MINNESOTA DEPARTMENT OF COMMERCE

Comment Form: Scoping

Energy Environmental Review and Analysis

Please provide your contact information. This information and your comments will be publicly available.

Name: Kate Jacobson Phone: 651-402-8901

Street Address: 2633 Pleasant Ave S. Apt 201

City: Minneapolis State: MN ZIP: 55408

Email: jacobson.kate@gmail.com

My comments pertain to:

- ☐ **Sandpiper Pipeline Project**
- ☐ **Line 3 Replacement Project**
- ☒ **Both Projects**

If including additional pages please number them and tell us how many you are providing: _____ pages

May 9, 2016
Testimony for Sandpiper/Line 3 Environmental Impact Statement Scope
Public Hearing
Saint Paul

Dear Department of Commerce Representatives,

On behalf of myself, my daughter, our community, the Earth we depend upon, I call on the Department of Commerce to ensure that Minnesota State Law (included in this testimony) is upheld and implemented in a thorough and comprehensive Environmental Impact Statement (EIS).

In particular, the scope of the EIS needs to include concrete process and measurements of the **impact of the project on future generations as well as the welfare of and impact on all people in the state, not just isolated subsets of the population.**

The scope needs to include consultation and an assessment by First Nations people through legal means/process that tribal nations self-determine appropriate for their people.

In order to fulfill the cumulative impacts, the EIS scope must include analysis from source of production to consumption of all aspects of the project, including materials and energy used to construct as well as impact of product it enables transportation of. Isolating projects out of larger context is turning a blind eye to the true environmental, social, and political impacts of any single project.

Just as the EIS scoping needs to be cumulative and within context of larger systems, the Department of Commerce must consult and employ cross-sector governmental bodies, public input, and pertinent experts to work as a team in evaluating each piece of the Environmental Assessment. Basic ecology shows the interconnectedness of our systems. The scope and process of determination of the EIS must reflect the complexities and uncertainties of our human impact.

We have a responsibility to our current human communities, future generations, and the biological systems we are part of, to take seriously the laws defined in our state and the impacts that can be seen and forecasted, through a cumulative EIS scope that weighs all parts equally.

Thank you for considering my testimony.

Kate Jacobson
2633 Pleasant Ave S, Apt 201
Minneapolis, MN 55408
651-402-8901

116D.02 DECLARATION OF STATE ENVIRONMENTAL POLICY.

Subdivision 1.**Policy.**

The legislature, recognizing the profound impact of human activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high density urbanization, industrial expansion, resources exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of human beings, declares that it is the continuing policy of the state government, in cooperation with federal and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which human beings and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of the state's people.

Subd. 2.**State responsibilities.**

In order to carry out the policy set forth in Laws 1973, chapter 412, it is the continuing responsibility of the state government to use all practicable means, consistent with other essential considerations of state policy, to improve and coordinate state plans, functions, programs and resources to the end that the state may:

(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) assure for all people of the state safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

(3) discourage ecologically unsound aspects of population, economic and technological growth, and develop and implement a policy such that growth occurs only in an environmentally acceptable manner;

(4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever practicable, an environment that supports diversity, and variety of individual choice;

(5) encourage, through education, a better understanding of natural resources management principles that will develop attitudes and styles of living that minimize environmental degradation;

(6) develop and implement land use and environmental policies, plans, and standards for the state as a whole and for major regions thereof through a coordinated program of planning and land use control;

(7) define, designate, and protect environmentally sensitive areas;

(8) establish and maintain statewide environmental information systems sufficient to gauge environmental conditions;

(9) practice thrift in the use of energy and maximize the use of energy efficient systems for the utilization of energy, and minimize the environmental impact from energy production and use;

(10) preserve important existing natural habitats of rare and endangered species of plants, wildlife, and fish, and provide for the wise use of our remaining areas of natural habitation, including necessary protective measures where appropriate;

(11) reduce wasteful practices which generate solid wastes;

(12) minimize wasteful and unnecessary depletion of nonrenewable resources;

(13) conserve natural resources and minimize environmental impact by encouraging extension of product lifetime, by reducing the number of unnecessary and wasteful materials practices, and by recycling materials to conserve both materials and energy;

(14) improve management of renewable resources in a manner compatible with environmental protection;

(15) provide for reclamation of mined lands and assure that any mining is accomplished in a manner compatible with environmental protection;

(16) reduce the deleterious impact on air and water quality from all sources, including the deleterious environmental impact due to operation of vehicles with internal combustion engines in urbanized areas;

(17) minimize noise, particularly in urban areas;

(18) prohibit, where appropriate, flood plain development in urban and rural areas; and

(19) encourage advanced waste treatment in abating water pollution.

MINNESOTA DEPARTMENT OF COMMERCE

Comment Form: Scoping
Energy Environmental Review and Analysis

Please provide your contact information. This information and your comments will be publicly available.

Name: Harlan T. Jensen Phone: 218-349-2060

Street Address: P.O. Box # 16725

City: Duluth State: MN ZIP: 55816

Email: none

My comments pertain to:

- ☐ **Sandpiper Pipeline Project**
- ☐ **Line 3 Replacement Project**
- ☒ **Both Projects**

I strongly believe if line 3 is replaced The old line should be removed, because I think Enbridge will continue to use it by reducing the pressure or useing it for storage of their products. Ive heard they did the same thing in Michigan a couple of years ago. They replaced a 30" or 36" line of about 60 miles and was suppose to abandon the old line, but continued to use the old line by reducing pressure to it. I also believe the Sandpiper line is not needed as we have thousands of miles of pipelines throughout Minnesota. Also they brag about all the money they are spending and people they are putting to work. But the bottom line is we all pay for it at the gas & Diesel pumps plus the other products made from oil, so the consumer which is us pay for these lines not Enbridge. Ive coorked on many pipeline projects in the past 50 years and so I see how these companies work. Also some of the inspectors they hire to oversee the contractors work are not trained right to do the job. Their are many things that aren't done right on these projects in my opinion, so I think they shoud be denied permits for both these projects

Thanx Harlan T. Jensen

If including additional pages please number them and tell us how many you are providing: _____ pages

From:	Lin James
To:	*COMM_Pipeline Comments
Subject:	Pipeline
Date:	Tuesday, May 24, 2016 11:55:49 AM

I sent a link on Facebook for a petition to sign plus also jamie's e mail if that helps make it a little easier to comment.....plus a website with talking points.

Sent from my Verizon Wireless 4G LTE smartphone

Ingrid Kimball

From: Lin James <lin_nature@hotmail.com>
Sent: Tuesday, May 24, 2016 8:34 AM
To: MacAlister, Jamie (COMM)
Subject: EIS Enbridge pipeline

Follow Up Flag: Follow up
Flag Status: Completed

Categories: Purple Category

Dear Jamie,

I'm a concerned citizen who does NOT want an Enbridge pipeline from North Dakota to Wisconsin through Minnesota. It could be very disastrous for our pristine lakes and shores if there were an oil spill. PLEASE do not let this happen. I do not trust that they will ensure this doesn't happen. In actuality, there is NO WAY they can insure it will not happen.

Thank you,
Lin James
6463 Whitetail Rd. N.E.
Bemidji, MN 56601

218-368-6741

From: Jon Jennings
To: *COMM_Pipeline Comments
Date: Thursday, May 12, 2016 8:15:50 PM

I am for the pipeline. Those that are against it must not drive cars or heat homes with fuel oil.

Virus-free. www.avast.com

Wanted to ask question to Enbridge
get a response - I said not
up for response so he
declined.

Speaker Registration

Complete to add your name to the speaker's list for tonight's public information meeting.

PLEASE PRINT CLEARLY

Name Harlan Jensen
First *Last*

Did you sign in at the door? If not, please add your address here:

Address _____

_____

City _____ State _____ Zip _____

From: bwj4@comcast.net
To: *COMM_Pipeline Comments
Subject: Sandpiper EIS scoping comments
Date: Monday, May 23, 2016 7:20:49 PM

The Big Sandy Lake Association (Big Sandy Lake, Aitkin County) requests that the following be included in the scoping of the Sandpiper EIS:

- Include the entirety of the project, from source to market. System alternatives (especially SA-04 and the original SA-03) must be included in the EIS.
- Solicit input from federal agencies (such as the Corps of Engineers, Fish and Wildlife, EPA, USGS), the affected Ojibwe bands of Minnesota, and the Minnesota DNR and MPCA.
- Include an economic analysis of the need for additional oil transportation through Minnesota.
- Include tar sand oil clean-up plans, including spill modeling under worst-case-scenario weather conditions. For example, if there is a tar-sands spill in the Big Sandy watershed in Aitkin County in the middle of winter, what is the clean-up plan? How will this affect wild rice beds in this area? Drinking water?
- In Section 4.4.3.5, include the Big Sandy Lake area of Aitkin County.
- Include findings from the National Academies of Science report, “Spills of Diluted Bitumen from Pipelines. ”
- Ensure that the EIS follows MEPA law.

Thank you from our lake association membership of over 450 households on Big Sandy Lake.

Bruce Johnson,
President
Big Sandy Lake Association

From:	David Johnson
To:	*COMM_Pipeline Comments
Subject:	Sandpiper & Line 3
Date:	Thursday, May 12, 2016 7:15:57 PM

To Whom It May Concern:

I am David Johnson, resident of Long Lost Lake Township, Clearwater County, Minnesota. I am writing in support of the following pipeline projects.

Sandpiper: PL-6668/CN-13-473 and PPL-13-474

Line 3: PL-9/CN-14-916 and PPL-15-137

The alternative means of transportation (railcars) is much more dangerous than pipelines. The country needs the fuels developed by the oil and is the only way the United States will become self-sufficient. The objections to the pipelines are hard to be believed since their only objection is based upon what might happen. Without anything to back them up I must reject their objections as not in the best interests of the United States and only serve to implement their "no oil usage because of climate change" narrative. Natural resources are meant to be used. Let's get on with these projects so we don't have to depend upon unfriendly nations to supply our energy.

David Johnson
12348 McKenzie Rd
Bagley, MN 56621

218-657-2853

Deanna Johnson

The draft scoping document before us has much the same content as the previous environmental analysis for the Sandpiper which was overruled by the Apeals Court. Again, we see a document before us that clearly favors the applicant by heavily relying on the applicant's input and general analysis summaries from other projects which are not specific to our environment. Does this meet MEPA Law?

From the start, the purpose of this project poses many questions. The purpose mentions growing crude oil production in the Bakken formation. This is outdated, as now we see significant decline in Bakken oil production and the Dakota Access pipeline has been approved to move oil from the Bakken. That company found it economically feasible to move oil out of the Bakken without traversing Minnesota's water rich environment.

The second purpose statement is to transport oil from the Bakken to Superior, WI. Is this the route considered by the company to give them the best cost savings? Cost savings for the company do not equal public purpose? Is the company hoping to come back later and ask to ship oil on Lake Superior, which hold 10% of the worlds fresh water supply? Think about their stated purpose for this project. They want to transport more oil than proposed for the Keystone XL across our prized Headwaters Region, our clearest lakes and our wild rice beds. Then they demand to end this route at Lake Superior. I have tell you the thought of opening the door to this company to transport large volumes of oil to Superior, WI is terrifying. Lake Superior is the worlds largest fresh water lake. It has been described as the "the most oligothrophic lake in the world." Water in Lake Superior is retained an average of 191 years. This EIS should be considering the grave implications of allowing this company to demand this route which if given would open up the potential for them to then later ask to ship oil across the Lake Superior. How much should we be expected to sacrific for a companies stated demands and profit margin calculations? There are great risks to our environment and our economic well-being that are being summarily subjugated to the financial requests of the company.

Enbridge is given control over much of the information that will inform this study. For example, Enbridge will provide the field study data for it's route and there will be no field study data done for system alternatives. Does this indicate safer alternatives will be generally ignored? ENbridge will also provide data on maximum spill volume estimate at sites of their choosing. There is not even a mention of the effects of a Dilbit spill in a watered environment. Will this factor be added and studied as part of an EIS? It should be as a tar sands oil spill would create unrepairable devastation to our water rich environment.

WHere are the spill study sites? Why is this information not provided in this document? Will maximum spill study be done for the Headwaters area where the pipe crosses the infant MS in

two locations? Will there be a spill study of the sensitive aquifer in Park Rapids? How would carcinegens leaking into our aquifer affect the health of our citizens? How would spills in these locations affect the economy of this area? Itasca gets over half million tourists a year and Park Rapids area depends on it's fragile aquifer. What happens to our economy if we loose our water supply or if the Itasca region is devastated by a spill and we loose our tourist attraction?

These projects pose tremendous hazzards to our sensitive environment which is also the lifeblood of our economy and are simply too many and too great to be stated here. A full and comprehensive EIS based on science with input from unbiased experts with specialized scientific background is demanded for our precious resources, for the health of our citizens and for our economy.

May 24, 2016

Jamie MacAlister

Minnesota Deptartment of Commerce

85 7th Place, Suite 500

Saint Paul, MN 55101

Dear Ms. MacAlister:

I am a life long Minnesotan writing to defend our precious natural water resources we are so blessed to have in our care. The draft scoping document brought forward by the Department of Commerce is concerning on many levels. The posturing of DOC staff at public meetings is also of great concern, as citizens look to our state officials to provide a fair and unbiased assessment of the Sandpiper and Line 3 proposals.

From the start, the purpose of the project is flawed in that it is based on increasing oil production which actually is significantly declining both in the Bakken and Alberta Tar Sands. The unpredictability of these markets and expected continued declining market would raise an additional concern of stranded pipeline infrastructure if these projects are built.

The purpose statement to move oil from the Bakken to Superior, WI is also flawed. This allows Enbridge to demand a specific route to meet the company's private purpose for their preferred business plan. This does NOT speak to public purpose for this project. This ignores the need to protect our state's priceless resources which are renowned and provide the basis for our economy. Minnesota's resources deserve to have system alternatives, SA-04 and SA-03, evaluated which would provide a safe alternative to these projects should there be a determination of need for a project. MEPA demands that safer alternatives be included in this EIS.

The DOC is failing this state by not listening to the the concerns and recommendations of both the Deptartment of Natural Resources and the Minnesota Pollution Control Agency when they expressed concerns about the companies preferred route in previous docket proceedings. Yet, these agencies expertise were ignored in previous proceedings and the DOC has set up a Memorandum of Understanding with these agencies where they can again choose to ignore or subjugate their input in the current proceedings. This is unacceptable.

Did the DOC fail to provide an appropriate bidding and vetting process for environmental work on this

project when they chose Cardno? An October 7, 2011 article in the New York Times, "Pipeline Review is Faced with a Question of Conflict," by Elisabeth Rosenthaland Dan Frosch, gives reason for great concern as we look at Cardno being brought in on this project. The article stated, "E.P.A. has criticized two prior draft environmental impact statements prepared by Cardno Entrix on the Keystone as "inadequate and providing insufficient information."

Unfortunately, evidence suggests by the direction of this draft EIS Scoping Document, that the EIS will not meet MEPA law and will again provide an environmental study which is largely at the directive of Enbridge. Enbridge is given control over much of the information that will inform this study. For, example, Enbridge will provide the field study data for it's route and there will be no field study data done for system alternatives. Does this indicate safer alternatives will be generally ignored? Enbridge will provide data on maximum spill volume estimates at 7 undisclosed sites. Why are these spill study sites NOT identified in this document? Are they in fact benign sites that will not provide information on the true consequences of a spill or rupture? Do these chosen sites ignore our most treasured resources? When this information is kept away from the public, it creates questions? There certainly should be a worse case scenario spill study done for the Headwaters area where the pipe crosses the infant Mississippi in two locations. Will there be a spill study of the sensitive aquifer in Park Rapids? Will there be a spill study site near the most productive wild rice sites?

Why is the DOC reluctant to bring in a panel of experts to assist with this EIS? Having such a panel involved in this process would speak to a committment to ensure a comprehensive and unbiased environmental review which would protect our resource. There is no inclusion in this scoping document of an evaluation of the effects of a Dilbit spill in our watered environment. This is an unconscionable ommission and speaks to a lack of understanding of this threat to our environment or worse an intention to omit an evalutation of this grave threat to our environmnet.

Public trust was discussed at the recent EQB meeting. It was greatly disheartening when Mr. Grant stated that holding a public open house would be planned to build public trust. As a citizen who has attended many public hearings and meetings, open house meetings are viewed as a forum to promote the project. To build public trust, a serious and thoughtful process to provide a MEPA compliant EIS which will be based on unbiased science with involvement of the State' s agencies charged protection of our environmental resources, the MPCA and the DNR along with appropriate scientific evidence provided by experts not tied to the project proposer being included is the key.

Sincerely,

Deanna Johnson

15559 Explorer Circle

Park Rapids, MN 56470

Ingrid Kimball

From: Glenn Johnson <dgjohnson@wiktel.com>
Sent: Thursday, May 26, 2016 12:58 PM
To: *COMM_Pipeline Comments
Subject: Comments on Enbridge pipeline

The Enbridge pipeline has always been fair and cooperative to deal with during the past fifty (50) years over the land we own in Pennington County, Mn. They always make personal contact by phone when they need to do a dig or travel across the right of way. Enbridge pipeline always paid for crop damage and always paid for specific access over land the pipeline did not have right-of-way. We are especially gratified to know Enbridge pipeline is replacing Line #3 to replace the use of an older pipeline. Sincerely, Glenn Johnson

From: Greg and Mary Johnson
To: *COMM_Pipeline Comments
Subject: Sandpiper and Line 3 comments
Date: Wednesday, May 25, 2016 10:35:56 PM
Attachments: maydoccomments.pdf

Department of Commerce
State of Minnesota

Re: Comments on Scoping for EIS on Sandpiper and Line 3

We provided comments during the public scoping hearing in Little Falls in late April and want to provide additional comments before the public input period ends. Our comments in Little Falls were limited by the short amount of time given for individual comments even though there was more than enough time to allow longer comments.

Since the scoping is for both proposed pipelines, it is difficult to specifically address each line. First, they have different public purpose and both must by delineated before scoping can be done for the EIS. Sandpiper oil is produced in the Bakken formation and the public purpose is to move the oil to several Marathon midwestern refineries and on to the Gulf Coast for export. This does not necessitate moving the oil through Clearbrook and Superior. All alternates that move the oil to Potoka, Illinois should be considered as part of that economic purpose.

The public purpose of Line 3 is to increase the capacity of the existing line 3 and move the oil from Alberta Canada to the Gulf Coast for export. The need for increased tar sands oil in other areas of the country cannot be substantiated. Replacement in the current line 3 corridor should be high on the list of alternatives for two reasons. First, if it is indeed a replacement, then it should go in the same corridor. Second, the abandonment places uncertainty on liability for future generations and the current state of the environment in and around the current line with its many leaks and repairs over the past years. There is no need for this oil to flow through Superior to get to the Gulf Coast.

Secondly, the EIS for each line has to answer fundamentally different questions as the chemical nature of both substances is very different. Bakken oil is light crude and will need very different analysis for worst case spillage and remediation scenarios while tar sands oils are very heavy and after dilutants evaporate the oil will sink requiring vastly different spillage and remediation scenarios. The corridor proposed by Enbridge crosses many streams and wetlands (some of the last remaining pristine wetlands in the state). Worst case spillage analysis should include these areas and spillage occurring in both summer and winter. Similar scenarios need to be done for the alternate routes as well to determine the best case methods for both oils in different topographies.

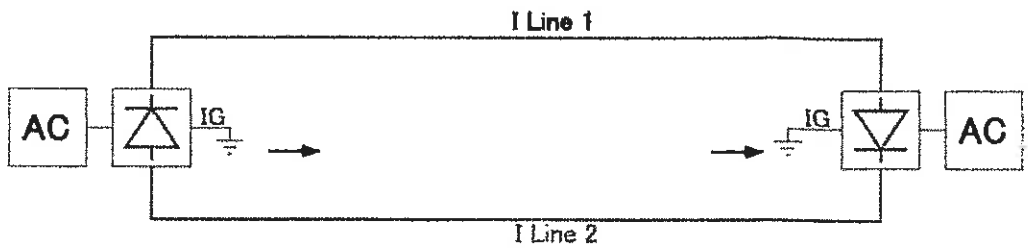
Third, the scoping must include economic impact of these pipelines in more than the value of temporary jobs and future property tax streams. The cost of oil production and use for global warming and its impact on our countries goals to be met for CO2 reduction must be considered. In addition, the value of water and undisturbed natural environment must be given realistic values. The Pine River Watershed is the number 1 watershed in the state for water quality and for preservation for both source and drinking water. Economic value needs to be developed for both keeping and endangering this vital resource. Economic value also needs to be developed and used to determine the loss of property value, jobs, etc. should a spill occur in the watershed or affect the Whitefish chain of lakes. Economic impact on native American use of water, wild rice and treaty rights needs to be included.

