to these scenarios provided an opportunity to review the level of preparedness and foresight that would be in place relative to potential spills from the proposed Project.

As stated in the FEIS, DOS and PHMSA reviewed these hypothetical spill response scenarios prepared by Keystone. Based on its review of the hypothetical spill response scenarios, DOS stated that it considers Keystone's response planning appropriate and consistent with accepted industry practice.

6. Mr. Kuprewicz's testimony (pg. 2) states "An oil spill plan should also include dealing with a possible release in the critical Ogallala Aquifer." Can you comment on this statement?

A. TransCanada will include the possibility of a release in the Ogallala Aquifer in the Emergency Response Plan for Keystone XL. As I have stated, the existing Keystone Pipeline System Emergency Response Plan will be augmented to include the risks and hazards associated with the Keystone XL route. Such risks and hazards include a release to groundwater, and the tactics for remediating this type of spill are already addressed in the Keystone Emergency Response Plan. Specifically, the following procedures and potential remediation techniques are included in the Keystone Emergency Response Plan:

Procedures:

- Evaluate the topography and evidence of surface contamination.
- Establish containment, accounting for public safety, spill volume, terrain, and presence of surface water.
- Notify landowner and appropriate public agencies of potential groundwater contamination.
- Immediately retain an independent consultant with expertise in this area to evaluate impacts and remediation options.

- Consult with appropriate agencies regarding remediation, including water and soil cleanup levels, and need for groundwater monitoring.
- Notify and procure additional response equipment and personnel as necessary to address site-specific conditions.

Remediation Techniques:

- Dig intercept trench down-gradient of release point.
- Line trench and stage vacuum truck to remove contaminated oil/water mixture.
- Excavate surface catchment up-gradient of the intercept trench and near leading edge of visible contamination.
- Excavate until contaminated soil is completely removed and clean soil is encountered or conditions prohibit continued digging.
- Line the catchment to limit or prohibit further groundwater contamination.
- Move vacuum truck from intercept trench to catchment to recover oil and/or oily water.
- Line drop down area to stage contaminated soil as excavated.
- Segregate waste streams to minimize later disposal.
- Based on anticipated release, stage temporary storage and additional vacuum trucks to ensure recovery efforts continue without interruption.

- Options for Long-term Remediation:
  - Air sparging
  - Vacuum extraction
  - Conventional pump and treat
  - Bio-slurping
  - Excavation
  - Enhanced biodegradation/bioremediation
  - Chemical addition/oxidation
  - Natural Attenuation
  - Enlist additional experts, as appropriate, for continuing remediation and coordination with appropriate agencies.
  -

7. Mr. Kuprewicz's testimony (pg. 2) states "The Keystone XL oil spill plans should be independently reviewed and made public to assure their effectiveness." Can you comment on that assertion?

A. The existing Keystone Pipeline System Emergency Response Plan was developed in accordance with 49 CFR Part 194 and is distributed, retained, and submitted to PHMSA in accordance with that federal regulation. Additionally, the plan satisfies South Dakota Codified

Laws 34A-12-9, 34A-18-2, and 34A-18-9. The South Dakota Department of Environment and Natural Resources – Division of Environmental Services is a plan holder of Controlled Copy #26 of the Keystone Pipeline System Emergency Response Plan, and the Department receives notification within 30 days of any change to the plan. A redacted version of the ERP for the Keystone System is available to the public as Appendix I to the State Department's January 2014 Final Supplemental Environmental Impact Statement.

8. Mr. Kuprewicz's testimony (pg. 6) states "[t]he potential to rapidly spread in this [steep terrain] environment raises a serious question as to whether the 12-hour or even the 6-hour Tier 1 time limit in federal regulations will be appropriate." Do you have a comment on that testimony?

A. First, the response time limits set forth at 49 CFR 194.115 have been established by the federal agency with demonstrated expertise in this area. If Mr. Kuprewicz believes they are inadequate, he should take that position up with the agency having responsibility and jurisdiction over this area.

TransCanada places great emphasis on ensuring the ability to promptly respond to an emergency. In fact, TransCanada has designed exercises to specifically assess the ability of their contracted response organizations to provide resource for a worst case scenario within the required time limits. These exercises evaluate contractor's availability to respond in specified time frames. In 2013, a Third Party Contractor Assessment Exercise was conducted in Yankton, SD to ensure adequate resources were available, and similar exercises are anticipated across the pipeline system in the future.