Fourth, this is not a Minnesota only project. It includes Canada, North Dakota, Wisconsin, the Federal Government and potentially other states. We should not treat this scoping document as a total project but rather as a small part of a much larger project and the DOC should include and use all available sources of assistance. In particular you should use the Federal agencies that will ultimately need to approve the project to give scoping input and economic evaluation assistance. You should also rely in a more comprehensive manner on the expertise available from the Minnesota PCA and DNR. Additionally, with the Dakota Access pipeline construction beginning from Williston to Illinois, this must be considered in determining public purpose and alternatives corridors for Sandpiper.

Fifth, we presented a report on co-locating pipelines and overhead transmission lines. This is of special concern for the route proposed by Enbridge as much of this route is co-located and in wetlands with high soil conductivity. Special expert input should be obtained in evaluating this high risk potential for the proposed routing.

You have a very demanding and challenging project in front of you and we hope you will keep Minnesotan's interests front and center in your decision making and put Enbridge's economic interests as a secondary influence on evaluating both pipelines.

Gregory and Mary Johnson
2089 Lake Hattie Dr. SW
Backus, MN 56435



IG = I Line 1 - I Line 2

Figure 6. Bipole System [34]

Tripole configurations have been considered and reviewed in research, but have not seen widespread use in practice. There are several types of designs and operation modes within the broad parameters of the monopole and bipole systems. During emergencies and in maintenance of the bipole system, an earth return is used. In an earth return mode there is a potential gradient generated and metallic objects, such as pipelines, can be subject to varying potentials and become a conductor of the return current if they provide a low resistance path. Where current is collected or received by the pipeline generally no damage occurs, unless the current is high enough to damage the coating. However, corrosion will occur at current discharge locations. The amount of corrosion is dependent on the amount of current and duration of discharge. In the case of large discharge current, significant corrosion damage can occur in relatively short time periods. The effects are similar to the interference currents caused by other DC power sources such as traction systems, cathodic protection systems or welding with an improper ground.

HVDC transmission lines also have the same coupling modes with pipelines that occur with HVAC transmission lines capacitive, inductive, and resistive. Although under typical circumstances these effects may be negligible. However, interference levels under faulted conditions can be significant.

3.4.1.1 Capacitive coupling

The results of research presented by Koshcheev indicate the electrical field below HVDC transmission lines does not generally require significant safety measures during construction when the pipe is isolated on skids, as the electric field influence associated with HVDC transmission is limited compared to HVAC.[21]

3.4.1.2 Inductive coupling

CAPP indicates the voltages induced due to HVDC, under steady state conditions tend to be negligible. The magnitude of induction may contribute to minor interference problems with telephone lines, and possibly other communications systems, but is typically low enough that neither pipeline integrity nor safety hazards are considered likely under steady state conditions. However, during fault conditions, there is a possibility for short duration of elevated inductive coupling.

3.4.1.3 Resistive coupling

During faulting both HVAC and HVDC transmission systems can present personnel safety issues and compromise pipeline integrity, with possible damage to the pipeline, coating, and associated equipment. A faulted HVDC power line presents a possible integrity concern for nearby pipelines. CAPP indicates that the fault current discharged to ground at the power line tower causes a ground potential rise (GPR) near the ground electrode. A voltage gradient exists relative to remote earth. A pipeline within the voltage gradient

will experience a coating stress voltage as discussed in Section 3.3.2.1. If high enough, the voltage stress could puncture the insulating coating possibly damaging the pipeline.

3.5 Industry Procedure Summary

The lack of industry consensus on the subject of AC corrosion guidelines has led to varied practices among pipeline operators in regards to mitigating AC interference on pipelines. As part of this study, The INGAA Foundation requested a review of industry practices and procedures related to AC interference. Based upon this review, all of the procedures address a safety concern and define a maximum allowable AC pipe-to-soil potential limit for above-grade appurtenances. For pipelines in close proximity to HVAC power lines, faults are identified as a hazard in almost all of the procedures. However, few addressed coating stress limit above which mitigation is required. For current density criteria, several procedures had clearly defined limits, while others addressed it as a concern for AC corrosion but did not specify a targeted limit of AC current density or define limits for mitigation. Table 1 provides a summary comparison of the industry procedures reviewed.

Table 1-Industry Procedure Summary

Induced AC Potential Limit Requiring Mitigation	*Fault Protection/Coating Stress Voltage Limit Requiring Mitigation*	*Current Density Criteria Requiring Mitigation*
In accordance with NACE: 15 V	Not specified	Not Specified
15 V	2500 V	Not Specified
15 V	Mentions damage possible from faults but no limit	Not Specified
15 V or higher - No work unless approved by area supervisor	Not specified	Not Specified
Modeling Required > 2 V	Consider with Modeling	30 A/m^2
15 V	5000 V	75 A/m^2 requires mitigation, 50 A/m^2 requires further evaluation
10-15 V	150-2000 V depending on fault duration	30 A/m^2
15 V	Faults to be considered along with a minimum separation distance, but no limit specified	20 A/m^2
15 V	Faults to be considered during mitigation analysis, but no limit specified	50 A/m^2
15 V	Faults to be considered during mitigation analysis, but no limit specified	50 A/m^2

4 NUMERICAL MODELING

Predicting high voltage interference is a complex problem, with multiple interacting variables affecting the influence and impact. In recent decades, development of advanced calculation methods and computer-based tools for simulation of interference effects, analysis of faults, and development of mitigation methods has been significant.2[3,5,9,10] Computer based numerical modeling can be utilized to examine the collocated pipeline's susceptibility to HVAC interference, help identify locations of possible AC current discharge, and where necessary design appropriate mitigation systems to reduce the effects of AC voltage, fault currents, and AC current density to meet accepted industry standards. These numerical models are capable of analyzing the interacting contribution of multiple variables to the overall magnitude of AC interference.

Computer modeling is used to analyze the interactions and sensitivity of the variables that affect the magnitude of AC induction on pipelines. This section provides a brief review of numerical modeling software in general, as well as the results of the individual variable analyses.

4.1 Modeling Software

Previous research has compared the benefits of specific industry standard software; literature is available for each of the common software packages.[3,9,2023] This review addresses the generalizations concerning the present industry standard software, but does not aim to address or endorse specific software packages.

For the majority of simple collocations considering a single pipeline and single HVAC power line numerous industry-accepted models have shown to be consistent in the assessment of HVAC interference. Often, for these simple cases, the benefit of a more complex model is not gained due to uncertainty in the analysis inputs. That is to say that for a majority of simple collocations, any of several industry accepted models are capable of providing an accurate analysis. The applicability is limited by the accuracy of the input data, and expertise of the analyst in utilizing the specific model. Often the uncertainty in critical input variables, such as the HVAC load current and phasing, outweighs the benefits gained from a more complex model. However, as the collocation complexity increases, both in terms of the number of structures and geometric routing, the limitations of some basic models support the benefits of the more detailed modeling software.

Typical industry standard software packages that were reviewed use a transmission line model (TLM) to calculate longitudinal electrical field (LEF), based on established fundamental Carson or Maxwell equations for electromagnetic fields. The geometry and routing of the complete pipeline and transmission line network incorporated in the model considers multiple pipelines, transmission lines, tower sections, and other collocation parameters. Collocations are simplified as a connected series of finite sections and nodes, with appropriate parameters applied simulating the pipeline, soil, and transmission load-ins. The modeling software can then calculate the LEF for each section and solve the fundamental equations to calculate the potential, current, and theoretical current density along a given collocation.

Calculation of the EMI and corresponding effects on buried pipelines requires a thorough understanding of the variables involved. Detailed modeling requires knowledge of electric field interactions, transmission current, tower design, bulk and local soil resistivity, and pipeline parameters such as geometry, coating, depth, diameter, electrical connections or isolations, and existing CP. All of these variables may significantly affect the AC interference model, and similarly the analogous real world interference. Likewise, the assumptions and simplifications made during the model setup can have significant impact on the accuracy and applicability of the outputs.

While most of the available models are able to analyze each of these variables, either directly or indirectly, the accuracy of the analysis is dependent on the expertise and understanding of the analyst to assess the given variables. Similarly, the accuracy of the models can only be as good as the input data. Multiple sources are required for the collection of data, i.e. measured in field, provided by power line or pipeline operators, or based off published nominal data. For that reason, the accuracy of the results is ultimately dependent on the expertise of analyst and the reliability of the data input to ensure technically appropriate setup, despite the presence of multiple models that have been shown to be capable of providing accurate analysis when used within their applicable limitations.

4.2 Variable Analyses

Due to the number of interacting variables affecting the overall levels of AC interference, it is difficult to isolate the effects of a single variable for all collocations scenarios encountered. Consequently, it is difficult to determine distinct limits for individual variables outside of which interference becomes negligible. Considering several key interacting variables is a more viable approach. For example, reported recommendations cite a distance of 1,000 feet as considered 'far' and assumed low risk for HVAC interference. However, in cases where power line current loads are greater than 1,000 amps and in regions of low soil resistivity, elevated induced AC potentials and corresponding current density exceeding recommended thresholds have resulted at even greater distances. Therefore, separation distance alone may not provide sufficient justification to exclude a collocation from further assessment. Conversely, considering the interacting effect of the key variables identified is necessary when determining the need for detailed analysis for a collocation.

DNV GL developed a series of computer models to illustrate the influence of key variables affecting induced AC on pipelines from nearby HVAC power lines. The software used is a graphical simulation platform developed to predict the steady state interference and resistive fault effects of HVAC power lines on buried pipelines in shared right-of-ways (ROWs). Using a TLM and appropriate input data, the software calculated the LEF, which then calculated the magnitude of induced AC potential, and current along the modeled collocated pipelines.

The models created for these studies are simplistic in terms of geometry and serve as a demonstration of the variables' influence on AC induction on adjacent pipelines. Based upon the number of variables and their interactions with respect to AC interference on pipelines, these studies determine the relevancy of the various parameters. The studies offer guidance demonstrating the trends associated with each parameter on the overall level of interference, and were used along with existing industry guidance and literature findings to develop the recommended guidelines presented in Section 6.

The primary variables analyzed as part of this study are as follows:

- HVAC Power Line Current
- Soil Resistivity
- Separation Distance Between Pipeline and Power Line
- Collocation Length of Pipeline and Transmission Line
- Angle Between Pipeline and Transmission Line
- Coating Resistance
- Pipeline Diameter and Depth of Cover

The results of these studies are presented and summarized in the following sub-sections.

4.2.1 HVAC Power Line Current

A primary variable influencing the magnitude of induced AC potential on a pipeline collocated with HVAC power lines is the magnitude of the phase conductor current. The current load of the nearby power lines has a direct influence on the LEF generated by the HVAC power line circuit(s). The intensity of the LEF varies with the current loads affecting both magnitude of induced AC potential on the nearby pipeline, as well as the area of influence. The area of influence affects the separation distance at which a collocated pipeline experiences significant interference and is further discussed in Section 4.2.3.1.

To demonstrate the sensitivity of power line current on pipeline interference, DNV GL created a computer model simulating a single circuit vertical transmission line, parallel to a 10-inch diameter pipeline for 5,000 feet at a horizontal separation distance of 100 feet. The pipeline approaches the transmission line at a 90-degree angle and parallels the transmission line for 5,000 feet before receding from the transmission line at a 90-degree angle, as depicted in Figure 7. The HVAC load current was varied while all other model inputs remained constant, to analyze the influence of current alone. A uniform soil resistivity of 10,000 ohm-cm was applied and constant throughout the analyses. The transmission line current loads analyzed were 250, 500, 1,000, 2,500, and 5,000 amps based on ranges of operating and emergency loading conditions reported in literature and previously provided from power transmission operator's design conditions. Figure 8 shows the maximum induced AC potential as a function of transmission line current load.

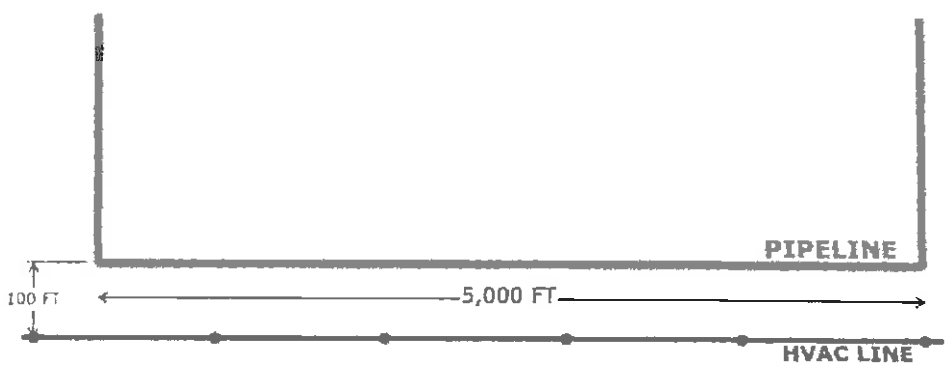


Figure 7. Simplified ROW Model Geometry

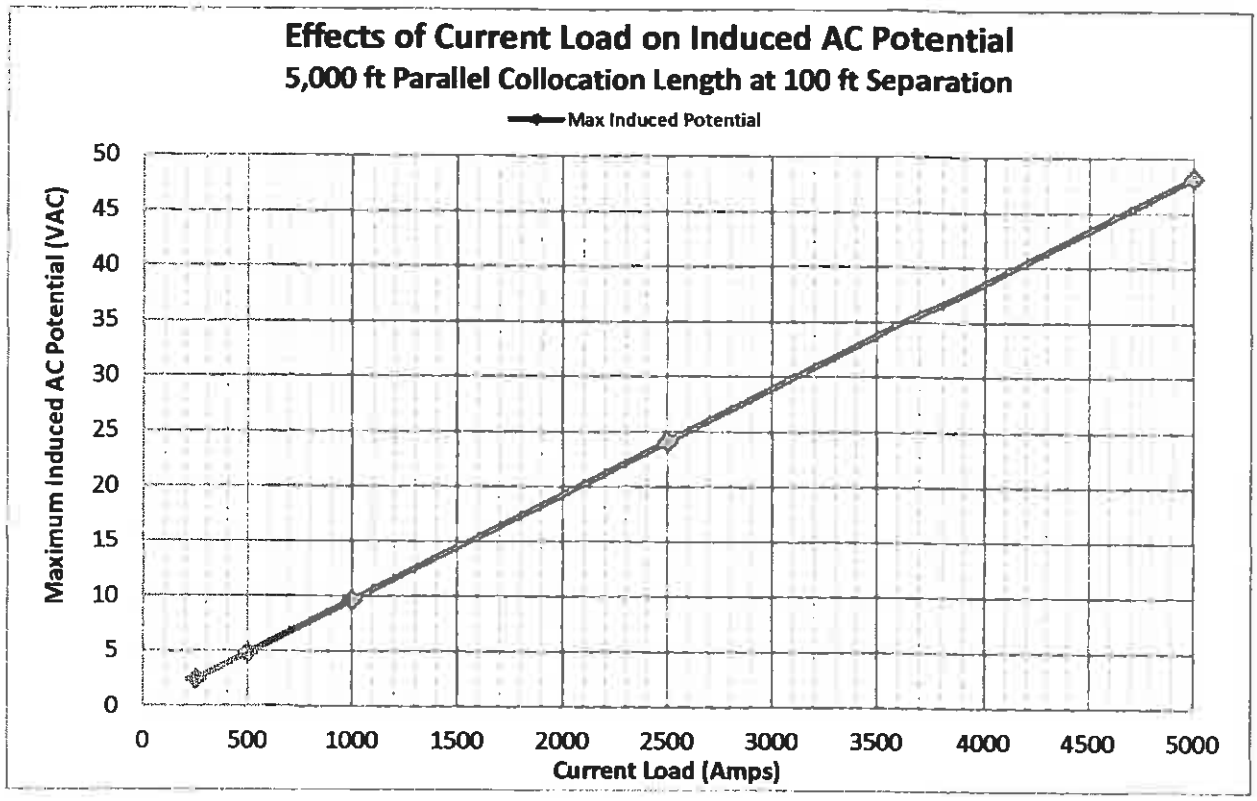


Figure 8. Maximum Induced AC Potential as a Function of HVAC Transmission Line Current

The results of this analysis show that the relationship between transmission line current and maximum induced AC potential on the pipeline is linear for a parallel collocation, considering a single interfering power line. When all other variables remain constant, the HVAC operating current load has a direct linear effect on the magnitude of the induced AC potential. This relationship allows for estimating influence of elevated current loads based on field measured AC pipe-to-soil potentials. For the specific case, with a pipeline collocated with a single HVAC circuit, if sufficient measurements of AC pipe-to-soil potential are taken, and corresponding transmission line current loads are provided for the specific time of measurement, the values can be scaled linearly to estimate the induced AC potential likely at the correspondingly scaled transmission current. This may be applicable, for example, for estimating the effects associated with a power line upgrade with a new current load. However, this method of approximation is only applicable for pipelines collocated with a single transmission line where sufficient data is available. As the number of transmission line circuits increases, the multiple interference sources and interaction the complexity of the interference increases such that the simply linear relationship is no longer valid. As the number of influencing HVAC circuits and pipelines within the area of influence are increased, the complexity of the interaction necessitates analysis that is more detailed.

It is known that while the higher current loads presented represent the high end of typical reported design loads, recent trends in the power transmission industry have shown development and installation of higher capacity HVAC transmission systems capable of carrying significantly greater current loads. For example, previous references indicate a typical load for 345kV to 500kV systems to be approximately 500 to 1,000 amps per circuit.3[24] Recent research indicates increased capacity for 345kV lines carrying up to 5,000 amps

per circuit, and over 6,000 amps for 500kV systems.[2,24] While these magnitudes are not considered typical, numerous projects have developed recently that require mitigation for circuits operating at these elevated loads, indicating a need to consider actual current ratings for certain collocations. For this reason, loads are presented in terms of current rather than line voltage rating, as current is the driving load to control the level of EMI. It is noted that line ratings are typically given in terms of voltage ratings such as 138 kV, 345 kV, etc. however, the current load is the more relevant variable when determining the level of HVAC interference. Voltage rating alone can be misleading as the associated loads can be significantly higher or lower than the 'typical' current loads for that kV rating. For this reason, it is recommended to obtain current load data from the power utility company when assessing risk of interference.

4.2.2 Soil Resistivity

The soil resistivity along the collocation affects the magnitude of induced AC potential distribution as well as the theoretical AC current density along a given pipeline. It is necessary to consider both the bulk and specific layer resistivity when assessing likelihood and severity of interference. The bulk resistivity to the pipeline depth is one of the controlling factors in the analysis of induced AC potential. The bulk resistivity is the average soil resistivity measured in a half-hemisphere to the depth of the pipe, as shown in Figure 9 below. However, the specific resistivity of the soil layer directly next to the pipe surface, shown as Layer 2 in Figure 9, is a primary factor affecting the corrosion activity at a coating holiday, considering both conventional galvanic and AC assisted corrosion. The bulk soil resistivity combined with the coating resistance of the pipeline affect the level of induced AC potential expected along the pipeline.

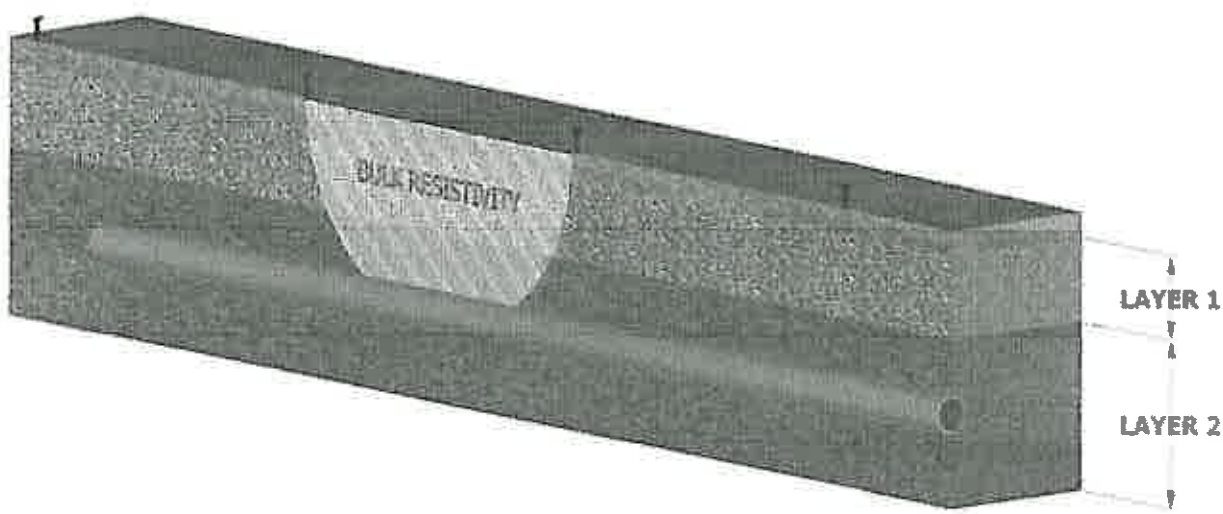


Figure 9. Graphical representation of soil resistivity measurements, showing bulk and layer zones

To demonstrate the sensitivity of soil resistivity on pipeline interference and current density, DNV GL created a computer model simulating a single circuit vertical transmission line, parallel to a 10-inch diameter pipeline with a configuration similar to the model setup described in Section 4.2.1. The soil resistivity was varied along the pipeline while all other model inputs remained constant, to analyze the influence of resistivity alone. The soil resistivity was uniform along the entire modeled collocation, considering 100, 1,000, 10,000, and 100,000 ohm-cm. Figure 10 shows the maximum induced AC potential corresponding to varying current loads.

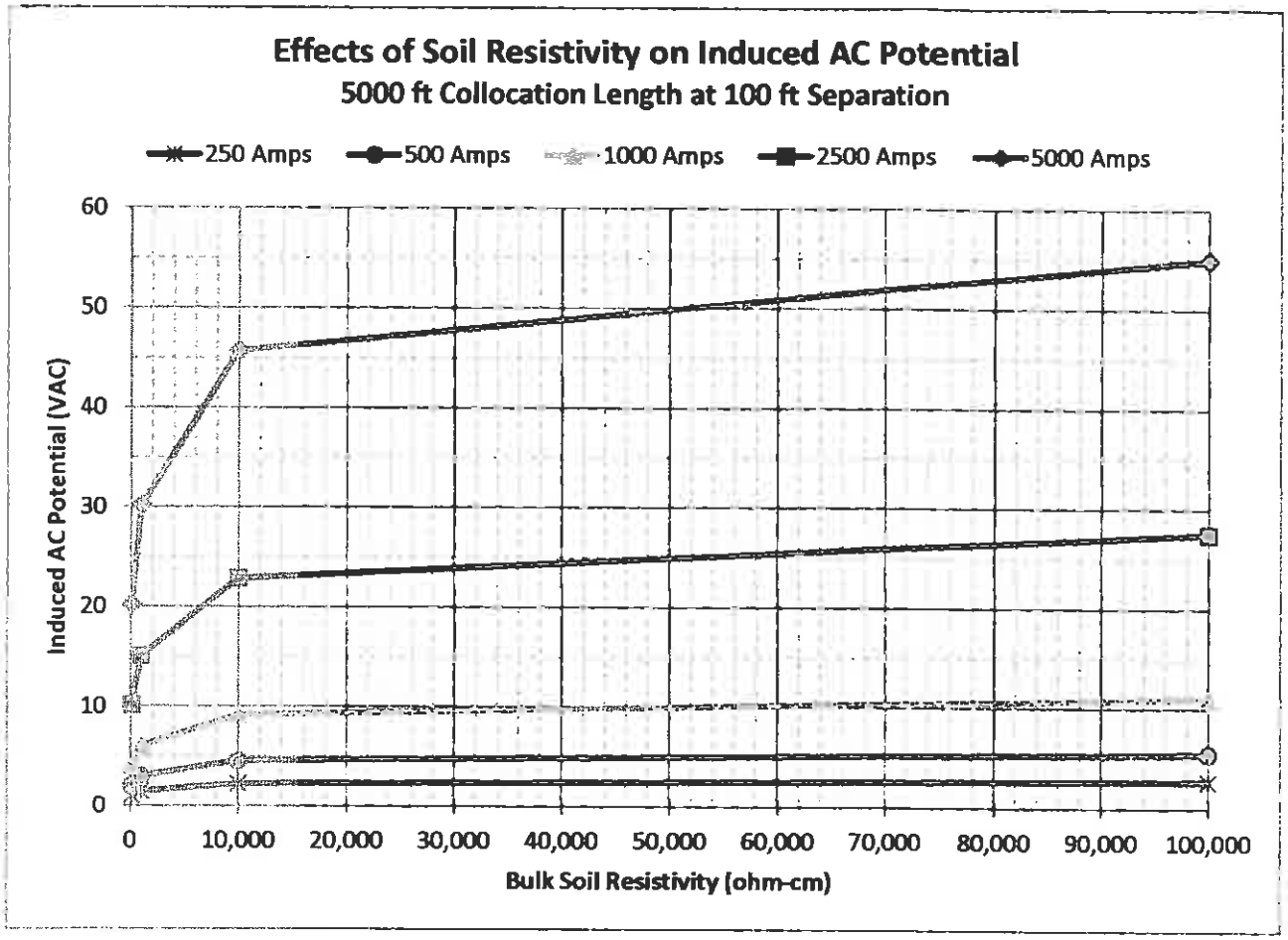


Figure 10. Maximum Induced AC Potential as a Function of Soil Resistivity

The results of the analyses show that the induced AC potential increases logarithmically with increasing soil resistivity. This increase in induced AC potential changes significantly between 100 and 10,000 ohm-cm but approaches asymptotical limit at soil resistivity values greater than 10,000 ohm-cm.

The effects of soil resistivity have greater influence however on the current density. While an increase in soil resistivity can result in a slight increase in the magnitude of induced AC voltage for a given collocation, the theoretical current density and associated risk of AC corrosion decreases linearly with the increased resistivity. The layer resistivity of the soil directly next to the pipe surface is a primary factor in the corrosion activity at a coating holiday. The specific resistivity near the pipe at a holiday is inversely related to theoretical AC current density, as shown by the calculation for theoretical AC current density in Equation 1. Thus, an increase in soil resistivity results in a decrease in theoretical AC current density.

Considering the 250 amp current load case from Figure 10, the theoretical current density was calculated from the induced AC potential for each magnitude of soil resistivity, considering a 1 cm^2 holiday, shown in Figure 11 and Table 2. While the soil resistivity values increase several orders of magnitude across the range, the theoretical current density decreases on similar order, with minimal change in the overall induced AC potential, as shown in Figure 11 and 0 Table 2. The red dashed line represents the lower bound 20 amps/m^2 threshold for current density as discussed in Section 3.3.1.1. It can be seen that based on the calculations provided by Equation 1, a very high theoretical AC current density is possible for relatively low AC potential, if soil resistivity values are below 10,000 ohm-cm. This results in elevated risk for AC corrosion for soil resistivity ranges below 10,000 ohm-cm.

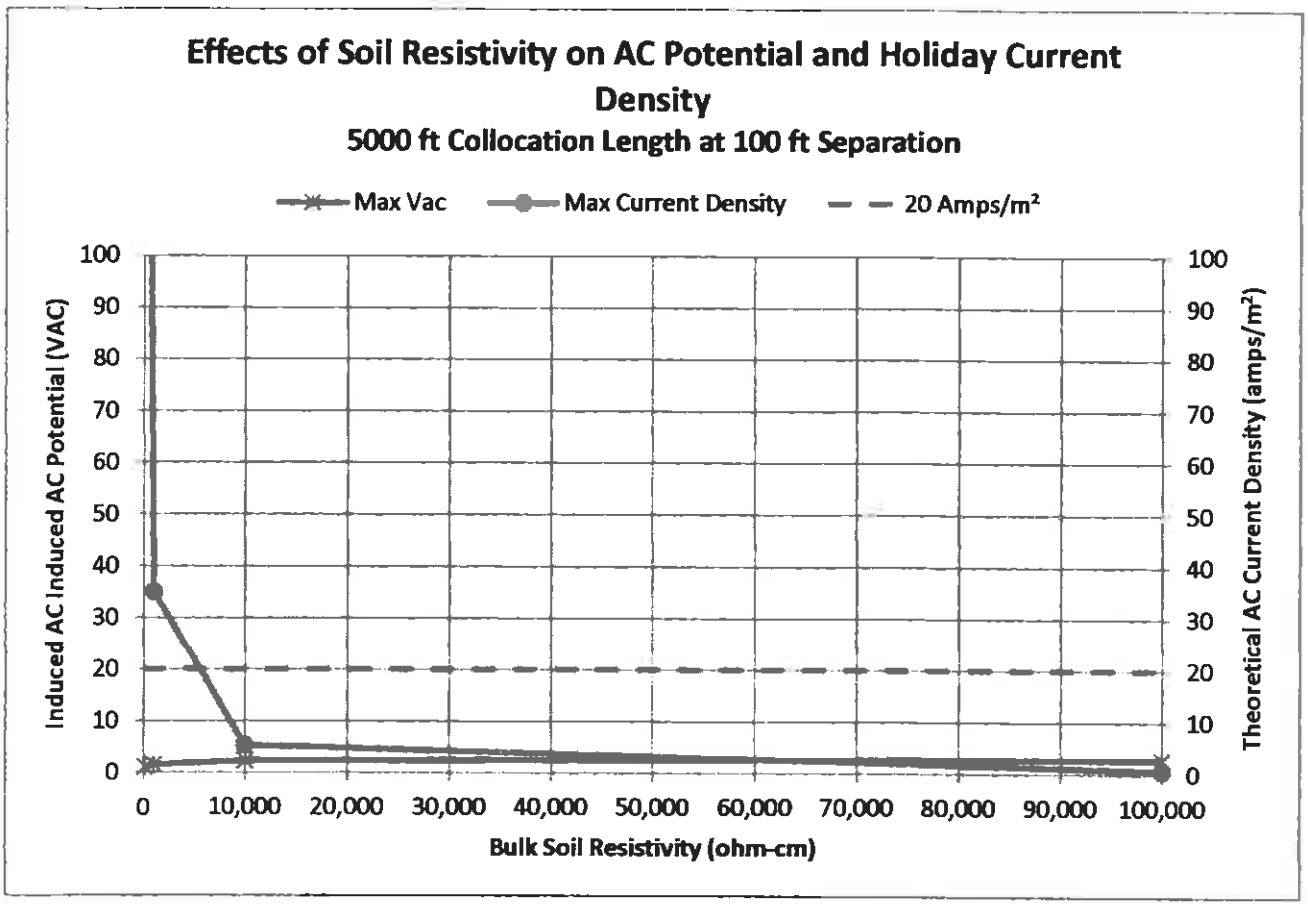


Figure 11. Effects of Soil Resistivity on Induced AC Potential and Corresponding Holiday Current Density. Current density presented for a theoretical 1cm^2 holiday

Table 2-Calculated current density and induced AC potential

ρ (ohm-cm)	Calculated Current Density (A/m^2)	Induced Potential (V_{ac})
100	234	1.0
1,000	35	1.5
10,000	5	2.3
100,000	0.6	2.8
Based on 5,000ft parallel collocation with a power line operating at 250 A load, 100-ft separation distance		

4.2.3 Collocation Geometry

The geometry of the pipeline relative to the transmission line is critical in determining the magnitude and distribution of induced AC potential along the pipeline. The level of AC interference for a given collocation or crossing, with respect to collocation geometry, is dependent on the relative distance between the phase conductors and pipeline, the locations of convergence or divergence, and angle of approach or crossing. Each of these variables affects the overall level of induction or susceptibility to fault hazards, and their influence is dependent on all other configuration variables. When assessing susceptibility to AC interference all of these variables are considered. However, for the sake of this assessment, the following studies analyzed each independently in order to provide a simplified assessment of the influence of each parameter.

The figures presented in Section 4.2.3.1 to 4.2.3.3 incorporate a dashed line similar to the current density threshold indicator in Figure 11. The limit lines provide reference to the AC potential limit that may result in a theoretical AC current density of 20 amps/m^2 for a hypothetical 1 cm^2 holiday, at soil resistivity of 1,000 and 10,000 ohm-cm. The limit lines are included to provide guidance illustrating the levels that may pose an elevated risk of AC corrosion at potentials below the NACE specified 15 volt limit for personnel safety.

4.2.3.1 Separation Distance Between Pipeline and Power Line

The separation distance between the pipeline and transmission line is a significant variable controlling the level of induced AC potential influencing a given pipeline. The proximity of the pipeline to the phase wires limits the strength of the LEF to which the pipeline is exposed.

To demonstrate the sensitivity of separation distance on pipeline interference, DNV GL created a computer model simulating a single 10-inch pipeline, and single circuit vertical transmission line, with similar configuration as described in Section 4.2.1. The separation distance was varied between the models while all other model inputs remained constant, to analyze the influence of separation alone. Induced AC potential results are plotted for separation distances of 50, 100, 500, 1,000, and 2,500 feet in Figure 12. The results indicate that for the higher load currents, the 20 A/m^2 recommended current density threshold is exceeded for separation distances greater than 500 feet is exceeded.

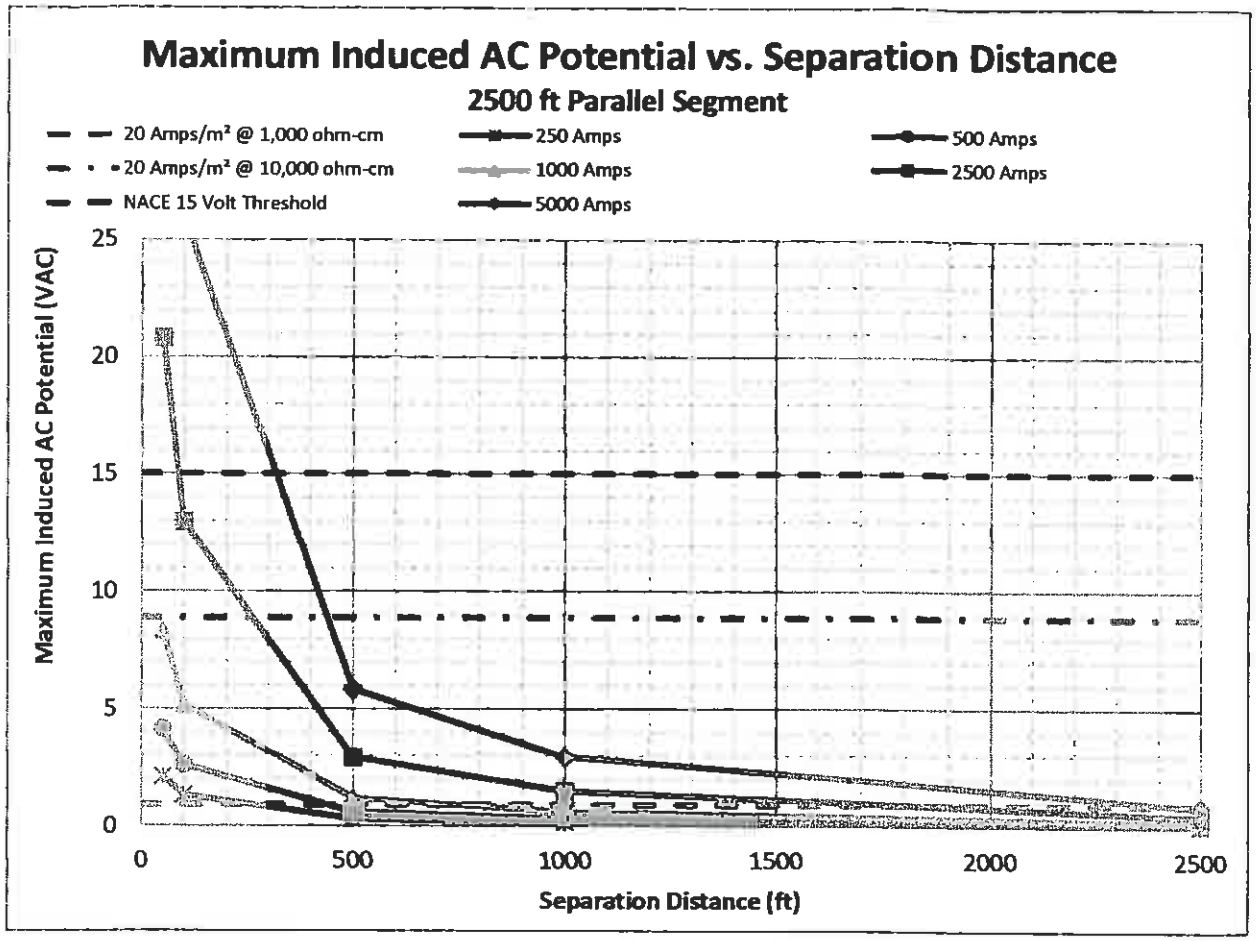


Figure 12. Effects of separation distance on induced AC potential. Current density limits presented for a theoretical 1cm^2 holiday.

As the distance between the pipeline and transmission line increases, the induction on the pipeline decreases. This is expected as where the distance between the pipeline and phase conductors increase the distance from the LEF origin increases, decreasing the coupling effects. The results of this study as presented in Figure 12 illustrate an important effect of the load current as well. The area of influence or separation distance at which a collocated pipeline experiences significant interference increases accordingly.

The figure also depicts potential levels corresponding to a 20 amp/m^2 current density for both 1,000 and 10,000 ohm-cm soil resistivity for reference. For the given parameters analyzed, a current load of 250 amps results in an induced potential of approximately 2 volts at a 50 foot separation distance which quickly decreases to less than 0.5 volts at a distance of 500 feet. However, a load of 2,500 amps results in an induced AC potential of approximately 21 volts at a separation distance of 50 feet, and approximately 1.5 volts at a separation distance of 1,000 feet. This is important when determining which pipeline collocations require detailed analysis, as there is variation among industry guidance documents for the limiting distance. A limiting distance of 1,000 feet is common practice, however, for HVAC current loads greater than 1,000 amps, significant interference might be possible at distances exceeding 1,000 feet. While the induced AC potentials magnitudes may appear relatively low in Figure 12, for separation greater than 2,000 feet, it should be noted this example is considering a single HVAC circuit, and only an approximately 0.5 mile collocation length. In practice additional interfering circuits collocated for longer distances would result in

higher induced AC potentials. Further, as discussed in Section 4.2.2, it is possible to have an elevated AC current density under relatively low soil resistivity conditions, such that AC corrosion is a concern at relatively low induced potential.

It is necessary to consider separation distance in conjunction with the other factors to exclude a collocation from further analysis for separation distances within 2,500 feet. At a minimum, operating current, or an estimate of it, is also necessary when determining if further analysis is required.

4.2.3.2 Collocation Length of Pipeline and Transmission Line

Just as separation distance affects the magnitude and distribution of induced AC potential along the pipeline, so does the length of collocation. The collocation length is the distance along the ROW that a pipeline parallels or crosses the transmission line within a separation distance and angle that allow for inductive coupling. The collocation length affects the magnitude of induced AC potential that accumulates on the pipeline as it defines the length of the pipeline exposed to the LEF of the phase wires.

To demonstrate the sensitivity of collocation length on pipeline interference, DNV GL created a computer model simulating a single 10-inch pipeline, parallel to a single circuit vertical transmission line at a 50 foot offset. The collocation length was varied between the models while all other model inputs remained constant, to analyze the influence of collocation length alone. Collocation lengths of 500, 1,000, 2,500, 5,000, and 10,000 feet of the pipeline and transmission line compare the maximum induced AC potential in Figure 13.

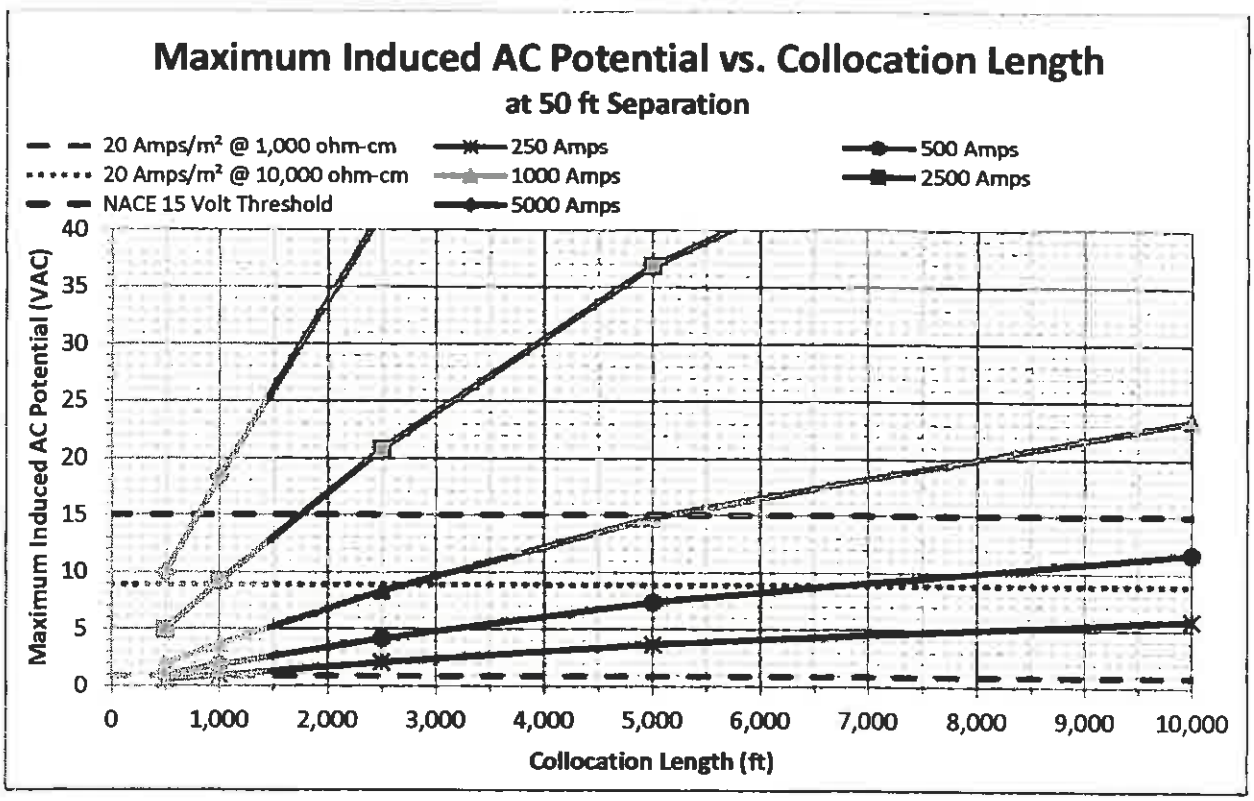


Figure 13. Maximum Induced AC Potential as a Function of Collocation Length

As the collocation length increases, the magnitude of induced AC potential on the pipeline increases, as the length of pipeline exposed to the LEF is increased. Collocation lengths as short as 500 feet are capable of inducing 2 – 10 VAC or greater considering a single collocated power line operating at 1,000 amps or greater.