9. As recent ruptures have indicated in the Yellowstone River, Oil Spill Response can be highly ineffective at containing or recovering spilled oil, which can rapidly spread tens of miles downstream in major river ways.

A. TransCanada maintains contracts with US Coast Guard classified Oil Spill Removal Organizations. These organizations have access to the most efficient and technologically advanced containment and recovery equipment available.

The Keystone Pipeline System Emergency Response Plan describes various tactics for containing and recovering spilled oil in flowing waterways. Dikes, berms, and dams are land-based tactics, with the objective of containing spilled oil and limiting spreading of oil slicks, thus minimizing impacts to the environment. Dikes, berms and dams are embankment structures built-up from the existing terrain, placed to contain and accumulate oil for recovery. These barriers can serve to:

- Contain and stabilize a contaminated area.
- Contain or divert oil on water or oil that has potential to migrate.
- Create cells for recovery.
- Use natural depressions to act as containment areas for recovery.

The Response Plan also describes the techniques and equipment used to recover spilled product in waterways through the use of skimmers, which fall into three types:

- Weir skimmers draw liquid from the surface by creating a sump in the water into which oil and water pour. The captured liquid is pumped from the sump to storage. Weir skimmers can recover oil at high rates, but they can also recover more water than oil, especially when the oil is in thin layers on the surface of the water. This creates the need to separate the water from the oil and decant it back into the environment. Otherwise, the recovered water takes available storage volume. Weir skimmers are best employed where oil has been concentrated into thick pools or where there are very large volumes of oil and recovered liquid storage capacity.

- Oleophilic skimmers pick up oil that adheres to a collection surface, leaving most of the water behind. The oil is then scraped from the collection surface and pumped to a

storage device. Oleophilic skimmers do not recover oil as fast as weir skimmers, but they have the advantage of recovering very little water. Oleophilic skimmers may be used where oil is very thin on the surface. Oleophilic skimmers are a good choice where liquid storage capacity is limited.

- Suction skimmers use a vacuum to lift oil from the surface of the water. These skimmers require a vacuum pump or air conveyor system. Like weir skimmers, suction skimmers may also collect large amounts of water if not properly operated. Most suction skimmers are truck mounted and work best at sites with road access.

These tactics are proven to be the most effective means to recover spilled product, and TransCanada has access to all of the resources required to employ these tactics through internally owned equipment, trained Company personnel, and contacts resources.

10. Kuprewicz testifies that oil spill response and remediation for the segment of the pipeline in Tripp County spanning the Ogallala Aquifer should focus on surrounding the release site with "reverse flow" injection and soil capture and remediation methods to limit its spread and involves removing underground soil contaminated from spill plumes that may be developed.

A. TransCanada will implement the most effective strategies, techniques, and equipment available to respond to any emergency in all our operating environments along the pipeline. During an emergency, TransCanada will work in collaboration with regulatory agencies to develop our strategies based on site specific conditions such as land or surface water, weather, geology, soil type, etc. While reverse flow injection may be one tactic to respond to an oil spill, TransCanada will not limit itself to a single response tactic. Instead, TransCanada will maintain contracts with US Coast Guard classified Oil Spill Removal Organizations who have access to the most efficient and technologically advanced containment and recovery equipment available.

11. Dr. Davis testifies that diluted bitumen that sinks in water is significantly more difficult to clean up. Can you comment on that statement?

A. TCP considers the potential for sinking and submerged oil as part of our Emergency Response plans and in the execution of such plans. In the unlikely event of a spill, TCP would work hand-in-hand with regulatory bodies to determine the correct response and remedial actions given to the specific variables of the event. While sinking crude oils do pose a greater challenge for containment and clean up compared to floating oil, the industry has emergency response containment and clean up procedures that have substantially improved, in part because of the lessons learned from the Kalamazoo spill.