The potential levels corresponding to a 20 amp/m^2 current density for both 1,000 and 10,000 ohm-cm soil resistivity have been included for reference. Considering a relatively low soil resistivity of 1,000 ohm-cm, the 20 amps/m^2 current density criteria is exceeded at a 2,500 foot collocation length for all load currents analyzed.

The results of the collocation length study also accentuate the sensitivity to HVAC load current as previously discussed in Section 4.2.1. The collocation length required prior to exceeding the 15 volt safety threshold for the 2,500 and 5,000 amp load conditions is approximately 1,750 and 800 feet respectively. These conditions are further increased in complex collocations where multiple lines exist.

It is necessary to consider collocation length in conjunction with the other factors to exclude a collocation from further analysis for separation distances within 2,500 feet. At a minimum, operating current, or an estimate of it, is also necessary when determining if further analysis is necessary.

4.2.3.3 Angle Between Pipeline and Transmission Line

The angle at which the pipeline and HVAC transmission line cross has an effect on the magnitude of induction on the pipeline at the crossing. As the angle increases between the pipeline and transmission line, the magnitude of the induction decreases as the component of the pipeline exposed to induction decreases. For a perpendicular crossing, with the pipeline crossing at or near 90° to the power line, the induction on the pipeline is minimized as the effective parallel length is minimized. The magnitude of the current on the transmission line also has a significant impact on the induced AC potential at crossing locations. Previous 'rule-of-thumb' practices throughout industry may have indicated crossings greater than 60° resulted in negligible induction on adjacent pipelines.[2] However, recent studies have resulted in HVAC installations with significantly greater current capacity, which acts to increase the corresponding interference resulting in cases with induced AC voltage at relatively high angle crossings.

To demonstrate the sensitivity of collocation angle on pipeline interference, DNV GL created a computer model simulating a single 10-inch pipeline, and single circuit vertical transmission line, with similar configuration as described in Section 4.2.1. The pipeline was approximately 2 miles long and the angle between the pipeline and transmission line varied between models while all other model inputs remained constant, in order to analyze the influence of crossing angle alone. Figure 14 shows the results of an analysis of crossing angles between 15 and 90 degrees and the calculated maximum induced AC potential for each case.

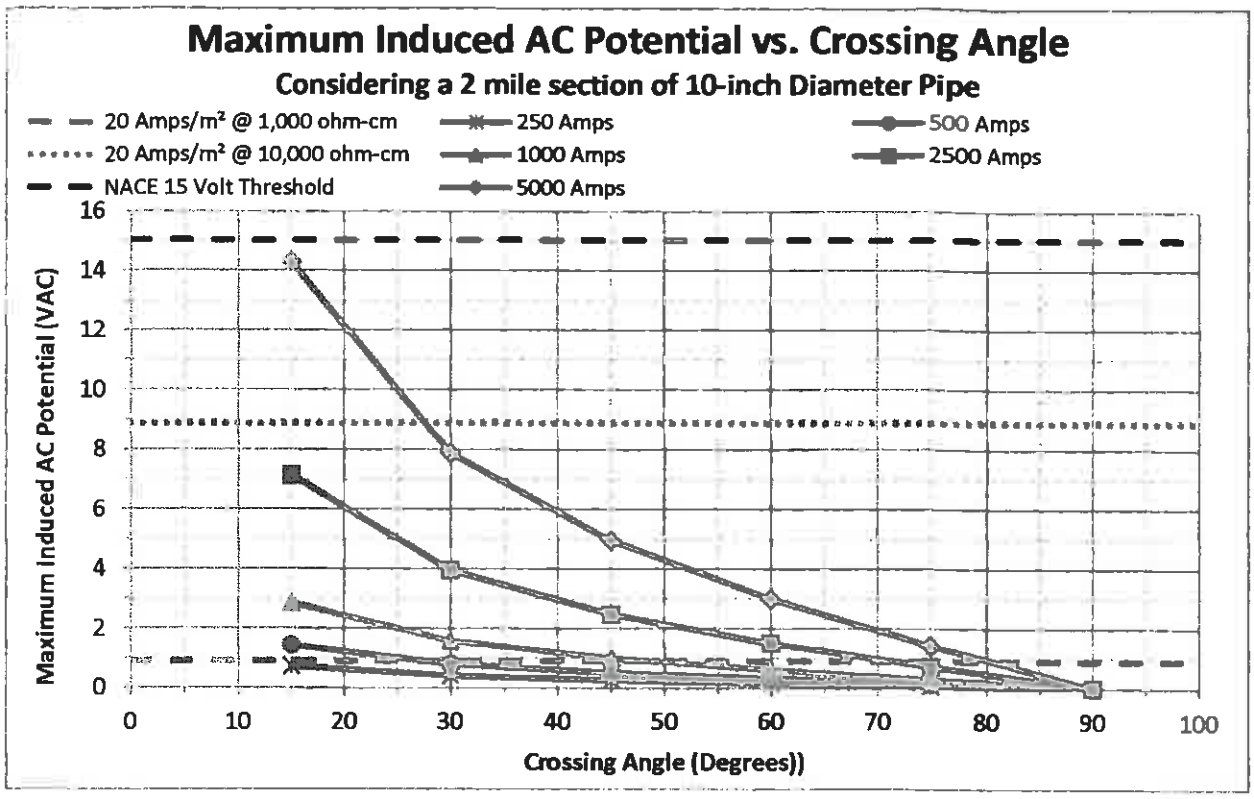


Figure 14. Maximum calculated induced voltage at various HVAC line crossing angles

Considering a typical 345kV circuit, and current loads of up to 1,000 amps, a crossing angle of greater than 45° degrees resulted in an induced potential of less than two (2) VAC for the study presented. A crossing angle of greater than 60° induces minimal potential such that the corresponding current density is less than 20 amps/m^2 even in a relatively low soil resistivity at 1,000 ohm-cm. Previous industry experience and general guidance practices across industry appear consistent with this understanding that crossings of greater than 60° are typically low-severity with respect to induction.

However, as the transmission line load increases to greater than 1,000 amps, it can be shown that crossing angles up to 60° may induce potentials such that corresponding current density exceeds 100 amps/m^2, in low resistivity soil conditions. Depending on target limits for current density, models show that crossing angles of 80° can cause high current density in relatively low soil resistivity locations.

The crossing angles discussed above are with respect to induced AC interference specifically. Assessment for susceptibility to faults, and coating breakdown due to fault voltage, is required for all crossings where pipelines pass in close proximity to a tower ground.

4.2.4 Coating Resistance

The resistance of the pipeline coating to ground is a significant factor controlling the level of induced potential that may build up on a pipeline. However, in practice the coating resistance is typically not known with great certainty and is generally inconsistent along the pipeline length. The coating resistance to ground is a function of the coating type, condition, thickness, and local soil resistivity, all of which may vary along a typical collocation length.

In general, a poorly coated pipeline, or deteriorated coating with low resistance to ground allows multiple paths to ground for AC potential to dissipate. This reduces the buildup of induction, resulting in lower AC potential and lower current density discharge at any individual holiday. Conversely, considering a well coated line with high dielectric strength and excellent coating condition, the resistance to earth along the length of the pipeline is relatively high allowing for greater induction build up over longer distances. For example, this case may exist with a newly FBE coated pipeline, with minimal holidays, in proximity to a collocated HVAC power line. Due to the high resistance to ground, and relatively few ground paths, the induced AC potential can build along the collocation length. This can generate elevated AC potentials, which may be hazardous from a safety standpoint, but also create a possible corrosion risk, as the AC current can discharge from a relatively few holidays after a physical or electromagnetic discontinuity, such as the pipeline diverging from the collocation.

Relative estimates of coating resistance are provided by Dabkoski in the report for Pipeline Research Council International (PRCI) and Parker[24,25], and summarized in Appendix B for reference, to be utilized in detailed modeling analysis based on coating quality, and soil resistivity, however specific guidance is not provided for a relative risk associated with the various coating resistance values.

4.2.5 Pipeline Diameter and Depth of Cover

The diameter of the pipeline collocated with or crossing an HVAC power line affects the level of induced AC potential on the pipeline. However, historical experience has indicated that the effect is relatively minor compared with the influence of other variables.

To demonstrate the sensitivity of pipe diameter on pipeline interference, DNV GL created a computer model simulating a single pipeline, parallel to a single circuit vertical transmission line for 5,000 feet at a horizontal separation distance of 100 feet. The pipeline approaches the transmission line at a 90-degree angle and parallels the transmission line for 5,000 feet before receding from the transmission line at a 90-degree angle. The pipeline model considered diameters of 6, 10, 18, 24, 36, and 48 inches, while all other model inputs remained constant, to analyze the influence of diameter alone. The model used a uniform soil resistivity of 10,000 ohms-cm. The results of this study indicate that the magnitude of induced AC potential decreases with an increase in pipeline diameter, as shown in Figure 15.

As the diameter of the pipeline decreases, the surface area exposed to the LEF also decreases. However, the magnitude of LEF generated by the transmission line remains unchanged. For a smaller diameter pipeline, the LEF influences a smaller surface area resulting in greater induced AC potential compared to a larger diameter line, considering all other variables equal. Further, the pipeline characteristic impedance varies inversely with pipeline diameter, as presented in previous work by PRCI3[24]. Considering all other parameters equal, a larger diameter pipeline will have a generally lower effective resistance to ground, and therefore a lower tendency of HVAC interference. For relative comparison, an increase in diameter from 6 to 48 inches resulted in a 20% decrease in induced AC potential on the pipeline, regardless of the interfering current level.

In the previous analysis, the models used 10-inch diameter pipeline, which will provide a conservative estimate relative to typical larger diameter transmission lines. This was chosen to clearly demonstrate the effects of the individual variables.

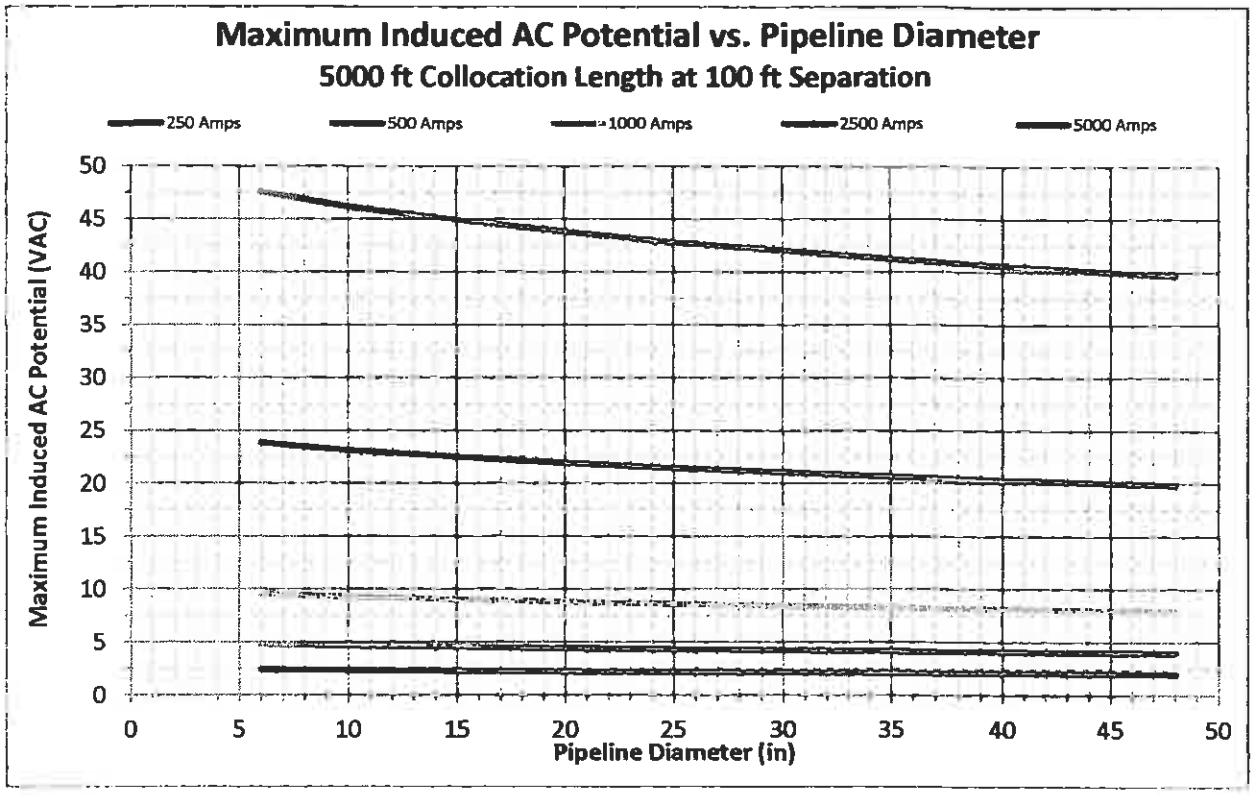


Figure 15. Maximum Induced AC Potential as a Function of Pipeline Diameter

Similar to pipeline diameter, the pipeline depth of cover has a relatively minor influence on the induced AC potential on the pipeline. In general, the level of AC interference decreases with increasing depth of cover as the distance from the individual phase conductors and total resistance to the LEF is increased, though the effect is relatively minor for typical burial depths. A fixed depth of cover of approximately 5 feet was used in the sensitivity studies above.

5 MITIGATION

NACE International Standard Practice SP0177-2014 requires a mitigation system designed for pipelines where HVAC interference is present.[10] Mitigation system design varies across the industry, but in general all involve a low resistance grounding system to pass interfering AC to ground. Typical mitigation system designs can be either surface or deep grounding designs. Both designs have benefits and detriments considering performance, cost, and constructability.

Liquid and gas transmission pipelines are regulated under the Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) Regulations §49 CFR Part 195 Subpart H Corrosion Control (195.551 – 195.589)[26] and §49 CFR Part 192 Subpart I Requirements for Corrosion Control (192.451 – 192.491)[27], respectively. The regulations have various requirements for corrosion control of which CP and electrical isolation are major factors in compliance. CP systems apply a DC to the pipeline, and electrical isolation quantifies the surface area or limits of the system. CP systems designed for transmission pipelines must meet federally regulated criteria.

5.1.1 DC Decouplers

When designing mitigation systems for induced AC and faults on transmission pipelines, detrimental effects to the CP system must be considered. It is essential to ensure they do not compromise the operation of the CP systems. Additional structures such as grounding and shield wires used in mitigating induced AC attached directly to the pipeline change the operating characteristics of the CP system, changing the surface area intended for the CP compromising its effectiveness. Direct current decouplers (DCD) alleviate this situation. However, there are some cases where the design of CP accounts for the mitigation. The decouplers, designed into the circuit, allow AC current to pass to ground, while blocking the DC CP current, maintaining the pipeline surface area. There are various types, sizes and ratings of decouplers used depending on the predicted faults or induced AC and mitigation design. DCDs are also used to block DC current at grounded above grade appurtenances, such as block valves, metering stations, and launcher/receiver stations.

Decouplers installed across electrical isolation flanges (IF) prevent "burn over" which can occur when an AC fault current or lightening surge is large enough in magnitude to arc over the gap between flange faces or exceeds the rating of the IF.

5.2 Surface Grounding

Surface grounding generally refers to one of several types of mitigation grounding installed at or near the surface or pipe depth. Typical designs may consist of bare copper cable, zinc ribbon, or engineered systems buried generally parallel to the pipe path and connected to the pipeline through a DCD. During new construction, surface grounding can be installed directly in the pipe trench, or laid parallel to the pipe in an adjacent trench or bore. This approach allows for cost-effective installation of a significant length of mitigation at a lower cost relative to alternative forms of mitigation, but is dependent on construction access along the ROW.[16]

If necessary, connecting additional mitigation ribbon in parallel and even adding shallow vertical anodes to the circuit will further reduce grounding resistance up to a certain extent. Installing this type of mitigation system at distributed, targeted locations, optimized from the interference model, reduces the induction along the pipeline. Additionally, when laid parallel to the pipeline in regions where transmission line towers are in close proximity, the mitigation ribbon also acts to protect and shield the pipeline from damage resulting from fault and arcing scenarios.

Analysis of the reduction in ground resistance possible with various installation approaches included a calculation of the resistance of 1,000 foot long mitigation ribbon in varying soil resistivity, using the modified Dwight's Equation for multiple anodes installed horizontally[28]. Figure 16 illustrates how this calculated grounding resistance varies with the number of ribbons connected in parallel at multiple levels of soil resistivity. While numerous sizes of ribbon cables exist, the length is a much more significant factor in determining total resistance than diameter, when considering typical ribbon diameters, therefore this analysis considers a constant diameter ribbon.

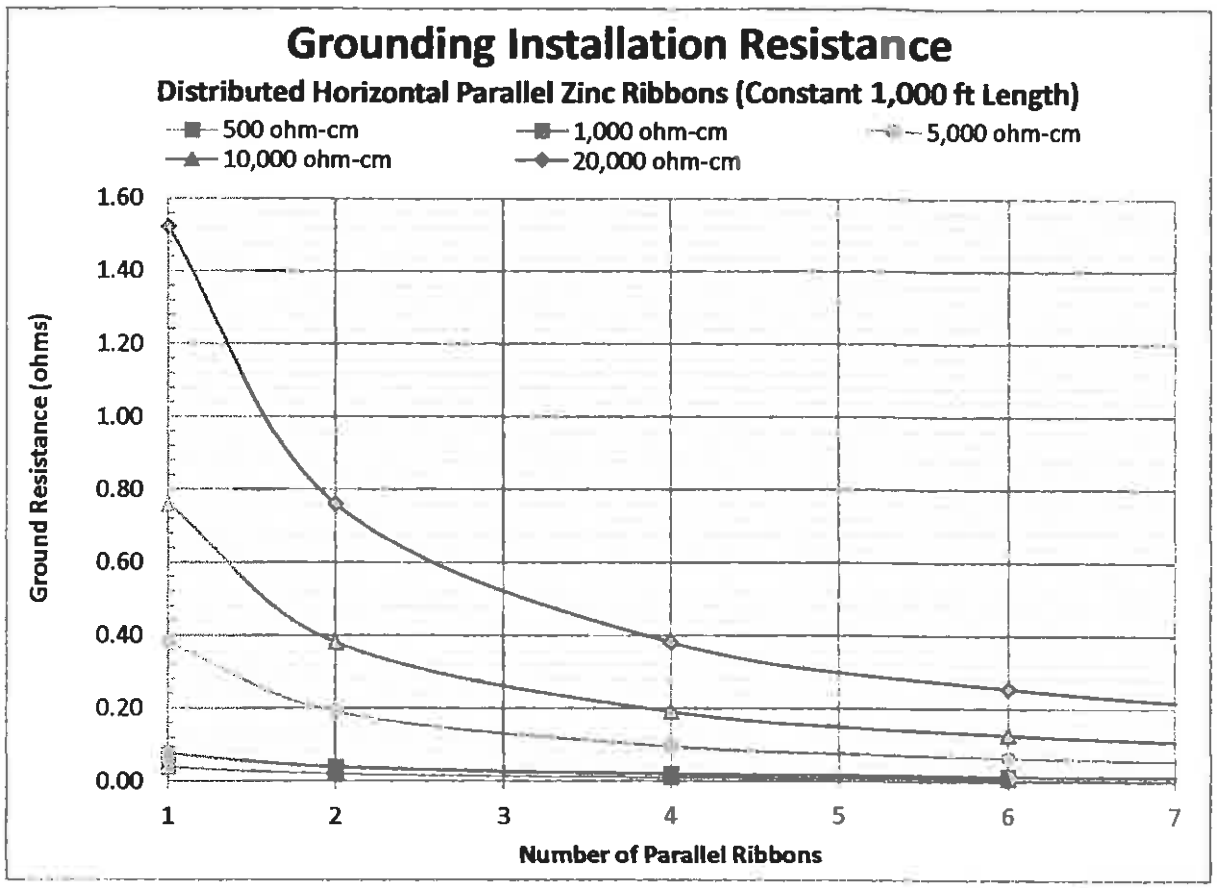


Figure 16. Grounding Resistance of Horizontal Parallel Zinc Ribbons at Varying Soil Resistivities

As shown in Figure 17, at low soil resistivities, very low grounding resistance results with a single, relatively short ribbon length. As the soil resistivity increases, so does the achievable grounding resistance. The data is presented considering multiple parallel mitigation ribbons to demonstrate that further reduction in ground resistance is possible by adding additional grounding at a particular installation. However, diminishing returns exist such that further increasing the extent of grounding at a specific site, beyond a certain threshold, results in minimal additional reduction, as shown in Figure 16.

The length of vertical grounding installations requires review of economics, construction, and practical design considerations. Multiple shorter grounding rods can be incorporated to achieve a low resistance to ground without requiring deep drilling, where parallel surface grounding does not sufficiently reduce the ground resistance. Vertical ground rods should be separated horizontally by the length of the ground rods at minimum for optimum efficiency.[23]

For locations of high surface resistivity, one drawback for horizontal surface grounding is the length of mitigation ribbon wire required to achieve a low resistance. Where multiple parallel ribbons are required to achieve sufficient grounding resistance significant ROW access may be required. As discussed, the shared utility ROW may limit construction access for mitigation parallel to a collocated pipeline. Additionally, as pipelines cross physical obstructions, such as roadways, railroads, access may limit the extent of parallel mitigation systems. However, surface grounding still continues to be the preferred mitigation technique and can efficiently provide adequate mitigation grounding for a majority of collocations.

5.3 Deep Grounding

Deep drilled ground wells (deep wells) offer another form of mitigation grounding, and may be considered for select applications. Deep wells generally consist of one or more anodes drilled vertically into the ground in order to achieve low ground resistance. Actual deep well depths can vary based on needs, but they generally range greater than 100 feet in depth.

In general, construction costs are generally higher for deep well grounding than for comparable surface mitigation. However, deep well grounding can be a viable option in specific applications where one or both of the following criteria are satisfied.

1. The soil resistivity at the surface is significantly greater than (>20 x) the soil resistivity at lower depths.
2. Horizontal surface grounding is not feasible due to construction obstacles (roads, railways, right-of-way access, etc.)

For typical mitigation systems, where parallel ribbon and deep grounding are both options, parallel ribbon proves to be more efficient and economical because it can achieve a lower resistance to ground for lower overall cost. For comparison, ground resistance calculations were analyzed to determine the approximate equivalency in effective ground resistance between parallel zinc ribbon, and an individual deep well anode.

Figure 17 below shows a comparison of parallel horizontal grounding configurations compared to a single 6-inch diameter deep well anode approximately 200 feet deep. The soil resistivity ratio, plotted on the x-axis, is the ratio between the bulk soil resistivity to a depth of 10 feet for surface ribbon and the bulk soil resistivity to a 200 foot depth for a deep well. Along the y-axis is the equivalent length of horizontal surface grounding required to meet the same level of grounding resistance as the deep well anode. The two curves in the figure below display this trend for single and double surface ribbon installations.

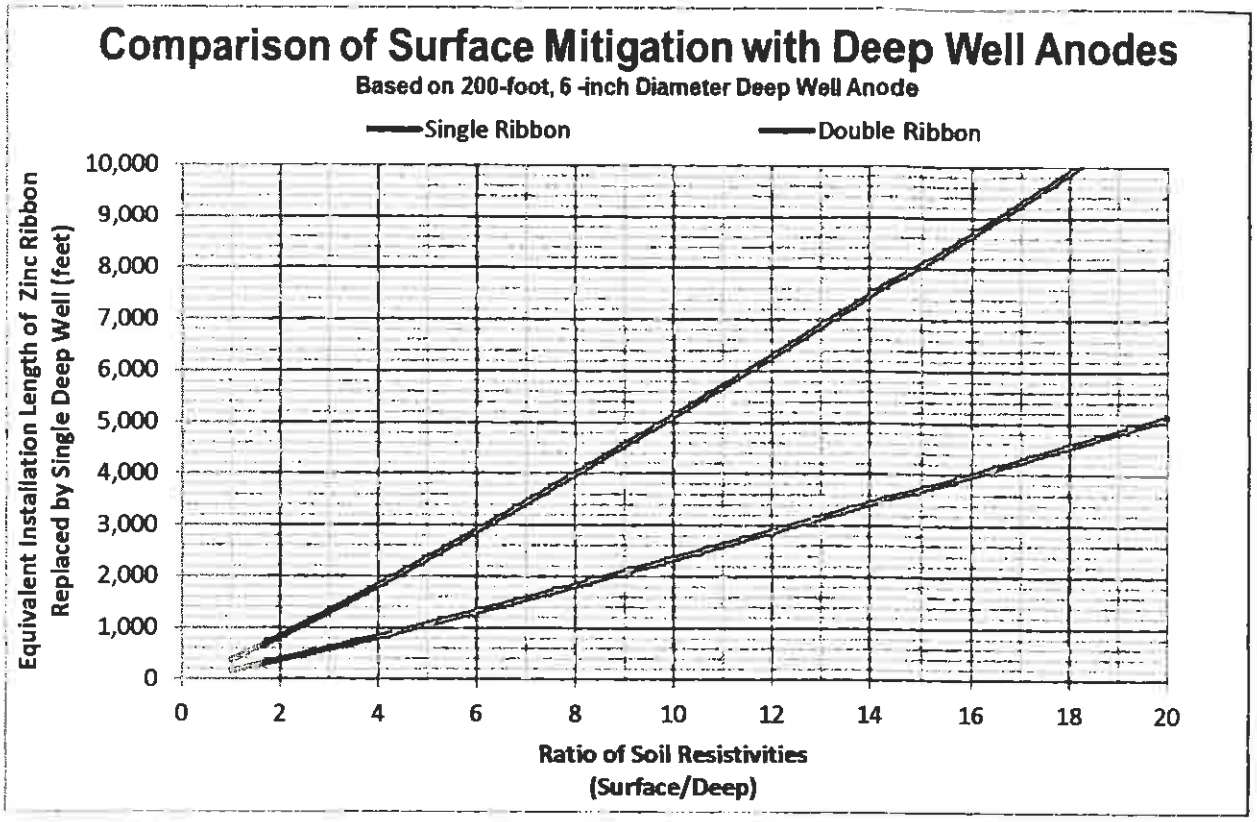


Figure 17. Comparison of Surface Mitigation to Deep Well Anodes

Considering a typical scenario where deep soil resistivity values are of similar order to the surface resistivity, a single deep well grounding installation would be necessary for approximately every 1,000 to 2,000 feet of individual parallel ribbon. However, considering a hypothetical location where the deep soil resistivity is an order of magnitude lower than at the surface (soil ratio of 10), it can be shown that a single deep well installation could provide a similar ground resistance as approximately 5,000 feet of individual parallel ribbon. Under certain scenarios, where the ratio between the surface and deep soil resistivity is high, deep well anodes may become a viable solution to obtain a low grounding resistance. Previous case studies and project experience have rarely shown soil resistivity ratios of this magnitude, such that deep well grounding was a preferred option. However, where construction access is limited, not allowing for installing longer lengths of surface grounding to achieve the required mitigation deep well grounding may be beneficial. In scenarios where grounding is only necessary at a single specific location on the pipeline, deep well grounding may be an option.

5.4 Mitigation Comparison

Deep well anodes may provide a viable mitigation option under specific circumstances, but industry practice, historical assessments, and construction practice have generally shown that surface mitigation provides more economical and efficient mitigation for the majority of collocations. In cases where arc shielding protection is required to guard against fault scenarios, deep well anodes do not provide such protection, thus necessitating the installation of surface ribbon in addition to primary mitigation. Surface mitigation can also serve as fault shielding, protecting against damage to the pipeline and its coating when properly placed between the pipeline and power transmission ground.

A primary benefit for surface mitigation is ease of installation and a lower associated cost. Mitigation installed in the same trench beside the pipe during pipeline construction further reduces installation costs. Typical industry construction estimates indicate that the cost of a single drilled deep well anode installation may be ten times the cost of a 1,000-foot surface installation, if installed during pipe construction. This would indicate that each deep well anode would need to replace approximately 10,000 feet of surface mitigation before it is economically viable from a ground resistance standpoint alone. That said, the decision between surface and deep grounding installation methods most often comes down to a number of other considerations, including construction access, grounding distribution, and contractor preference in addition to cost alone. [Appendix C contains a simplified summary, presents the pros and cons for various mitigation materials and methods for reference.] The comparison information provides guidance and demonstrates the comparative benefits of each approach based on various soil resistivity layers.

5.5 Additional Mitigation Methodologies

The AC mitigation techniques discussed utilize low-resistance grounding to transmit induced AC voltage to ground. While grounding can be an effective mitigation technique for many interference cases, recent industry experience has identified collocations where induced potentials or current density reduction to adequate levels cannot be achieved by grounding alone. This is generally due to a combination of elevated transmission currents and unfavorable soil resistivity conditions. Trends in the power transmission industry have led to increased power capacity and corresponding operating currents, for some long distance transmission systems as shown. This increase in operating current has a direct effect on the level of EMI. In many cases, this has presented a significant challenge for achieving adequate mitigation on pipelines crossing or collocated with the power transmission lines. In these cases, additional mitigation techniques should be considered.

In terms of risk reduction or prevention, the approach to AC interference mitigation can be categorized on a primary, secondary, or tertiary level. Primary prevention targets controlling or reducing the source of the risk, through elimination or control. Secondary prevention targets reducing exposure to a risk factor, and tertiary prevention targets treating the response or consequences of the risk factor, generally after exposure to the risk. By these terms, a standard practice of mitigating AC induction by grounding alone is considered a tertiary form of mitigation. That is to say, the treatment targets only the consequence of the interference by reducing the detrimental AC effects at the pipeline level, after allowing the pipeline to be exposed to the interference risks. While not currently in widespread application, further research of primary and secondary risk controls should be considered in future development, to reduce overall interference and risks associated with AC interference, especially considering cases that cannot be effectively mitigated by traditional means. While the concepts presented may not be readily employed by pipeline operators without further research, they are presented to address the need for continued research and development of more robust high voltage interference mitigation methodologies, and pursue improved collaboration between the power line and pipeline operators.

5.5.1 Primary Threat Control of AC Interference

Although mitigation grounding is a common industry practice, cases exist where grounding alone is insufficient to reduce interference levels on collocated pipelines. For such cases, additional techniques should be considered. From an engineering risk basis, with respect to overall risk reduction, a preferred approach is to reduce the source of interference. Specifically, this means reducing the interference prior to it reaching the pipeline, generally through design controls during the development phase prior to construction, where

modifications to the pipeline or transmission line are possible. The level of interference experienced at the pipeline is dependent on the magnitude of EMI generated at the source, and the collocation parameters that limit the EMI levels reaching the pipeline. Specifically, revising collocation routing, and tower and circuit configuration modifications can reduce or optimize the level of EMI produced. Conductor arrangements can be designed to balance individual phases producing the lowest levels of EMI for a given circuit configuration.

For a given circuit configuration (single circuit horizontal/vertical, double circuit horizontal/vertical/delta, etc.) there exists an ideal phase sequence which minimizes the LEF at the pipeline location and thus results in lower magnitudes of AC interference. Dabkowski studied the magnitudes of the LEF for varying circuit types and phase sequence. The results demonstrated that for a single horizontal circuit a reduction of up to 9 percent of the LEF may be achieved, by choosing the proper phase sequence.[24] With the single circuit vertical case, the LEF at the pipeline location could be reduced by as much as 15% with the proper phase sequence.

The double circuit vertical tower configuration presents a unique scenario for phase sequencing. There are 36 possible phase sequences, classified into five sets of phase combinations: center point symmetric, full roll, partial roll upper, partial roll lower, and center line symmetric. The LEF magnitude between the various phasing configurations can vary significantly.[29] Generally, the ideal phase sequence for a double vertical circuit is the center point symmetric phase configuration, which generates an LEF approximately 65% to 90% less than the center line symmetric phase configuration.[29] This is significant when considering this is simply the result of the physical interaction between conductors, and primary mitigation reduction at the source reduces the interference levels that ever reach the collocated pipeline. Additionally, optimization of the phase configuration does not require unconventional installation methods to obtain this reduction in LEF magnitude.[29] It is recognized that for existing installations, pipeline operators generally may not be able to influence HVAC power design; however, for new construction and power system expansions where interference is a concern, communication between pipeline operators and transmission owners of possible effects is recommended in order to review possible interference hazards prior to construction. Where possible, pipeline and HVAC power line design controls can limit EMI and interference on adjacent pipelines.

The addition of phase transpositions along a given collocation can also act to reduce the overall EMI influencing a collocated pipeline. However, phase transpositions should only considered as part of a detailed analysis, as the discontinuity presented by a phase transposition can create a localized point of elevated interference, and may have further impact on the power transmission design.[24] However, where appropriate, phase transpositions can create discontinuities and effectively break up long line interference built up on long collocations. Further, in areas where construction access may be limited, phase transpositions can be located strategically to reduce interference at the source.

5.5.2 Secondary Threat Control of AC Interference

With respect to overall threat reduction, a secondary control works by means of isolating a threat from a structure. In the case of AC interference, this specifically means intercepting and grounding the EMI prior to reaching the pipeline.

One proposed example is overhead shielding, which is used to mitigate AC interference in other industries including rail transport systems, but is notably less common in mitigating AC interference on pipelines. An overhead shielding technique works by placing a conductor, grounded at regular intervals, within a targeted region between the pipeline and the adjacent transmission line. This shielding conductor, located in the same LEF generated by the conductor circuit, induces a current and an accompanying LEF 180 degrees out

of phase with the field generated by the transmission line. In so doing the conductor acts to cancel part of the LEF generated by the transmission line, resulting in lower levels of induction on the pipeline. Dabkowski studied the effectiveness of this technique for the same tower configurations discussed in Section 5.5.1.[29] The results indicated a substantial reduction in the induced potential on the pipeline was possible; however, the mitigating effectiveness was highly sensitive to loading conditions, and the precise location of the shielding conductor. For the single circuit horizontal circuit, an auxiliary overhead ground wire resulted in a reduction of approximately 25% in the LEF, and thus the corresponding induction on the pipeline. The ideal placement of this overhead auxiliary shield wire was approximately the same height as the phase wires, which for single circuit horizontal circuits may make this solution impractical. For the single circuit vertical tower configuration, Dabkowski found a maximum LEF reduction of approximately 60% to 75% by mounting the overhead shield wire at an optimum height on the tower centerline. Reductions in the LEF generated by the double circuit vertical configuration were found to be range from 50%-95%. However, when examining slight imbalances of +/-5 to 15% between phase wires, the benefits realized by this auxiliary shield wire quickly diminished to 20% or less when compared to uniform current across all phase wires of the circuit.29[23] While this is generally not a common practice in mitigation of pipeline interference, overhead shielding has been considered and studied in the past, and is used within other industries. Specific overhead shielding installations require detailed design, and precise locating but this approach may present an alternative means of mitigation where ineffective through more traditional means. Further research and testing is required on a case-specific basis to determine if this is a viable technique.

Fault and arc shielding, which are used to reduce the risk of damage to the pipeline and the coating near tower grounds during fault conditions are another form of secondary risk control. Fault protection typically takes the form of a parallel shield wire, similar to mitigation ribbon discussed in Section 5.2. However, the primary function of fault and arc shielding protection acts to intercept transmission line fault current and transfer to ground prior to reaching the pipeline. For this reason, the location and placement of the arc shielding mitigation is far more critical when protecting against conductive (fault) interference than for inductive interference.

5.5.3 Tertiary Threat Control of AC Interference

With respect to overall risk reduction, tertiary controls rely on reducing the consequences of the threat after exposure to the structure. Per this definition, typical grounding mitigation can be considered a tertiary control. Mitigation grounding works by transmitting the AC potential to ground, only after it has already reached the pipeline. While grounding has proven to be an effective means of mitigation for many historical installations, and installation is generally within the capabilities and access of the pipeline operators, scenarios occur where grounding alone is not sufficient to reduce interference to acceptable levels.

Ideally, a combination of primary, secondary, and tertiary mitigation techniques would provide the highest level of threat reduction and protection for the pipeline. However, addressing a threat at the lowest level possible will provide reduction in severity, increasing the likelihood that mitigation will be effective. That is to say, reducing AC interference at its source or shielding EMI from reaching an adjacent pipeline can provide greater risk reduction than simply allowing the interference to pass to the structure and dissipating to ground via tertiary mitigation methods. In practice however, it may not always be possible or practical to address interference at a primary or even secondary level. Tertiary mitigation through low resistance grounding techniques may provide adequate risk reduction for a majority of interference collocations. However, further research and continued development into additional mitigation techniques would benefit the industry.

5.6 MONITORING

As mentioned previously, the measurement or calculation of AC current density has been the primary indicator to determine the likelihood of AC corrosion across industry in North America. It is possible to measure AC current density on a representative holiday through the installation and use of metallic coupons or ER probes. A test wire connected to the coupon, routed to the surface and connected to the pipeline through a test station is an example of a simple installation. By inserting an ammeter into the circuit, an AC and DC current can be measured which when can be used to calculate the current density at that location. In many cases, test stations with coupons also include additional instrumentation such as ER probes and reference electrodes. The ER probes provide a time based corrosion rate while the reference electrodes provide both and AC and DC pipe-to-soil potentials for comparison.

Using coupon test stations (CTS), and ER probes, real-time monitoring can provide a better understanding of the interference effects acting on a collocated pipeline. However, as previously discussed, the magnitude of interference depends on the magnitude of current loads on the associated power lines. Correlation of the CTS and ER probe data with power line loads provides a thorough understanding of the system performance. While it has historically been difficult to obtain this information from power line operators, there is a recognized need to have good understanding of the operating power line loads to determine relevance of coupon test station or ER probe data. Additionally, best practices dictate obtaining data over a representative period (days or weeks as relevant) in order to assess the interference response during high load conditions. A measurement for AC potential or AC current density at a single point in time with unknown operating current loads may not be representative of the actual risk for interference on the pipeline.

6 GUIDELINES FOR INTERFERENCE ANALYSIS

The following steps are provided as best practice procedures for determining where detailed analysis is recommended based on the results of this study, industry standards, historical technical publications, and previous industry experience.

Pipeline operators are faced with many existing and new construction pipelines collocated and crossing power line ROW. Little guidance exists to assist in selecting and prioritizing collocations for detailed analysis and modeling. Under certain conditions, it may be possible to justify the low likelihood of AC interference, and exclude specific locations from further detailed modeling with detailed monitoring, or justification that the risk due to interference is low.

It is recommended to collect the following information, where possible, to determine if a detailed AC analysis is required. Appendix D is a sample of data to collect from the powerline company. Use the corresponding severity limits in Sections 6.1.1 through 6.1.5 to assist with this methodology:

- Peak and Emergency load rating (amps) for collocated power lines
- Line rating (kV) for collocated power lines
- Soil resistivity along the collocation at multiple depths
- Collocation and / or crossing routing geometry for the pipeline and power line
- AC pipe-to-soil (P/S) measurements (for existing pipelines)
- AC Current density using coupons or probes where previously installed
- Maximum fault potential and fault clearing time

Detailed "analysis" in the context of this document refers either to data collection using detailed monitoring or to specific application of numerical calculation of interference magnitudes. This analysis is done using detailed computer modeling or similar application of interference calculation methods.

6.1 Severity Ranking Guidelines

This section provides general guidance with respect to the relative severity ranking for the identified variables with respect to their impact on the severity of AC interference.

6.1.1 Separation Distance

Separation distance and load current are key factors in determining whether a collocation will experience significant AC interference. Generally, the separation distance is readily available or easily determined, so it is often a primary screening variable. However, it has been shown that significant interference is possible for distances greater than 1,000 feet when considering collocations with load capacity greater than 1,000 amps.[2] It is therefore recommended to consider collocations within 2,500 feet, and the decision for further analysis should also incorporate estimate of the power line current.

Severity ranking for separation distance is provided in Table 3.The following generalized rankings have been determined through review of industry data, parametric studies, and historical experience.

Table 3-Severity Ranking of Separation Distance

Separation Distance - D (Feet)	Severity Ranking of HVAC Interference
$D < 100$	High
$100 < D < 500$	Medium
$500 < D < 1{,}000$	Low
$1{,}000 < D \leq 2{,}500$	Very Low

6.1.2 HVAC Power Line Current

The magnitude of transmission line currents is one of the most influential parameters determining the likelihood and severity of AC interference. However, there is often debate as to which load rating to consider for interference analysis and mitigation design. HVAC power lines generally have multiple ratings that specify the operating loads allowable during normal operation and peak or emergency load ratings allowable during short duration scenarios. Ultimately, the load rating considered should be a risk-based decision made by the pipeline operator, considering the frequency of occurrence for the load level, typical duration throughout operation, and the consequence associated.