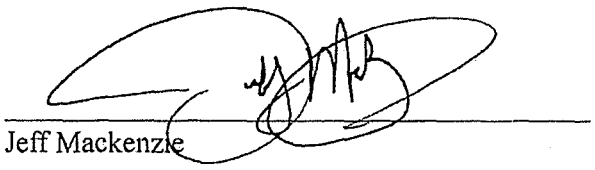
Such emergency response tactics may include, but not limited to the following:

•Mechanical methods such as suction dredging and air bubbling.
•Non-Mechanical methods could include chemical treatment / dispersants, bio-mediation and in-situ burning.

Petroleum hydrocarbon plumes do not sink within groundwater as observed with chlorinated solvent plumes (e.g., trichloroethylene [TCE], perchloroethylene [PCE]); instead, they form along the uppermost layer of groundwater.

Therefore, contamination of groundwater would be limited to the uppermost volume associated with the groundwater surface. Petroleum hydrocarbons are naturally degraded by microbial communities naturally found within soils. As a result, petroleum hydrocarbon plumes would be expected to result in highly localized effects. Removal of the source oil and remediation actions would help to further minimize groundwater impacts. Kuprewicz reaches the same conclusion (p. 7), specifically stating that impacts to RST groundwater wells are not anticipated due to the slow-moving nature of the groundwater plumes.

Dated this 26th day of June, 2015.



Jeff Mackenzie

CERTIFICATE OF SERVICE

I hereby certify that on the 26th day of June, 2015, I sent by United States first-class mail, postage prepaid, or e-mail transmission, a true and correct copy of the foregoing Rebuttal Testimony of Jeff Mackenzie, to the following:

Patricia Van Gerpen
Executive Director
South Dakota Public Utilities Commission
500 E. Capitol Avenue
Pierre, SD 57501
patty.vangerpen@state.sd.us

Kristen Edwards
Staff Attorney
South Dakota Public Utilities Commission
500 E. Capitol Avenue
Pierre, SD 57501
kristen.edwards@state.sd.us

Brian Rounds
Staff Analyst
South Dakota Public Utilities Commission
500 E. Capitol Avenue
Pierre, SD 57501
brian.rounds@state.sd.us

Darren Kearney
Staff Analyst South Dakota Public Utilities Commission
500 E. Capitol Avenue
Pierre, SD 57501
darren.kearney@state.sd.us

Tony Rogers, Director
Rosebud Sioux Tribe - Tribal Utility Commission
153 South Main Street
Mission, SD 57555
tuc@rosebudsiouxtribe-nsn.gov

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

Jane Kleeb
1010 North Denver Avenue
Hastings, NE 68901
jane@boldnebraska.org

Byron T. Steskal
Diana L. Steskal
707 E. 2nd Street
Stuart, NE 68780
prairierose@nntc.net

Terry Frisch
Cheryl Frisch
47591 875th Road
Atkinson, NE 68713
tcfrisch@q.com

Arthur R. Tanderup
52343 857th Road
Neligh, NE 68756
atanderu@gmail.com

Lewis GrassRope
PO Box 61
Lower Brule, SD 57548
wisestar8@msn.com

Carolyn P. Smith
305 N. 3rd Street
Plainview, NE 68769
peachie_1234@yahoo.com

Robert G. Allpress
46165 Badger Road
Naper, NE 68755
bobandnan2008@hotmail.com

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

Louis T. (Tom) Genung
902 E. 7th Street
Hastings, NE 68901
tg64152@windstream.net

Benjamin D. Gotschall
6505 W. Davey Road
Raymond, NE 68428
ben@boldnebraska.org

Nancy Hilding
6300 West Elm
Black Hawk, SD 57718
nhilshat@rapidnet.com

Elizabeth Lone Eagle
PO Box 160
Howes, SD 57748
bethcbest@gmail.com

Paul F. Seamans
27893 249th Street
Draper, SD 57531
jacknife@goldenwest.net

John H. Harter
28125 307th Avenue
Winner, SD 57580
johnharter11@yahoo.com

Viola Waln
PO Box 937
Rosebud, SD 57570
walnranch@goldenwest.net

Peter Capossela
Peter Capossela, P.C.
Representing Standing Rock Sioux Tribe
PO Box 10643
Eugene, OR 97440
pcapossela@nu-world.com

Wrexie Lainson Bardaglio
9748 Arden Road
Trumansburg, NY 14886
wrexie.bardaglio@gmail.com

Travis Clark
Fredericks Peebles & Morgan LLP
Suite 104, 910 5th St.
Rapid City, SD 57701
tclark@ndnlaw.com

Harold C. Frazier
Chairman, Cheyenne River Sioux Tribe
PO Box 590
Eagle Butte, SD 57625
haroldcfrazier@yahoo.com
mailto:kevinckeckler@yahoo.com

Jerry P. Jones
22584 US Hwy 14
Midland, SD 57552

Cody Jones
21648 US Hwy 14/63
Midland, SD 57552

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

Gena M. Parkhurst
2825 Minnewsta Place
Rapid City, SD 57702
GMP66@hotmail.com

Jennifer S. Baker
Representing Yankton Sioux Tribe
Fredericks Peebles & Morgan LLP
1900 Plaza Dr.
Louisville, CO 80027
jbaker@ndnlaw.com

Joye Braun
PO Box 484
Eagle Butte, SD 57625
jmbraun57625@gmail.com

Duncan Meisel
350.org
20 Jay St., #1010
Brooklyn, NY 11201
duncan@350.org

The Yankton Sioux Tribe
Robert Flying Hawk, Chairman
PO Box 1153
Wagner, SD 57380
robertflyinghawk@gmail.com
Thomasina Real Bird
Attorney for Yankton Sioux Tribe
trealbird@ndnlaw.com

Bruce Ellison
Attorney for Dakota Rural Action
518 6th Street #6
Rapid City, SD 57701
belli4law@aol.com

Chastity Jewett
1321 Woodridge Drive
Rapid City, SD 57701
chasjewett@gmail.com

RoxAnn Boettcher
Boettcher Organics
86061 Edgewater Avenue
Bassett, NE 68714
boettcherann@abbnebraska.com

Bruce Boettcher
Boettcher Organics
86061 Edgewater Avenue
Bassett, NE 68714
boettcherann@abbnebraska.com

Bonny Kilmurry
47798 888 Road
Atkinson, NE 68713
bjkilmurry@gmail.com

Ronald Fees
17401 Fox Ridge Road
Opal, SD 57758

Robert P. Gough, Secretary
Intertribal Council on Utility Policy
PO Box 25
Rosebud, SD 57570
bobgough@intertribalCOUP.org

Tom BK Goldtooth
Indigenous Environmental Network (IEN)
PO Box 485
Bemidji, MN 56619
ien@igc.org

Dallas Goldtooth
38731 Res Hwy 1
Morton, MN 56270
goldtoothdallas@gmail.com

Gary F. Dorr
27853 292nd
Winner, SD 57580
gfdorr@gmail.com

Cyril Scott, President
Rosebud Sioux Tribe
PO Box 430
Rosebud, SD 57570
cscott@gwtc.net
ejantoine@hotmail.com

Thomasina Real Bird
Representing Yankton Sioux Tribe
Fredericks Peebles & Morgan LLP
1900 Plaza Dr.
Louisville, CO 80027
trealbird@ndnlaw.com

Frank James
Dakota Rural Action
PO Box 549
Brookings, SD 57006
fejames@dakotarural.org

Tracey A. Zephier
Attorney for Cheyenne River Sioux Tribe
Fredericks Peebles & Morgan LLP
910 5th Street, Suite 104
Rapid City, SD 57701
tzephier@ndnlaw.com

Matthew Rappold
Rappold Law Office
on behalf of Rosebud Sioux Tribe
PO Box 873
Rapid City, SD 57709
matt.rappold01@gmail.com

Kimberly E. Craven
3560 Catalpa Way
Boulder, CO 80304
kimecraven@gmail.com

Mary Turgeon Wynne
Rosebud Sioux Tribe - Tribal Utility Commission
153 S. Main Street
Mission, SD 57555
tuc@rosebudsiouxtribe-nsn.gov

Paula Antoine
Sicangu Oyate Land Office Coordinator
Rosebud Sioux Tribe
PO Box 658
Rosebud, SD 57570
wopila@gwtc.net
paula.antoine@rosebudsiouxtribe-nsn.gov

Sabrina King
Dakota Rural Action
518 Sixth Street, #6
Rapid City, SD 57701
sabinra@dakotarural.org

Robin S. Martinez
Dakota Rural Action
Martinez Madrigal & Machicao, LLC
616 West 26th Street
Kansas City, MO 64108
robin.martinez@martinezlaw.net