From a personnel safety standpoint, it is recommended to consider the maximum load that a power line can carry for any duration. The terminology for this varies among transmission operators, but it is commonly referred to as "Emergency Load", defined as the maximum load a transmission circuit is capable of carrying for a short duration such as during an emergency or maintenance condition. Considering personnel safety, elevated step or touch potential could pose an instantaneous threat as a shocking hazard, regardless of duration of the elevated power line current. As the pipeline operator is generally unaware of an emergency load condition on the power line, it may not be feasible to reduce or prevent exposure during even a short-duration elevated current load. It is therefore generally best practice to consider the maximum capacity or

emergency loading conditions when assessing the risk of personnel safety threats such as shocking, unless other provisions can be made to prevent exposure.

However, AC corrosion is a time-dependent threat. The magnitude of AC current density possible on a pipeline under AC interference will be sensitive to the current load on the adjacent HVAC conductor. While emergency loads, or other spikes in power line current may cause an elevated current density, the associated corrosion damage may be low as the duration is limited.

The power line current is often the most controlling parameter influencing the magnitude of AC interference. For this reason, we recommend obtaining the power line load limits from the relevant power transmission operator when assessing the risk of AC interference on a given pipeline. These limits should include the various operating ratings (generally 'Normal', 'Peak', and 'Emergency'), the allowable duration for each, and expected frequency of occurrence.

Transmission operating parameters are not always readily available to pipeline operators, and this information may be difficult to obtain. However, the power line current is a primary factor, and the relevance and accuracy of an AC analysis may vary greatly with the accuracy of the operating current. Where actual load data is unavailable, published reference currents for various HVAC power line ratings are available in literature[24]. However, these guidelines are for reference only, and may provide over or under conservative results. In practice, there are cases where the operating currents provided for a specific power line significantly exceeded these estimates. Additionally, as discussed in Section 4.2.1, increase load capacity on new and upgraded systems may result in load ratings above the provided reference levels.

Severity rankings associated with HVAC load current for a collocated power line is provided in Table 4.

The following generalized rankings have been determined through review of published technical literature, industry data, parametric studies, and historical experience.

Section 5.2.1 contains further background and detailed information for effects of power line phase current.

Table 4-Relative Ranking of HVAC Phase Current

HVAC Current - I (amps)	Relative Severity of HVAC Interference
$I \geq 1{,}000$	Very High
$500 < I > 1{,}000$	High
$250 < I < 500$	Med-High
$100 < I < 250$	Medium
$I < 100$	Low

6.1.3 Soil Resistivity

Soil resistivity affects both the magnitude of induced AC and the susceptibility to AC corrosion. The AC corrosion process, as presented in Section 3.3.1 is a function of the AC current density at a coating holiday, which in turn is dependent on the level of AC voltage on the pipeline and the local spread resistance. The bulk soil resistivity is a primary factor controlling overall level of induction, while the local soil resistivity near a holiday is a primary factor in the corrosion activity, as discussed in Section 4.2.2. The following generalized severity rankings have been determined based on industry experience and guidance provided in EN 15280:2013, with respect to AC corrosion.[15]

Table 5-Relative Ranking of Soil Resistivity

Soil Resistivity - ρ (ohm-cm)	Relative Severity of HVAC Corrosion
$\rho < 2{,}500$	Very High
$2{,}500 < \rho < 10{,}000$	High
$10{,}000 < \rho < 30{,}000$	Medium
$\rho > 30{,}000$	Low

6.1.4 Collocation Length

The collocation length of the pipeline and transmission line affects the magnitude of induced AC potential accumulating on the pipeline as it defines the length of the pipeline exposed to the LEF of the phase wires. The following generalized rankings have been determined through parametric studies, and historical experience.

Table 6-Relative Ranking of Collocation Length

Collocation Length: L (feet)	Relative Severity
$L > 5{,}000$	High
$1{,}000 < L < 5{,}000$	Medium
$L < 1{,}000$	Low

6.1.5 Collocation / Crossing Angle

The angle of collocation or crossing of the pipeline and power line limits the influence of induction. The following generalized rankings have been determined through parametric studies, and historical experience.

Table 7-Relative Ranking of Crossing Angle

Collocation/Crossing Angle - θ (°)	Relative Severity
$\theta < 30$	High
$30 < \theta < 60$	Med
$\theta > 60$	Low

6.2 Recommendations for Detailed Analysis

The guidance parameters presented are based on industry literature and standards where available. Where guidance has not previously been provided, qualitative classifications have been provided to aid in severity ranking and prioritization. The qualitative guidance parameters have been determined based on published industry guidance, numerical modeling parametric studies, previous analytical experience, laboratory studies, and failure investigations for AC corrosion related damage. The intention is not to replace or remove detailed analysis from the design decisions, but rather to aid in severity ranking and prioritization when determining where additional detailed analysis and mitigation design is required.

The guidelines within should be used by the operators as part of an overall risk-based decision. The details within this report and this section can only provide guidance regarding the severity of HVAC interference or AC corrosion. When determining whether to perform further detailed analysis, add location specific

monitoring, or where no further action is required, possible consequences must be a part of the decision process and reviewed on a case-specific basis.

As discussed in Section 4.2, collocations with power lines operating at greater than 1,000 amps are subject to interference under conditions where likelihood would otherwise be low. Special consideration required for collocations where the power line loads are greater than or equal to 1,000 amps. For this reason, an understanding of the power line load current is necessary for evaluating the need for further analysis. The two cases below provide an assessment of collocations and crossings encountered, based on:

Case 1 – Current Load greater than or equal to 1,000 amps, pipeline crossing or collocated within 2,500 feet

Case 2 – Current Load less than 1,000 amps, pipeline crossing or collocated within 1,000 feet

6.2.1 Case 1

For scenarios where power line current is known or can be estimated to operate at or above 1,000 amps, and a steel pipeline is crossing or collocated within 2,500 feet of the power line, a detailed analysis is recommended when one or more of the following conditions are met:

- Collocation Length severity is characterized as "High"
- Soil resistivity severity is characterized as "High" or worse
- Three or more of the variables identified in Section 6.1 are categorized as "Medium" or worse

6.2.2 Case 2

For scenarios where power line current is known or estimated to operate below 1,000 amps, and a steel pipeline is crossing or collocated within 1,000 feet of the power line, a detailed analysis is recommended when one or more of the following conditions are met:

- Phase current severity is characterized as "High" or worse
- Collocation length severity is characterized as "High"
- Soil resistivity severity is characterized as "High" or worse
- Three or more of the variables of severity rankings identified in Section 6.1 are categorized as "Medium" or worse

High angle crossings, with crossing angles of greater than 60°, while considered low-risk for inductive interference, are susceptible to fault or lightning arcing, as well as coating breakdown due to fault voltage. Crossings with an angle greater than 60° may still be susceptible to inductive interference if subject to very high current load, or multiple HVAC power lines.

6.2.3 Faults

As fault conditions are generally infrequent and of short duration, it is not practical to obtain measurements of AC potential during a fault condition. Analysis of fault voltages generally requires numerical modeling. Fault current levels or estimates of possible magnitudes, are generally obtained by HVAC power line operators and can vary significantly depending on tower design, power capacity, and location relative to substation and generation source.

- Tower ground resistance
- Maximum fault voltage
- Fault clearing time
- Shield wire configuration

6.4 General Recommendations

As the operating current is a controlling parameter influencing AC interference, it is recommended to obtain the power line load current from the relevant electrical utility operator when assessing a collocation for the threat of AC interference. Historically, lack of collaboration between pipeline and power line operators has led to projects being assessed without accurate understanding of the power line data. This can lead to either an overly conservative and costly design or an under-designed system not adequately reducing the interference. Collaboration between the respective pipeline and power line operators is critical to accurate assessment and efficient mitigation of any possible interference effects.

In addition to the assessment described in previous sections, the following general recommendations apply for collocations and crossings where AC interference is a concern:

- Install coupon test stations or ER probes to monitor AC Current density, a coupon surface area of 1.0 cm^2 is recommended.
- During pipeline construction near HVAC transmission lines, confirm that the contractor safety program complies with the recommended 15 VAC limit for shock hazards, and applicable OSHA construction standards as referenced in Section 3.2.2.
- Record AC pipe-to-soil potentials along with the DC pipe-to-soil potentials during the annual cathodic protection survey on sections where AC interference threats may exist. This can provide information, should the power transmission company change its operating parameters, or unexpected changes occur between the pipeline and transmission line.
- Request power line loads corresponding to the time of AC pipe-to-soil potential measurement to provide thorough understanding of the interference measurements
- Measure soil resistivity at locations where AC interference threats may exist. This data can be used with the measured AC potentials to estimate theoretical AC current density for specific locations in the absence of coupons or ER probes.
- Operating personnel should be trained in the hazards and safe practices associated with working on pipelines subject to HVAC interference
- Suspend work (when possible) along the collocated or crossing section of pipeline during weather conditions that may lead to a transmission line fault.

Safety precautions are required when making electrical measurements:

- Only knowledgeable and qualified personnel trained in electrical safety precautions install, adjust, repair, remove, or test impressed current cathodic protection and AC mitigation equipment.
- Properly insulated test lead clips and terminals should be used to prevent direct contact with the high voltage source.
- Attach test clips one at a time using a single-hand technique for each connection when possible.

- Extended test leads require caution near overhead HVAC power lines, which can induce hazardous voltages onto the test leads, or present a source of data error.

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APPENDIX A LITERATURE REVIEW

Where published, historically identified corrosion defects and pipeline failures associated with AC corrosion degradation were reviewed and are presented to demonstrate the magnitudes and variability in corrosion rates possible with AC accelerated corrosion. The general findings, discussion, technical details, and results are utilized and summarized throughout this document.

This lack of industry consensus on the subject of AC corrosion guidelines has led to varied practices among pipeline operators in regards to mitigating AC interference on pipelines. As part of this study, The INGAA Foundation requested a review of industry practices and procedures related to AC interference. The INGAA Foundation provided DNV GL with the procedures related to AC interference or mitigation for 10 pipeline operators who are members of the Foundation. The primary finding from this review is that there is significant variation in company procedures with respect to AC interference. Based upon this review, all of the procedures provided address a safety concern and define a maximum allowable AC pipe-to-soil potential limit for above grade appurtenances. Faults were included as a concern/risk for pipelines in close proximity to HVAC power lines in almost all of the procedures. However, few addressed coating stress limit above which mitigation is required. For current density criteria, several procedures had clearly defined limits, while others addressed it as a concern for AC corrosion but did not specify a targeted limit of AC current density or define limits for mitigation.

Case Studies

Numerous studies, both laboratory and field based, have been performed that attempt to determine magnitudes of corrosion rates associated with AC interference. However, reviewing available technical literature confirms a wide range of experimental rates, and a scarcity of controlled field measured rates.

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The State-of-the-Art report also cites European Standard CEN/TS 15280:2006[15], which previously offered the following guidelines related to the likelihood of AC corrosion:

> *"The pipeline is considered protected from AC corrosion if the root mean square (RMS) AC density is lower than 30 A/m^2 (2.8 A/ft^2).*

In practice, the evaluation of AC corrosion likelihood is done on a broader basis:

- *Current density lower than 30 A/m² (2.8 A/ft²): no or low likelihood;*
- *Current density between 30 and 100 A/m² (2.8 and 9.3 A/ft²): medium likelihood; and*
- *Current density higher than 100 A/m² (9.3 A/ft²): very high likelihood"*

EN 15280:2013

The latest revision of EN 15280:2013 was revised to present criteria based upon the AC interference and DC current due to CP. EN 15280:2013 presents using the cathodic protection system of the pipeline to ensure the levels of induced AC potential do not cause AC corrosion under the following conditions:

1. AC voltage on the pipeline should be decreased to a target value, which should be less than 15 V (measured over a representative time period, i.e. 24 hr)
2. Effective AC corrosion mitigation can be achieved while maintaining cathodic protection criteria as defined in EN 12954:2001
3. One of the following conditions is satisfied in addition to items 1 and 2:
    - Maintain AC current density (RMS) over a representative period of time (i.e. 24 hr) less than 30 A/m² (2.8 A/ft²) on a 1cm² coupon or probe
    - If AC current density is greater than 30 A/m² (2.8 A/ft²), maintain the average cathodic (DC) current density over a representative period of time (i.e. 24 hr) less than 1 A/m² on a 1cm² coupon or probe
    - Maintain a ratio between AC current density and DC current density (J_{AC}/J_{DC}) less than 5 over a representative period of time (i.e. 24 hr)

The NACE State-of-the-Art report also references experimental studies by Yunovich and Thompson that concluded

> *"AC density discharge on the order of 20 A/m² (1.9 A/ft²) can produce significantly enhanced corrosion (higher rates of penetration and general attack without applied CP). Further, the authors stated that there likely was not a theoretical 'safe' AC density (i.e., a threshold below which AC does not enhance corrosion); however, a practical one for which the increase in corrosion because AC is not appreciably greater than the free-corrosion rate for a particular soil condition may exist."*[4]

APPENDIX B COATING RESISTANCE ESTIMATES

Pipe Coating Conductance/Resistance

Pipe Line Corrosion and Cathodic Protection, Marshall E. Parker & Edward G. Peattie

No.	Coating Quality	Soil Resistivity	Conductance Range		Resistance Range					
			µmhos/ft2		ohm-m^2		ohm-ft^2		Kohm-ft^2	
1	Excellent	High	1	10	92,903	9,290	1,000,000	100,000	1,000	100
2	Good	High	10	50	9,290	1,858	100,000	20,000	100	20
3	Excellent	Low	50	100	1,858	929	20,000	10,000	20	10
4	Good	Low	100	250	929	372	10,000	4,000	10	4
5	Average	Low	250	500	372	186	4,000	2,000	4	2
6	Poor	Low	500	1,000	186	93	2,000	1,000	2	1

PRCI

No.	Coating Quality	Soil Resistivity (ohm-m)	Coating Resistance (Kohm-ft2)		
1	Excellent	25	Multiply Soil Resistivity (ohm-m) by 5	5	125
	Excellent	50	Multiply Soil Resistivity (ohm-m) by 5	5	250
	Excellent	200	Multiply Soil Resistivity (ohm-m) by 5	5	1,000
	Excellent	600	Multiply Soil Resistivity (ohm-m) by 5	5	3,000
2	Good	25	Multiply Soil Resistivity (ohm-m) by 2	2	50
	Good	50	Multiply Soil Resistivity (ohm-m) by 2	2	100
	Good	200	Multiply Soil Resistivity (ohm-m) by 2	2	400
	Good	600	Multiply Soil Resistivity (ohm-m) by 2	2	1,200
3	Fair	25	Multiply Soil Resistivity (ohm-m) by 0.5	0.5	13
	Fair	50	Multiply Soil Resistivity (ohm-m) by 0.5	0.5	25
	Fair	200	Multiply Soil Resistivity (ohm-m) by 0.5	0.5	100
	Fair	600	Multiply Soil Resistivity (ohm-m) by 0.5	0.5	300

APPENDIX C MITIGATION COMPARISON SUMMARY

Zinc Ribbon

Advantages

- Can typically be installed during pipeline construction minimizing installation costs
- Cost of raw material is typically one third the cost of copper
- Can be trenched or plowed in relatively inexpensively after pipeline installation
- Typically results in very low resistances
- Historically has performed as intended
- Surface mitigation ribbon can double as shielding for fault mitigation

Disadvantages

- Zinc clad ribbon is more difficult to work with compared to copper
- Life expectancy is generally less than comparable copper installation

Copper Cable

Advantages

- Can typically be installed during pipeline construction minimizing installation costs
- Can be trenched or plowed in relatively inexpensively after pipeline installation
- Typically results in very low resistances
- Historically has performed as intended
- Surface mitigation cable can double as shielding for fault mitigation
- Depending on the size cable the material cost of a copper installation can be lower than a zinc installation

Disadvantages

- Cost of raw material is typically higher than the cost of zinc
- Risk of having a more noble metal (cathodic) near or connected to pipeline even if through a decoupler

Deep Grounding (anodes used as the ground)

Advantages

- May be advantageous when surface resistivity is extremely high

Disadvantages

- Typically high cost for both installation and materials
- Generally not suitable for mitigating ground potential rises (GPR) or arcing issues associated with faults

Shallow Grounding (driven ground rods or bored ribbon or cable)

Advantages

- Can be used to supplement horizontal ribbon or cable installation if required
- Magnitude of the surface resistivity affects the resistance

Disadvantages

- Generally not suitable for mitigating ground potential rises (GPR) or arcing issues associated with faults

Engineered mitigation and/or Additives (no specific product identified)

Advantages

- Could increase design life

Disadvantages

- Typically increases the material costs

Notes:

1) These are typical statements and there are instances where they do not apply.
2) All mitigation installations are considered connected through a decoupling device such that there is no direct passage of DC current to or from the mitigation.

APPENDIX D DATA REQUEST TEMPLATE

Company: _____
Project: _____
Project Number: _____

High Voltage Alternating Current (HVAC) Power Transmission Parameters

No.	Information Requested	T-Line 1	T-Line 2	T-Line 3
	General			
1	Owner:			
2	Power transmission voltage (kV):			
3	Average Tower Span (feet)			
4	Substation ground grid impedance (ohms):			
	Phase Wires			
5	No. of circuits:			
6	Circuit type:			
	Conductors:			
7	No. 1 average height (ft):			
8	No. 1 average horizontal distance (ft):			
9	No. 1 phasing (degrees):			
10	No. 2 average height (ft):			
11	No. 2 average horizontal distance. (ft):			
12	No. 2 phasing (degrees):			
13	No. 3 average height (ft):			
14	No. 3 average horizontal distance (ft):			
15	No. 3 phasing (degrees):			
16	Other: Cable Sag, Lowest point (feet):			
	Circuit Loading			
17	Peak loading (amps):			
18	Emergency loading (amps):			
19	Emergency loading time (hours):			
	Shield Wires			
20	No. of conductors:			
21	No. 1 type:			
22	No. 1 conductor GMR (ft):			
23	No. 1 conductor resistance (ohms/mil):			
24	No. 1 average height (ft):			
25	No. 1 average horizontal distance (ft):			
26	No.2 type:			
27	No. 2 conductor GMR (ft):			
28	No. 2 conductor resistance (ohms/mil):			
29	No. 2 average height (ft):			
30	No. 2 average horizontal distance (ft):			
	Fault Current Parameters			
31	Fault clearing time (cycles):			
32	Average tower resistance (ohms):			
33	Beginning of Collocation: Total_____from left substation _____ from right substation			
34	Middle of Collocation: Total_____from left substation _____ from right substation			
35	End of Collocation: Total_____from left substation _____ from right substation			

- Tower ground resistance
- Maximum fault voltage
- Fault clearing time
- Shield wire configuration

6.4 General Recommendations

[illegible]

Company: _____
Project: _____
Project Number: _____

Pipeline Parameters

No.	Information Requested	Pipeline 1	Pipeline 2	Pipeline 3
	General			
1	Pipeline number:			
2	Pipeline owner:			
3	Pipeline name:			
4	Product transported:			
5	Diameter (in.):			
6	Burial depth (ft.):			
7	Wall Thickness (inch):			
8	Length of Collocation (feet/miles):			
	Coatings			
9	Coating type (majority):			
10	Coating resistance (kohm-ft2):			
11	Coating thickness (mils):			
	Cathodic Protection			
12	Location of cathodic protection:			
13	Resistance of cathodic protection groundbed(s):			
14	Bonding to foreign pipelines? (Y/N):			
15	Existing AC mitigation measures? (Y/N):			
16	Describe existing AC mitigation:			

- Extended test leads require caution near overhead HVAC power lines, which can induce hazardous voltages onto the test leads, or present a source of data error.

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APPENDIX A LITERATURE REVIEW

Where published, historically identified corrosion defects and pipeline failures associated with AC corrosion degradation were reviewed and are presented to demonstrate the magnitudes and variability in corrosion rates possible with AC accelerated corrosion. The general findings, discussion, technical details, and results are utilized and summarized throughout this document.

This lack of industry consensus on the subject of AC corrosion guidelines has led to varied practices among pipeline operators in regards to mitigating AC interference on pipelines. As part of this study, The INGAA Foundation requested a review of industry practices and procedures related to AC interference. The INGAA Foundation provided DNV GL with the procedures related to AC interference or mitigation for 10 pipeline operators who are members of the Foundation. The primary finding from this review is that there is significant variation in company procedures with respect to AC interference. Based upon this review, all of the procedures provided address a safety concern and define a maximum allowable AC pipe-to-soil potential limit for above grade appurtenances. Faults were included as a concern/risk for pipelines in close proximity to HVAC power lines in almost all of the procedures. However, few addressed coating stress limit above which mitigation is required. For current density criteria, several procedures had clearly defined limits, while others addressed it as a concern for AC corrosion but did not specify a targeted limit of AC current density or define limits for mitigation.

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While not a Standard Practice document, NACE published "AC Corrosion State-of-the-Art: Corrosion Rate, Mechanism, and Mitigation Requirements"[1] in 2010, providing guidance for evaluating AC current density, and providing recommended limits as discussed in Section 3.3.1.1.