Paul C. Blackburn
4145 20th Avenue South
Minneapolis, MN 55407
paul@paulblackburn.net

April D. McCart
Representing Dakota Rural Action
Certified Paralegal
Martinez Madrigal & Machicao, LLC
616 W. 26th Street
Kansas City, MO 64108
april.mccart@martinezlaw.net

Joy Lashley
Administrative Assistant
SD Public Utilities Commission
joy.lashley@state.sd.us

Eric Antoine
Rosebud Sioux Tribe
PO Box 430
Rosebud, SD 57570
ejantoine@hotmail.com

WOODS, FULLER, SHULTZ & SMITH P.C.

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

APPENDIX A

Jeff Mackenzie

Calgary, Alberta

SUMMARY

Highly skilled Senior Emergency Manager with more than 20 years' experience in Emergency Management & Preparedness, Risk Management, Facilities and H&S. Specialized knowledge in Emergency Services Management, EH&S Programs Development, Risk Management and Emergency Services Administration.

EXPERIENCE

TransCanada Pipeline — *08/2014 - Present*
Senior Emergency Preparedness & Response Specialist, Major Projects

- Responsible for coordinating emergency preparedness and response-related activities in support of all phases of the Major Project life-cycle.
- Manages a variety of project activities by creating and updating scorecards that provide stakeholders with the status of EP&R deliverables.
- Maintains project deliverables and budgets by creating project plans and identifying and addressing any gaps or project conflicts - proactively communicates with stakeholders and team members accordingly.
- Provides permit application support by creating work plans and submitting timely and accurate documentation to ensure all applicable regulatory and Company standards are met.
- Engages in stakeholder outreach and consulting by developing business fact sheets, presentations and talking points for meetings and open houses.
- Plans and coordinates EP&R activities by creating work plans that incorporate operation requirements - ensures that plans are filed, approved, and submitted in a timely matter and with respect to all applicable regulatory and Company standards; ensures that Company is prepared to respond to emergencies.
- Conducts design and document reviews to ensure EP&R requirements are understood by the project and identify hazards and mitigation measures to be implemented through engineering design and other means.
- Ensures that the Company is able to meet or exceed all regulatory requirements and is adequately staffed to effectively respond to emergencies.
- Coordinates equipment procurement by ensuring the proper identification, budgeting and delivery of emergency-response related equipment.
- Develops and maintains a network of EP&R consultants, contractors, and industry and agency organizations by working with external resources leads and supply chain to identify needs for supplemental support by third parties - ensures corresponding agreements are active and in accordance with resource strategies.

Bissett Resource Consultants
Senior Emergency Planner — *11/2013 – 08/2014*

- Development of Regulatory projects completed in accordance with governing regulatory body (Alberta Energy Regulator - AER).
- Preparation of projects for public consultation, the analysis and processing of field work, the writing of an Emergency Response Plan (ERPs – Corporate, Site Specific, Facility/Area) for the approval by the regulator and for the protection of workers, the public, and the environment in the event of an emergency.
- Full scale & table top exercise AER regulated training for corporate (Emergency Command Centre), site leaders and field. Some clients include: Suncor Energy, Sinopec, ConocoPhillips, Bonavista Energy, and Harvest Energy.
- Liaise with all departments (Petroleum Engineers, Hazard Assessors, GIS Technologists, Dispersion Modelers) that have input required for writing emergency response plans

- Development of regulatory projects completed in accordance with the AER Directive 056 and AER Directive 71 for projects in Alberta and BC Oil and Gas Commission Emergency Response Plan Requirements for projects in BC.

Suncor Energy *11/2006 – 09/2013*
Natural Gas, North America Onshore Emergency Management & EH&S Advisor

Risk Management

- Completion and compiling of a Security Risk Registry/All Hazards to identify probable and potential risks to the organization by using a task risk analysis approach. Security risk registry range from Bomb threats, to terrorism to environmental issues (WCSS, loss of containment and spill prevention & response).
- Detailed understanding and on hands experience of Integrated Risk Management System (IRMS) and Operational Excellence Management System (OEMS).
- Experience with Incident Learning Prevention, Action Management, Management of Change, EH&S and Risk Matrix.
- Experience in a variety of settings that were primarily in the oil & gas sector: Remote drilling sites, Production (Oil Sands Mining & InSitu), H2S, Natural Gas and Well site services.