The State-of-the-Art report also cites European Standard CEN/TS 15280:2006[15], which previously offered the following guidelines related to the likelihood of AC corrosion:

> *"The pipeline is considered protected from AC corrosion if the root mean square (RMS) AC density is lower than 30 A/m^2 (2.8 A/ft^2).*

In practice, the evaluation of AC corrosion likelihood is done on a broader basis:

- *Current density lower than 30 A/m^2 (2.8 A/ft^2): no or low likelihood;*
- *Current density between 30 and 100 A/m^2 (2.8 and 9.3 A/ft^2): medium likelihood; and*
- *Current density higher than 100 A/m^2 (9.3 A/ft^2): very high likelihood"*

EN 15280:2013

The latest revision of EN 15280:2013 was revised to present criteria based upon the AC interference and DC current due to CP. EN 15280:2013 presents using the cathodic protection system of the pipeline to ensure the levels of induced AC potential do not cause AC corrosion under the following conditions:

1. AC voltage on the pipeline should be decreased to a target value, which should be less than 15 V (measured over a representative time period, i.e. 24 hr)
2. Effective AC corrosion mitigation can be achieved while maintaining cathodic protection criteria as defined in EN 12954:2001
3. One of the following conditions is satisfied in addition to items 1 and 2:
    - Maintain AC current density (RMS) over a representative period of time (i.e. 24 hr) less than 30 A/m^2 (2.8 A/ft^2) on a 1cm^2 coupon or probe
    - If AC current density is greater than 30 A/m^2 (2.8 A/ft^2), maintain the average cathodic (DC) current density over a representative period of time (i.e. 24 hr) less than 1 A/m^2 on a 1cm^2 coupon or probe
    - Maintain a ratio between AC current density and DC current density (J_{AC}/J_{DC}) less than 5 over a representative period of time (i.e. 24 hr)

The NACE State-of-the-Art report also references experimental studies by Yunovich and Thompson that concluded

> *"AC density discharge on the order of 20 A/m^2 (1.9 A/ft^2) can produce significantly enhanced corrosion (higher rates of penetration and general attack without applied CP). Further, the authors stated that there likely was not a theoretical 'safe' AC density (i.e., a threshold below which AC does not enhance corrosion); however, a practical one for which the increase in corrosion because AC is not appreciably greater than the free-corrosion rate for a particular soil condition may exist."*[4]

APPENDIX B COATING RESISTANCE ESTIMATES

Pipe Coating Conductance/Resistance

Pipe Line Corrosion and Cathodic Protection, Marshall E. Parker & Edward G. Peattie

No.	Coating Quality	Soil Resistivity	Conductance Range		Resistance Range					
			µmhos/ft2		ohm-m^2		ohm-ft^2		Kohm-ft^2	
1	Excellent	High	1	10	92,903	9,290	1,000,000	100,000	1,000	100
2	Good	High	10	50	9,290	1,858	100,000	20,000	100	20
3	Excellent	Low	50	100	1,858	929	20,000	10,000	20	10
4	Good	Low	100	250	929	372	10,000	4,000	10	4
5	Average	Low	250	500	372	186	4,000	2,000	4	2
6	Poor	Low	500	1,000	186	93	2,000	1,000	2	1

PRCI

No.	Coating Quality	Soil Resistivity (ohm-m)	Coating Resistance (Kohm-ft2)		
1	Excellent	25	Multiply Soil Resistivity (ohm-m) by 5	5	125
	Excellent	50	Multiply Soil Resistivity (ohm-m) by 5	5	250
	Excellent	200	Multiply Soil Resistivity (ohm-m) by 5	5	1,000
	Excellent	600	Multiply Soil Resistivity (ohm-m) by 5	5	3,000
2	Good	25	Multiply Soil Resistivity (ohm-m) by 2	2	50
	Good	50	Multiply Soil Resistivity (ohm-m) by 2	2	100
	Good	200	Multiply Soil Resistivity (ohm-m) by 2	2	400
	Good	600	Multiply Soil Resistivity (ohm-m) by 2	2	1,200
3	Fair	25	Multiply Soil Resistivity (ohm-m) by 0.5	0.5	13
	Fair	50	Multiply Soil Resistivity (ohm-m) by 0.5	0.5	25
	Fair	200	Multiply Soil Resistivity (ohm-m) by 0.5	0.5	100
	Fair	600	Multiply Soil Resistivity (ohm-m) by 0.5	0.5	300

APPENDIX C MITIGATION COMPARISON SUMMARY

Zinc Ribbon

Advantages

- Can typically be installed during pipeline construction minimizing installation costs
- Cost of raw material is typically one third the cost of copper
- Can be trenched or plowed in relatively inexpensively after pipeline installation
- Typically results in very low resistances
- Historically has performed as intended
- Surface mitigation ribbon can double as shielding for fault mitigation

Disadvantages

- Zinc clad ribbon is more difficult to work with compared to copper
- Life expectancy is generally less than comparable copper installation

Copper Cable

Advantages

- Can typically be installed during pipeline construction minimizing installation costs
- Can be trenched or plowed in relatively inexpensively after pipeline installation
- Typically results in very low resistances
- Historically has performed as intended
- Surface mitigation cable can double as shielding for fault mitigation
- Depending on the size cable the material cost of a copper installation can be lower than a zinc installation

Disadvantages

- Cost of raw material is typically higher than the cost of zinc
- Risk of having a more noble metal (cathodic) near or connected to pipeline even if through a decoupler

Deep Grounding (anodes used as the ground)

Advantages

- May be advantageous when surface resistivity is extremely high

Disadvantages

- Typically high cost for both installation and materials
- Generally not suitable for mitigating ground potential rises (GPR) or arcing issues associated with faults

Shallow Grounding (driven ground rods or bored ribbon or cable)

Advantages

- Can be used to supplement horizontal ribbon or cable installation if required
- Magnitude of the surface resistivity affects the resistance

Disadvantages

- Generally not suitable for mitigating ground potential rises (GPR) or arcing issues associated with faults

Engineered mitigation and/or Additives (no specific product identified)

Advantages

- Could increase design life

Disadvantages

- Typically increases the material costs

Notes:

1) These are typical statements and there are instances where they do not apply.
2) All mitigation installations are considered connected through a decoupling device such that there is no direct passage of DC current to or from the mitigation.

APPENDIX D DATA REQUEST TEMPLATE

Company: _____
Project: _____
Project Number: _____

Pipeline Parameters

No.	Information Requested [redacted]	Pipeline 1	Pipeline 2	Pipeline 3
	General			
1	Pipeline number:			
2	Pipeline owner:			
3	Pipeline name:			
4	Product transported:			
5	Diameter (in.):			
6	Burial depth (ft.):			
7	Wall Thickness (inch):			
8	Length of Collocation (feet/miles):			
	Coatings			
9	Coating type (majority):			
10	Coating resistance (kohm-ft2):			
11	Coating thickness (mils):			
	Cathodic Protection			
12	Location of cathodic protection:			
13	Resistance of cathodic protection groundbed(s):			
14	Bonding to foreign pipelines? (Y/N):			
15	Existing AC mitigation measures? (Y/N):			
16	Describe existing AC mitigation:			

February 21, 2016

Bill Grant
Deputy Commissioner Department of Commerce
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul MN 55101

Dear Mr. Grant,

Please take action to put the **necessary and legally mandated** effort into the public process for determining a pipeline corridor.

There appears to be an attempt by Enbridge to circumvent the Appellate court ruling. The work that the PUC/DOC is doing at present is a violation of that ruling, and puts a bad face on how government is supposed to work.

Please insist that

> a complete EIS is done on all routes suggested by the PCA and DNR,

> the oversight of the EIS is done by personnel who have experience doing the process,

> the EIS and routing decision needs to comply with the Appellate court ruling

The watersheds of northern MN are too valuable an asset to risk their loss due to pressure from the pipeline industry resulting in hasty decision making. Pushing decisions through too quickly could have serious negative effects on the health and economy of our state. Please stand up for our environment and the economy of Minnesota, now and in the future.

Lowell Johnson

Lowell Johnson
4441 20th St.
Fort Ripley MN 56449

RECEIVED
MAR 04 2016
MAILROOM

COMMENTS FOR EIS SCOPING HEARING - Little Falls, MN

Much attention in the press has been given to the safety of oil traveling by rail, with overt or covert suggestions that public safety is a choice between rail or pipelines. This either/or type of thinking is an example of the type of narrow and only partially accurate information being presented to the public. If we want to make rail traffic safer, then we should focus on how to do that. It is my understanding that ND had not been required to strip volatiles prior to loading in rail cars. This resulted in a very low flash point (85 Deg C.) resulting in explosions during derailments. Generally, companies do the minimum required by law, not necessarily what is best for public safety. Rail safety is certainly a separate issue from choosing the best route for a pipeline.

The scoping for the EIS should be as broad as possible and include all alternate routes-both within Minnesota and outside it, such as the Bakken North Pipeline, which is very near its final approval. This pipeline would travel from Williston, ND, through South Dakota and Iowa, ending in Patoka, Illinois.

If approved,the Bakken North will transport 450,000 barrels per day of Bakken crude. If Sandpiper is colocated with this pipeline or approved in another route with its 375,000 barrels per day, the combined capacity would be 825,000 barrels per day. Current Bakken production is slightly more than 1,000,000 barrels per day. Rail shipments would be greatly reduced, but will never be eliminated, as refineries on the East coast that are not served by pipelines will still require rail shipment. This fact has been pointed out in public meetings by MPCA personnel, but seems to get ignored in the push to approve pipelines. Even if Sandpiper is not approved in any route, the decrease in rail shipments with Bakken North operating will be substantial.

Because the Sandpiper and Line 3 pipeline corridor is not just a Minnesota project, the EIS should be done with the assistance of the Federal agencies that need to ultimately approve the project. The pipeline scoping should be taking a broad, not a piecemeal approach, in making the right decision for the present and future citizens of Minnesota, keeping in mind that clean water is a safety issue for people as well.

Mary Johnson
2089 Lake Hattie Dr SW
Backus, MN 56435
218-587-4014
gregmary445@gmail.com

RioTinto

Kennecott Exploration Company
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Salt Lake City, Utah 84116
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T + 1 (801) 238-2400
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150 Warren Street
Tamarack, MN 55787
USA
T +1(218) 768-3292
F +1(218) 768-3283

April 29, 2016

Minnesota Department of Natural Resources
Division of Minerals
500 Lafayette Road
St. Paul, Minnesota 55155-4045

RE: Enbridge Sandpiper Route and Line 3 Replacement

We wanted to follow up on the route proceedings on-going at the Minnesota Public Utilities Commission relating to Enbridge's Sandpiper crude oil pipeline and Line 3 replacement projects. As you know, Kennecott opposes the preferred route for the pipelines because they would intersect and unduly interfere with Kennecott's access to mineral deposits critical to the exploration and potential development of copper nickel minerals it has leased from the State in Carlton County for the Tamarack Project.

After considerable delay, the Department of Commerce issued its Scoping Environmental Assessment Worksheet (EAW) for the pipeline Projects and asked for written comments on the Scoping EAW. In reviewing the Scoping EAW, Kennecott observed that it identifies impacts to Kennecott's mineral interests, but it does not appear to recognize DNR's role in surface use authorization with respect to such interests. In particular, Permit Table 8-1 lists the required permits and authorizations needed from DNR and omits surface use authorization. As we previously discussed, Kennecott opposes any surface use authorization that does not contain adequate protection of its mineral interests, *e.g.*, relocation requirements. We wanted to highlight this omission in the event DNR decides to submit comments on the Scoping EAW, which are due May 26, 2016. Thank you for your consideration.

Sincerely

KENNECOTT EXPLORATION COMPANY

E B

Erik Best

Land Manager

cc. David Simpson

From: Christian Kiel
To: *COMM_Pipeline Comments
Subject: Pipeline Scoping
Date: Thursday, May 26, 2016 9:48:42 AM

To Jamie MacAlister and the Department of Commerce,
Subject: Pipeline Scoping

The Sandpiper and Line 3 Replacement projects are both vital to the state of Minnesota. It is important that these project be developed in order to create jobs for hard working Minnesotans, move oil safely underground, and boost our local economy.
As a farmer in our state, I can personally attest to how much these projects would benefit the agriculture industry. More agricultural products could be shipped on trains because petroleum will be distributed in this additional pipeline capacity.
A fair, timely and final evaluation of these two projects has been delayed for far too long. Any entity attempting to conduct business in the State of Minnesota relies on a predictable, consistent and timely regulatory process. We ask that the Department of Commerce adhere to the 280-day time limit to prepare the EIS to keep the project schedule on track.
The scope of the EIS should serve both the public and private purpose of the two projects. It should not be overly broad, and it should not be too narrow as to be inadequate. This important balance must be met.
Thank you for the work you do for the state of Minnesota and for working to move both of these projects forward in a timely manner.

Sincerely,
Christian Kiel

MINNESOTA DEPARTMENT OF COMMERCE

Comment Form: Scoping
Energy Environmental Review and Analysis

Please provide your contact information. This information and your comments will be publicly available.

Name: Julie Kingsley Phone: 218-652-4878

Street Address: 21169 Firefly Trail

City: Akeley State: MN ZIP: 56433

Email: Kingsley@unitele.com

My comments pertain to:

- ☐ **Sandpiper Pipeline Project**
- ☐ **Line 3 Replacement Project**
- ☒ **Both Projects**

1) These pipelines are going through major watersheds for the state of Minnesota. This is the headwaters for those systems. Downstream from Hubbard County is St. Cloud, and the Twin Cities which are drawing their drinking water from surface water in increasing amounts due to depletion of groundwater sources. The pipelines should go around the lake rich area to avoid contamination of drinking water supplies in the headwaters area of these systems.

2) Next comment regards the business of Enbridge, offering each county money that the proposed pipelines will go through, Then coming back 2 years later and now asking for tax reductions for their company from each County! This not how to do business + Not how to promote your company. You are making yourselves look greedy, are taking Advantage of Counties once you have entered the County and gotten approval to turn around and want money back. This contributes to your bad image + of distrust by the public.

3) All project alternatives already proposed and any routes brought up from public meetings need to go through the EIS process + the route that is the best for the Environment not the shortest + Cheapest route for Enbridge.

If including additional pages please number them and tell us how many you are providing: 1 pages

MINNESOTA DEPARTMENT OF COMMERCE

Comment Form: Scoping
Energy Environmental Review and Analysis

Please provide your contact information. This information and your comments will be publicly available.

Name: Julie Kingsley Phone: 218-732-0121

Street Address: 603 Central Ave N.

City: Park Rapids State: MN ZIP: 56470

Email: julie.kingsley@mn.nacdnet.net

My comments pertain to:

- ☐ Sandpiper Pipeline Project
- ☐ Line 3 Replacement Project
- ☒ Both Projects

at the beginning of this project the Hubbard County Local Water Management Plan was written in 2007-2012. For the Environmental assessment I would like to notify all the agencies that Hubbard County Local Water Management plan (2016-2026) has been updated & is available & should be used for assessment of this project. The Hubbard LWMP is available on the county website of www.co.hubbard.mn.us

Thank you.

Julie Kingsley
Hubbard County Soil & Water Conservation District
District Manager.

If including additional pages please number them and tell us how many you are providing: 1 pages

From:	Dan Kittilson
To:	*COMM_Pipeline Comments
Cc:	Dan Kittilson
Subject:	Sandpiper and Line 3 Pipeline Projects
Date:	Thursday, May 26, 2016 12:34:06 AM

Jamie MacAlister
Environmental Review Manager
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul, Mn 55101

Re: Sandpiper: PL – 6668/CN-13-473 and PPL-13-474
Line 3: PL-9 / CN-14-916 and PPL-15-137

Dear Ms. MacAlister:

Hubbard County's clean water and pristine lakes are our greatest assets and have tremendous value to the culture and economic viability of Hubbard County. These assets are at enormous risks from the proposed route of the Sandpiper and Line 3 pipeline passing through our pristine waters and landscape.

It is Minnesota's responsibility to protect these cold, clean waters and healthy landscapes, and to stand up for future generations of Minnesotan's. It is our duty to make it possible for our kids and their kids to have the same opportunity we had.

I have the following comments regarding the Public Utilities Commission's (PUC) scoping for the Environmental Impact Study (EIS) for the Sandpiper and Line 3 pipeline projects.

I ask for your consideration of the following points:

--[if !supportLists]-->➢ <!--[endif]-->The EIS must be prepared by qualified, independent experts that protect the public interest in our environment and natural, beautiful places.

--[if !supportLists]-->➢ <!--[endif]-->The establishment of an expert panel to provide oversight and assistance with the technical aspects of the EIS scoping process.

--[if !supportLists]-->➢ <!--[endif]-->All "system alternative routes" submitted for this pipeline corridor should be included in the EIS analysis.

Thank You for your consideration of my comments. Please contact me with further questions at drkittil@q.com.

Dan Kittilson
22924 County 7
Park Rapids, MN 56470

Comments on behalf of Mille Lacs Band of Ojibwe

I am Susan Klapel, the Commissioner of the Mille Lacs Band of Ojibwe's Department of Natural Resources.

The Mille Lacs Band will submit written comments which will address the Band's concerns regarding the scope of the environmental review for the Sandpiper and Line 3 projects in greater detail.

Today, I want to make four points on behalf of the Mille Lacs Band:

First, the environmental review must be thorough and objective.

- Regardless of where the pipelines are constructed, they will affect thousands of people and the environment in which they live. However, some potential routes present more problems than others.
- In order to make an informed decision and to minimize the impact on people and the environment, the State must have a complete and accurate understanding of the potential impacts of the proposed projects and all reasonable alternatives.

Second, the pipelines are proposed to be located near Minnesota's most productive wild rice waters.

- These waters are not only important environmental and economic resources – they are an integral part of the cultural identity of the Mille Lacs Band.
- The environmental review must include an evaluation of all potential impacts on these waters including their unquantifiable value as cultural resources

Third, the final scoping decision document must include a detailed plan for consultation between the State of Minnesota and the Mille Lacs Band.

- The Band is a sovereign government with a duty to protect the interests of its members.
- This can only be achieved if the Band and the State engage in early and meaningful consultation regarding the potential impacts of the proposed projects and the evaluation of alternatives to minimize those impacts.

Finally, I encourage the Department of Commerce, the applicant, and all agencies and officials involved in the environmental review process listen carefully to the comments made by the community today. These individuals will be directly affected by the proposed projects and we all share an obligation to ensure that all reasonable steps are taken to address their concerns and to minimize the potential impacts of the proposed projects.

Thank you.

I request that the following be addressed in the Sandpiper EIS. I'll submit my full comments in writing but here are a few main points:

1. Update the Project Purpose

   Others have pointed out problems with the Project Purpose in the EAW, but I'll focus on the fact that its description of Bakken oil production is based on what was happening back in 2013, when there were 183 oil rigs operating in North Dakota. Today there are just 27, yet Enbridge's Project Purpose states that Bakken production "exceeds the currently available pipeline capacity."

   Two years after this was written, the Oil and Gas Financial Times stated in 2015 that "available capacity on both rail and pipeline out of North Dakota today is more than enough to handle current and projected crude production." Regarding rail, Enbridge is selling the Sandpiper to the public by saying it will take the pressure off rail shipments. But even if the Sandpiper existed, it wouldn't necessarily carry the oil that's currently being shipped by rail — even the director of the North Dakota Pipeline Authority, talking about oil leaving North Dakota, said that "Oil trains mostly supply coastal refiners that are not necessarily served by pipelines." So let's not kid ourselves about rail. If rail is less safe than pipelines, as Enbridge's Lorraine Little repeated AGAIN on the news last night, then we need to ask Enbridge why it's not doing all it can to make its rail cars safer than pipelines. Neither are safe.

   Even if the oil industry believes that the Bakken boom will return someday, we can't consider such a land-altering, massive project based on wishful thinking and a project purpose that's no longer true. It seems to me that the Project Purpose must be fixed to reflect the current situation before we can even proceed further, as it's presumably the reason we're talking about building a pipeline in the first place. We need to see the revised Project Purpose, and soon. The fact that Enbridge didn't ~~even bother to~~ update it for this scoping process is bizarre, considering this is such an expensive project for all concerned.

2. While addressing the economies of each water body listed in the EAW, I trust that you'll look at the truth behind the statistics.

   Regarding *this* area, the EAW states simply that the Sandpiper doesn't cross Big Sandy Lake I worry that an outside firm like Cardno, while preparing the EIS, would look at this and move on, thinking Sandy Lake isn't affected — but in fact the pipeline would pass under the inflow river to Big Sandy before crossing the width of the Big Sandy watershed, the entirety of which empties into Big Sandy Lake and then into the Mississippi. From the EAW it's also not mentioned that Big Sandy Lake is the foundation of our local economy and the home of one of the biggest tax bases in our county. A major spill anywhere in the Big Sandy Watershed would ravage the economy of Aitkin County — and 50 years from

now, when the aging Sandpiper begins to leak from age and weathering, there *will* be oil in Big Sandy Lake if we accept Enbridge's proposed route. This region is simply too watery for an oil pipeline.