Emergency Preparedness & Management

- Emergency Management Advisor & Team Leader of the development of the North America Onshore, Natural Gas Emergency Management Guideline G503. Successfully implemented to maintain, test and continuous improvement for Suncor's emergency/security preparedness.
- Assist businesses, manage, implement, plan, test, guide and facilitate emergency management components: Full Scale ERP Exercises, Evacuation drills, Revision of fire protection systems, confined space consulting. and the Incident Command System (Level 3).
- Interaction with external parties AER (ERCB), CEPA, DOT, Canutec, ...
- Maintenance and update of resource material and essential information for ERPs.
- Interaction with federal, municipal, local and mutual aid agreements to coordinate emergency response planning and preparedness.

EH&S

- EH&S Advisor for Suncor Energy's largest Natural Gas Plant, Hanlan Robb and the Medicine Hat & Saskatchewan field.
- Advisor for OH&S code regulations, Policies & Procedures, Best Practices and occupational classifications. Board member of Workplace Health & Safety Committee.
- Authorization & revision of safety contingency plans and site specific work plans.
- Completion of on-site safety audits inspections
- Incident Investigation for EH&S & Security (Injuries, Fatalities, Incidents, Preventive Maintenance,...)
- Emergency preparedness planning creation & implementation for hazardous operations.
- Process Safety Management (PSM): Field Level Risk Assessments, Work place observations and pre-start up safety reviews and process analysis.
- Environmental issue responsibility: Environmental spills, Hazardous Materials, Call Outs and Crisis Communication (CEPA & E2 Plans).
- Support the EH&S team through active participation in the development of EH&S safety programs and plans to support Suncor's ongoing commitment to the Journey to Zero injuries program.

Emergency Response Officer

- Paramedic, Medical Clinic and firefighter duties provided at Suncor Energy Oil Sands, Fort McMurray and In-situ, Firebag.
- Active daily involvement with WCB Policies & Procedures (referrals, diagnosis, initial/re-visit medical – occupational & non-occupational classification, short & long term disability involvement.
- Perform a wide variety of duties relating to fire, medical, security, hazmat and environmental monitoring, oil response preparedness and training according to standard practices and procedures.
- Provide leadership and training to personnel while ensuring the effective choice and application of appropriate fire and medical response tactics and techniques at the scene.

City of Calgary Fire Department *02/2006 – 11/2006*

Firefighter

- Emergency Response, fire ground operations, pump operations, primary searches, ventilation, interior attack, salvage/overhaul, pre-hospital care, vehicle extrication, fire prevention/inspections, training/drills, public relations, aircraft rescue, hazardous materials, high angle, urban search and rescue and administrative duties.

City of Calgary Emergency Medical Services *03/1999 – 02/2006*
Advanced Care Paramedic

- Provide treatment and transport to emergent medical requests, inter-facility transfers and facility based medical support with the Calgary Zone and the Province of Alberta. Provided Alberta Residents with the highest quality Advanced Cardiac Life Support (ACLS) services in accordance with legislation. A patient advocate who effectively communicated and interacted with other allies health care professionals and public safety partners.
- Incident analysis training/conducting (Calgary EMS – Medical Examiner's Office fatality classification.

Crowsnest Pass Emergency Medical Services – Industrial *01/2004 – 11/2006*
Advanced Care Paramedic

- Provide advanced care paramedical services in the industrial setting.
- Experience in a variety of settings that were in the oil & gas sector: Remote drilling sites, Production (Oil Sands Mining & InSitu), H2S, Natural Gas and Well site services in Northern Alberta and BC. Some clients include: EnCana, CNRL and Husky Oil.

Grande Prairie Regional Emergency Medical Services *03/1998 – 03/1999*
Flight Paramedic

- Provided advanced care flight paramedic duties for STARS (formerly Northern Life Flight).

EDUCATION

- Bachelor of Applied Business: Specializing in Emergency Management, with Distinction *2011*
- Canadian Registered Safety Professional & Certified Emergency Manager (currently completing). *2014*
- Texas – TEEX Advanced Industrial Firefighter. *2007*
- National Fire Protection Assoc. Standard 1001,1003,1006 Fire Fighter Level II *2006*
- Emergency Medical Technician – Paramedic, S.A.I.T., Calgary, AB. *1994-1998*
- Advanced High School Diploma, John G. Diefenbaker H.S., Calgary, AB. *1991*

SPECIALIZED KNOWLEDGE & SKILLS

- Emergency Services Management
- Risk Management
- Ethics for Emergency Services
- Interpersonal Communications
- Organizational Behaviour
- Team Leadership & Development
- Financial Statement Analysis
- Statistics for Administrators
- Resource Management
- Legal Issues in Emerg Services
- Labour Relations/Contract Law
- Future of Leadership

- OH&S Programs Development
- Emergency Services Administration
- Public Relations/Media Skills
- Crisis Communication
- Human Resources Management Emergency Services
- Accounting Principles
- Capital Budgeting
- Strategic Business Planning
- Personal Performance Management
- Critical Thinking
- Critical Incident Stress Management
- Reflective Thinking

- Advanced Cardiac Life Support
- Aircraft Rescue Fire Fighting
- Calgary Fire Dept. HazMat Awareness

- Pediatric Advanced Life Support
- Advanced Basic Trauma Life Support
- Calgary Fire Dept. HazMat Operations

- ~ HazMat Paramedic Team (1st in Canada)
- ~ Incident Command System 100,200,300
- ~ Flight Paramedic, Aeromedical Evacuations
- ~ High Angle Rescue Tech
- ~ Emergency Operations Centre Management
- ~ Crew Chief, City of Calgary, Cochrane & Grande Prairie EMS

PROFESSIONAL & RECREATIONAL AFFILIATIONS

- ~ Canadian Society of Safety Engineers (CSSE)
- ~ Alberta College of Paramedics Association
- ~ Health Sciences Association of Alberta
- ~ Heart and Stroke Foundation of Canada
- ~ C.U.S.A. Calgary United Soccer Association
- ~ Lakeland College
- ~ International Association of Firefighters.
- ~ Emergency Cardiac Care Task Force, GPREMS
- ~ S.A.I.T. Alumni Association
- ~ N.C.A.A Calgary Junior Hockey League Alumni

AWARDS

City of Calgary – Employment Recognition Awards
Rutherford Scholarship - Awarded on the basis of consistent academic merit in High School.
Northwest Athletic Association Scholarship – Calgary Junior Hockey League (C.J.H.L.)
Calgary Old Time Hockey Players Association – Sweeney Schriner Memorial Scholarship

APPENDIX B

small stream or river crossings not spanned by HDD[4]. If spilled oil is released to the flooded area, especially to flowing waters, oil could be distributed to adjacent terrestrial, wetland, and aquatic habitats that normally would not be exposed. These habitats and natural resources, as well as human uses of the habitats and resources, may be exposed to the spilled material.

Concern was expressed in comments on the draft EIS relative to potential spray zones associated with operational leaks from the proposed pipeline. Winds, especially high-velocity sustained winds, could spread material released under pressure from hole(s) in the top hemisphere of an exposed portion of the pipeline to create a "spray zone." To generate a spray zone a potential leak would need to occur on the upper hemisphere of the proposed pipeline. If corrosion related leaks occurred, they would typically occur on the lower hemisphere of the pipeline and would likely be associated with entrained water. The implementation of the Project-specific Special Conditions developed in consultation with PHMSA would make such leaks highly unlikely. Potential leaks on the upper hemisphere of the proposed pipeline would likely be associated with accidental equipment impact. However, the likelihood of such events is significantly reduced by the 4-foot minimum cover requirement in most areas and the implementation of public awareness and damage prevention programs. However, if such a release were to occur, ejected material could form a cloud of mist and fine particles, and could be carried downwind. The extent of distribution would depend on wind velocity, direction of the released spray (e.g., downward into the ground, horizontal, or skyward), and characteristics of the release (e.g., pressure in the pipeline, type of oil, size of hole). Under most scenarios, the pressure in the pipeline would drop quickly, the release would be highly visible, and immediate pipeline spill control and shutdown actions would be taken[5] by the CMP and SCADA as well as the onsite personnel. If a leak would occur on the upper hemisphere of the pipeline, Keystone has estimated that the maximum spray zone for an exposed portion of the pipeline would be in the range of 75 to 400 feet (i.e., the areal extent of the release to land would be limited to a few acres or less in the immediate area of the release point and downwind of the release point).

Major flooding or adverse weather conditions (e.g., high winds, tornados, blizzards, and extreme cold) could limit Keystone's ability to detect small releases and/or hinder the spill response contractors from implementing timely and effective oil spill containment and cleanup operations. Response actions appropriate for these conditions would be addressed in the ERP and the PSRP (see Section 2.4.2.2).

3.13.5.2 Keystone Response Time and Actions

For spills ranging in magnitude from very small to substantive, response time and actions by responders would most likely prevent the oil from reaching sensitive receptors or would contain and clean up the spills before significant environmental impacts occurred. Most spills in this category are likely to occur on construction sites or at operations and maintenance facilities, and would not be released to the environment outside of these Project-related areas.

For large spills, very large spills and potentially some substantive spills, especially those that reach aquatic habitats, the response time between initiation of the spill event[6] and arrival of the response contractors would influence the magnitude of impacts to the environmental resources and human uses. This would be particularly true if the oil reaches flowing waters in major rivers. Once the responders are

[4] These type of events account for less than 4 percent of spills (see Table 3.13.1-3) and Keystone has a proactive, preventative plan to shut down the pipeline if severe weather or any other natural event poses a threat to the pipeline integrity.

[5] The SCADA system would shut down the pipeline within 12 minutes of detection of the release (Sections2.4.2.1 and 3.13.5.5).

[6] "Initiation of the event" means when the oil began to leak or spill to the environment, not when it is detected by either the SCADA or other means. There may be a substantive delay between initiation and detection, particularly for slow or pinhole leaks under snow or below ground.

at the spill scene, the efficiency, effectiveness, and environmental sensitivity of the response actions (e.g., containment and clean up of oil, and protection of resources and human uses from further oiling) would substantively influence the type and magnitude of additional environmental impacts.

In response to a DOS data request, Keystone presented its approach to spill response under two hypothetical spill scenarios defined by DOS. The two spill scenarios presented to Keystone and its response to these scenarios provide an opportunity to review the level of preparedness and foresight that would be in place relative to potential spills from the proposed Project.

The first hypothetical spill occurs in the summer in an area with deep groundwater, relatively flat terrain, at least 2 miles from any navigable stream, no wetlands within 1 mile, and with no nearby private water wells or public water intakes. The second hypothetical spill occurs in the winter in an area of relatively shallow groundwater (25 feet bgs), sloping terrain, nearby wetlands, and a navigable stream within 1,000 feet, including private water wells within 100 feet of the release site and a public water intake 2 miles downstream.

For each of these scenarios, Keystone describes the following:

- Response procedures including pipeline shutdown, commencement of field response, spill assessment, and development of incident command post;
- The potential horizontal and vertical spread of crude oil into the environment;
- Response tactics employed for source control;
- Cleanup approaches for spills on land including containment methods and removal methods;
- Cleanup approaches for spills to groundwater including options for short- and long-term remediation;
- Cleanup approaches for spills on calm or slow moving water (lake or pond) and to flowing water (stream or river);
- Cleanup approaches for spills that occur on ice or under ice; and
- Cleanup approaches for spills in wetland areas.

DOS and PHMSA have reviewed these hypothetical spill response scenarios prepared by Keystone and would also review a final ERP to be prepared by Keystone prior to startup of the proposed pipeline (see Section 2.4.2.2 for additional information on the Keystone ERP). Based on its review of the hypothetical spill response scenarios, DOS considers Keystone's response planning appropriate and consistent with accepted industry practice.

3.13.5.3 Factors Affecting the Behavior and Fate of Spilled Oil

The primary and shorter-term processes that affect the fate of spilled oil are spreading, evaporation, dispersion, dissolution, and emulsification (Payne et al. 1987, Boehm 1987, Boehm et al. 1987, Overstreet and Galt 1995). These processes are called weathering. Weathering dominates during the first few days to weeks of a spill. A number of longer term processes also occur, including photo-degradation and biodegradation, auto-oxidation, and sedimentation. These longer-term processes are more important in the later stages of weathering and usually determine the ultimate fate of the spilled oil that is not recovered by the cleanup program.