3. In Section 4.6 of the DSDD, include information from the National Academies of Science report, "Spills of Diluted Bitumen from Pipelines," which states that weathered diluted bitumen has more potential for *chronic contamination* of water supplies. Enbridge's proposed route crosses the Mississippi, twice, upstream from millions of people who depend on that river for their drinking water. The Minnesota DOC cannot ignore this study, not when people all over the country are becoming aware of the safety of their drinking water.

4. In Section 4.5 of the DSDD, include information about leak detection systems.

   Enbridge says on their website, "We invest heavily in leading-edge tools and technologies to ensure our system is safe." Unfortunately, in reality, the technology is not up to the task. Please refer to the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration's (PHMSA) Final Report of their Leak Detection Study. The study found that more oil spills are discovered by citizens than by leak detection systems, yet Enbridge continues to overstate the safety of these systems. I worry that the DOC or Cardno will look at only Enbridge's information, not the truth, especially when it comes to river crossings.

   The global oil and gas pipeline leak detection industry is expected to surpass $1.8 billion in the next five years, due in part to increased leaks over the past few years. In Texas alone, the frequency of leaks and other hazardous events has more than doubled since 1995. Research shows that weather, age and corrosion are all common causes of leaks. People in the oil industry publicly broadcast almost daily that pipelines are safe and that spills are rare, and it's just not true.

5. Include realistic job data.

   In addition to Sandpiper jobs, please get data from the Minnesota Dept. of Employment and Economic Development on similar jobs available in the green energy sector, and on the current state of pipefitter employment in Minnesota, to get a true picture of the job situation. Requesting a hazardous liquid pipeline so some people can have dinner with their families for a year or two is a lot to ask. Also, take into consideration existing non-pipeline-related jobs that would be lost in the event of a major spill over the lifespan of a pipeline. It's possible that net jobs with the Sandpiper would be a negative number.

Minnesota citizens will not settle for an EIS that ignores the input of the MN DNR and Minnesota Pollution Control Agency or that ignores the research and concerns of some very capable, competent citizens who have spoken at these hearings, or that fails to consider the

meetings

alternative system routes. Do an honorable job, worthy of the state of Minnesota, so we can stop revisiting this. Thank you.

From:	Lance Klatt
To:	*COMM_Pipeline Comments
Subject:	Pipeline Scoping
Date:	Wednesday, May 25, 2016 3:28:49 PM
Attachments:	20160525153932606.pdf

Good afternoon Jamie and the Department of Commerce Staff,

Please see my attached letter in regards to the scoping process for the Sandpiper and Line 3 Replacement project. This is project is huge to our organization and to our industry. Thank you for your work for our state and for continuing to work in moving these projects forward.

Lance

Lance L. Klatt
Executive Director
Minnesota Service Station & Convenience Store Association
Minnesota Professional Towing Association
ph: (651) 487-1983
cell: (612-916-9917
e-mail : lance@mnssa.com

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MSSA Minnesota Service Station & Convenience Store Association

Proudly serving or members since 1966...

Service Stations Towing Operators Car Washes Convenience Stores Automotive Repair Businesses Body Shops

50th 1966-2016 Anniversary

To: Jamie MacAlister and Department of Commerce staff,

From: Lance Klatt

Date: May 25, 2016

Re: Pipeline Scoping

Jamie and Department of Commerce Staff,

We are pleased that the scoping process for the Sandpiper and Line 3 Replacement projects is moving forward under the authority of the Department of Commerce and the Public Utilities Commission.

The Sandpiper and Line 3 Replacement projects are both vital to the state of Minnesota. Sandpiper and Line 3 will ensure the safe delivery of abundant, dependable energy to fuel cars and airplanes, power homes across the state, and generate electricity for residential and industrial use. Our members are small employers all over this state, and we play a significant role in the energy industry. Efficient, safe and clean movement of our energy resources is important to the industry as a whole.

I ask that the Department of Commerce adhere to the 280-day time limit to prepare the EIS to keep these project schedules on track. The scope of the EIS should serve both the public and private purpose of the two projects. It shouldn't be overly broad, but it also shouldn't be too narrow as to be inadequate. This important balance must be met. Most of all there must be some certainty and efficiency. The process in MN has taken too long; not because of the deliberate nature, but because the rules keep changing.

Thank you for your work for our state and for continuing to work to move these projects forward. Please feel free to contact me at 612-916-9917 or my email at lance@mnssa.com.

Sincerely,

Lance Klatt

Lance Klatt
Executive Director
Minnesota Service Station and Convenience Store Association

MSSA
Minnesota Service Station & Convenience Store Association

ASMI
Association Services of Minnesota, Inc.

Minnoco

2886 Middle Street
Little Canada MN 55117

www.MNSSA.com
1-800-752-4884

phone 651-487-1983
fax 651-487-2447

From: Joellen
To: *COMM_Pipeline Comments
Subject: Comment about proposed pipeline going through Minnesota
Date: Tuesday, May 24, 2016 11:58:27 AM

Please consider the good of all Minnesotans, and do not allow private industry the right to run a pipe line through the State of Minnesota. Please do not allow them to run it through our natural resources, including water, and soil, and do not allow them to run it through any state owned land. We all pay taxes for our state's land, water, and resources. The private interest proposing to use our state's property and resources for this pipeline will not pay for it or benefit Minnesota citizens in any meaningful or profitable way, and will jeopardize our natural resources.
Thank you.
JoEllen Klemek
14319 452nd Street
Becida, MN 56678

Sent from my iPhone

Michael Knudson

Line 9 Communities
Oil Pipeline Awareness & Discussion

History of Enbridge Spills

Using data from Enbridge's own reports, the Polaris Institute calculated that 804 spills occurred on Enbridge pipelines between 1999 and 2010. These spills released approximately 161,475 barrels (25,672.5 m³) of crude oil into the environment ... Will YOUR Community Be Next?

2013 (July 1st) – Michigan Department of Environmental Quality issues a citation against Enbridge for contamination of North Ore Creek by an Enbridge pipeline maintenance activity.

2013 (June 23rd) – Cheecham, Alberta – Line 37 – Approx. 750 barrels (investigation ongoing). Line 37, constructed in 2006, a 17-kilometre-long, 12-inch diameter pipe links the Long Lake oil sands upgrader to the Cheecham terminal and is part of Enbridge's Athabasca system. Unusually heavy rainfall in the region, that caused the 2013 Alberta floods, may have caused "ground movement on the right-of way that may have impacted the pipeline." Enbridge's Athabasca (Line 19) shares a portion of right of way with Line 37 and Enbridge's Wood Buffalo/Waupisoo (Line 75/18) which also shares a portion of right of way with Line 37, a major part of the network that serves Alberta's oil sands, were closed down as a precautionary measure. Operations between Hardisty and Cheecham were restored on June 23 when Enbridge's Athabasca pipeline (Line 19) was restarted

2012 (November 20th) – Mokena, Illinois – 905 barrels.

2012 – Grand Marsh, Wisconsin – 1,200 barrels – pipeline installed in 1998. *Cause:* Flaws in the longitudinal welds had been seen during X-ray checks of girth welds.

2012 (Feb 15th) – Arenac County, Michigan – oil discovered in soil around an Enbridge oil pipeline.

2010 (September 9th) – Romeoville, Illinois – Line 6A – 7,500 barrels.

2010 (July 26th) – Marshall, Michigan – Line 6B – 27,132 barrels. *Cause:* Known but unrepaired cracks and external corrosion. CLICK HERE for Full NTSB Accident Report Information Docket

2010 (April 17th) – Deer River, Minnesota – Line 2. *Cause:* Crack-like feature associated with the longitudinal weld seam on inside of the pipe.

2010 (April) – Virden, Manitoba – Pipeline ruptured spilling more than 9.5 barrels (1.51 m³) of oil, and leaked into the Boghill Creek which eventually connects to the Assiniboine River.

2010 (January 2nd) – Neche, North Dakota – Line 3 – 3784 barrels released – only 2,237 recovered. Cause: Material defect.

2009 (May 21st) – Superior, Wisconsin – 155 barrels – An Enbridge pipeline pig sending trap leaked due to operator error, spilling about 6500 gallons of crude oil. 700 cubic yards of contaminated soil had to be removed.

Follow

2009 (January) – Enbridge pipeline leaked about 4,000 barrels (640 m³) of oil southeast of Fort McMurray at the company's Cheecham Terminal tank farm. Most of the spilled oil was contained within berms but about 40 barrels (6.4 m³), sprayed into the air and coated nearby snow and trees.

In 2009, Enbridge Energy Partners, a U.S. affiliate of Enbridge Inc., agreed to pay $1.1 million to settle a lawsuit brought against the company by the state of Wisconsin for 545 environmental violations.In a news release from Wisconsin's Department of Justice, Attorney General J. B. Van Hollen said "...the incidents of violation were numerous and widespread, and resulted in impacts to the streams and wetlands throughout the various watersheds".The violations were incurred while building portions of the company's Southern Access pipeline, a project to transport crude from the oil sands region in Alberta to Chicago.

2007 (November 27th) – Clearbrook, Minnesota – killed two employees.Enbridge was cited for failing to safely and adequately perform maintenance and repair activities, clear the designated work area from possible sources of ignition, and hire properly trained and qualified workers.

2007 (November 13th) – Clearbrook Minnesota – Line 3. Enbridge discovered a leak on their 34-inch Line 3 at Mile Post 912. Later, the pipeline exploded during repairs, on November 27, causing the deaths of two employees. DOT officials said that two Enbridge workers died in a crude oil explosion as they worked to make repairs on the former Lakehead system pipeline. Enbridge was cited for failing to safely and adequately perform maintenance and repair activities, clear the designated work area from possible sources of ignition, and hire properly trained and qualified workers.

2007 (April) – Glenavon, Saskatchewan – Roughly 6,227 barrels (990.0 m³) of crude oil spilled into a field downstream of an Enbridge pumping station.

2007 (February 2nd) – Rusk County, Wisconsin – 4,800 barrels – only 2,066 recovered. A construction crew struck an Enbridge pipeline with equipment. Some of the oil filled a hole more than 20 feet (6.1 m) deep and was reported to have contaminated the local water table.

2007 (January 1st) – Superior, Wisconsin – 1,500 barrels / 50,000 US Gallons spilled onto farmland and into a drainage ditch. *Cause:* Incomplete fusion of a longitudinal weld at the pipe maker that failed as pressure cycle was established as the cause. The same pipeline was struck by construction crews on February 2, 2007, in Rusk County, Wisconsin, spilling 201,000 US gallons (760 m³) of crude, of which about 87,000 gallons were recovered. Some of the oil filled a hole more than 20 feet (6.1 m) deep and contaminated the local water table.

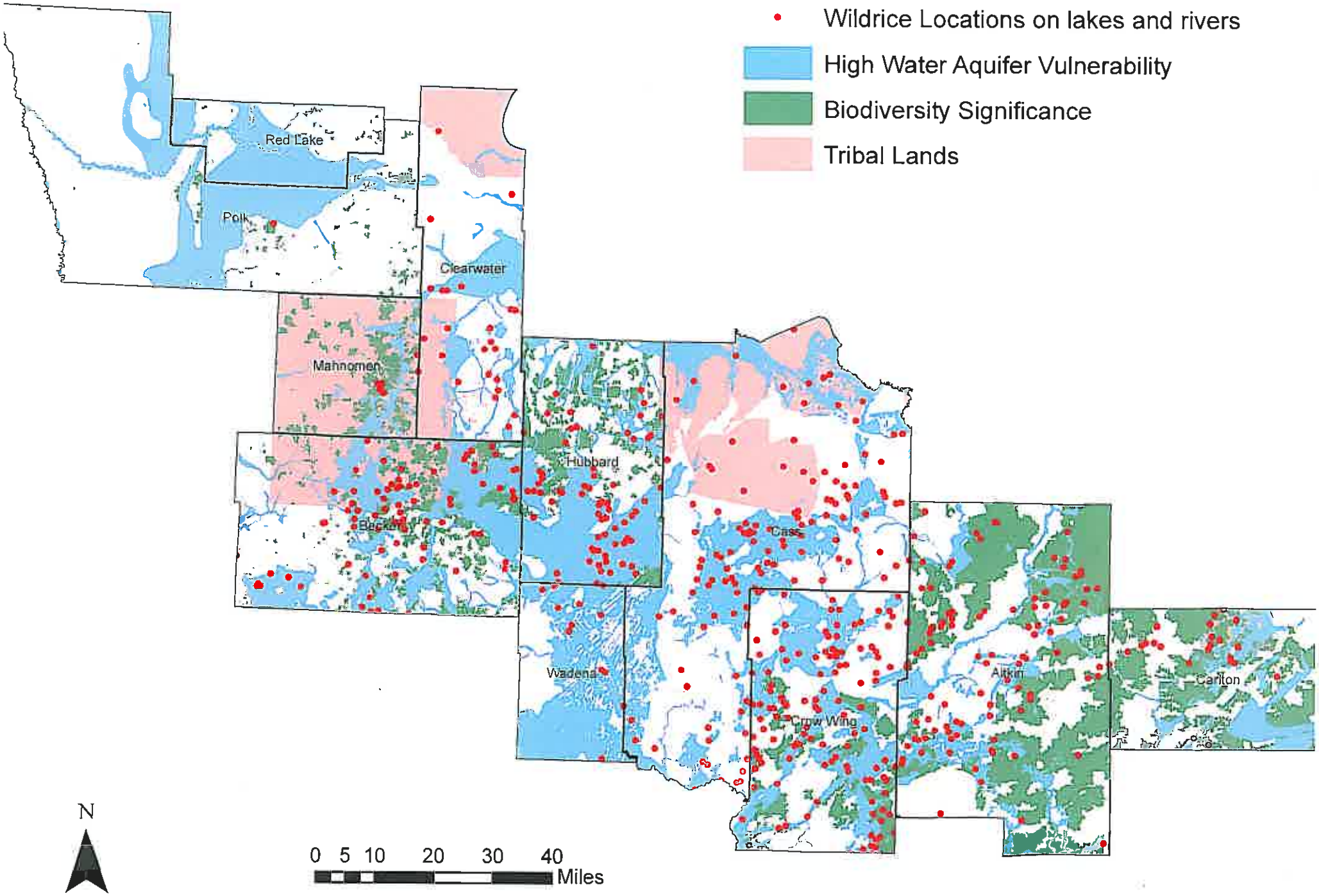
In 2007 there were 65 reportable spills totaling 13,777 barrels (2,190.4 m³).

2006 (March 18th) – Enbridge's Willmar Terminal in Saskatchewan – Approximately 613 barrels (97.5 m³) of crude oil were released when a pump failed. According to Enbridge, roughly half the oil was recovered.

In 2006 there were 67 reportable spills totaling 5,663 barrels (900.3 m³) on Enbridge's energy and transportation and distribution system.

2005 (January 18th) – Bay City, Michigan – 100 barrels – An Enbridge pipeline failed from temperature problems. The pipe was just 2 years old at the time.

Follow


Wildrice Locations on lakes and rivers
High Water Aquifer Vulnerability
Biodiversity Significance
Tribal Lands
Red Lake
Polk
Clearwater
Mahnomen
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The Sandpiper pipeline is proposed to be routed through Polk County of which I am a resident. While the following are my own views on the project, I hope that an honest and comprehensive EIS will provide greater analysis of all potential human and environmental impacts, and potential project alternatives.

First and foremost, the pipeline is a support system to oil extraction by method of hydraulic fracturing from the Bakken fields in North Dakota. Catastrophic climate change impacts are already occurring in Minnesota and globally. As a citizenry, we should be focusing on curtailing such extraction instead of supporting it. Currently the oil and gas industry enjoys exclusions and exemptions to major federal environmental statutes intended to protect human health and the environment including: Comprehensive Environmental Response, Compensation and Liability Act, Resource Conservation and Recovery Act; Safe Drinking Water Act, Clean Water Act, Clean Air Act, National Environmental Policy Act, Toxic Release Inventory under the Emergency Planning and Community Right-to-Know Act. As a result of this lack of oversight, human health, wildlife communities and the environment are being endangered. Until more thoughtful state regulations are enacted in North Dakota and until the petroleum industry at large is held accountable to remedy the negative impacts on human health and the environment, Minnesota should not put our human communities, land or water systems at risk of degradation.

The proposed preferred Sandpiper route poses threats not only to waterways and wetlands in Polk County, but along the entire route. While I am concerned about the pipeline crossing the Red River of the North and Red Lake River Watercourses, I am equally concerned about the route crossing the state's most famous river, the Mississippi. This pristine headwaters area is a valuable and cherished natural resource to residents of Minnesota and across the nation. The bounty of freshwater resources in northern Minnesota including wild rice beds, lakes and rivers and fisheries generate $7.2 billion annually. This doesn't include the tourism industry which grosses $11.9 billion in sales. These are real and permanent jobs. I am concerned that multiple pipelines will be allowed to follow this corridor if approved, including the proposed replacement Line 3. These pipelines threaten not only pristine ecosystems, but also human communities and economic livelihoods.

Estimates predict that the Bakken oil boom is at or near peak production. Because productivity of shale wells declines rapidly, many new wells must be drilled just to maintain existing production levels. This is not sustainable development. The current no build alternative that allows for road or railway transport will continue meeting the need to transport oil to refinery destinations. The Sandpiper will not eliminate or reduce the oil being transported by rail and truck. It will only allow more transportation to occur. Rail and truck transport allow flexibility to reach refineries and are the most feasible method given the short term production expectations.

The impact on communities in North Dakota associated with the 'Bakken Boom' are experiencing unsustainable population growth leading to human trafficking, crime, drug use and trafficking, lack of adequate and safe housing, shortage of police and emergency response workers, cost of living increases and many health problems. This industry does not support the health and wellbeing of our neighbors in North Dakota.

The only thing constant in the 'Bakken Boom' is change. Minnesota's natural resources should not be placed at permanent risk for the economic advancement of the North Dakota Pipeline Company and its desire to transport hazardous material. This project is not in the best interest of current or future

citizens of Minnesota, only for those who expect to make money. Instead of muddling along on our current march toward energy independence by evermore domestic production it is time we redefine milestones and work toward a significant transition away from oil.

Is Minnesota aware of the goals of the Paris Climate Change Agreement and does Sandpiper Pipeline project work towards contributing to those goals. No

Does the Sandpiper Pipeline make a meaningful long-term (sustainable) contribution to our economy? No

Would it lower energy prices for consumers? No

Does shipping dirtier crude oil across a sensitive MN landscape increase America's or even MN's energy security? No

Will MN be taking a national leadership role on climate change through the Sandpiper Pipeline? No

The Sandpiper Pipeline is all risk to MN and its residents with no reward for MN, the people of this state, and our natural resources.

Psychological and social impacts that this could have on communities in our state, some communities whom are already at-risk, displaced, and living in poverty. The Sandpiper Pipeline provides no social, cultural, health, psychological, or economic benefit to these communities. So, why are we even considering this project?

From:	Kate Knuth
To:	*COMM_Pipeline Comments
Subject:	Comments of DSDD for Sandpiper and DSDD for Line 3
Date:	Monday, May 23, 2016 6:56:48 PM
Attachments:	Knuth Sandpiper DSDD Comments.docx Knuth Comments on Line 3 DSDD.docx

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Dear Jamie MacAlister,

Attached you will find my comments regarding the DSDD for the proposed Sandpiper pipeline project and my comments regarding the DSDD for the proposed Line 3 replacement and expansion. Please confirm receipt of these comments. I look forward to them being addressed in the Final Scoping Decision Documents.

Sincerely,

Kate Knuth
Citizen Member of Minnesota Environmental Quality Board
276 Xerxes Ave N, Minneapolis, MN 55405

Comments of the Draft Scoping Decision Document for proposed Sandpiper Pipeline Project
Submitted by Kate Knuth, Citizen Member of the Minnesota Environmental Quality Board,
Resident of Minneapolis, MN
May 23, 2016

I am submitting comments on the proposed Sandpiper Pipeline Project draft scoping decision document(DSDD) of April 8, 2016. Overall, the comments can be summarized as supporting the need for Minnesota to fully consider the impacts of climate change when seeking to understand the environmental impacts and economic risks of the proposed pipeline.

I realize Minnesota's environmental review statutes and rules were written before climate change was seen as a major societal and public policy issue. However, this fact does not mean the environmental review process should not consider climate change in a substantive way. To not fully consider climate change would not meet the letter and spirit of Minnesota's environmental laws. I have specific suggestions below.

Underlying Purpose of the Project – Page 6 of the DSDD
The DSDD states the underlying purpose of the project as follows:

> The purpose of the project is to transport growing crude oil production from the Bakken Formation in North Dakota to the Superior, Wisconsin, terminal and then connect to various other pipelines expanding access to refinery markets in the US Midwest and beyond.

This proposed underlying purpose has several significant problems.

First, the purpose assumes "growing crude oil production from the Bakken Formation." The statement is taken verbatim from the Enbridge Certificate of Need Notice Plan of June 7, 2013. In June of 2013, oil was trading at around $100/barrel. In May of 2016, oil is trading below $50/barrel and has been for some time. The production in the Bakken Formation has dropped off accordingly. To assume "growing" crude oil production in the Bakken Formation is a faulty assumption, and it should not be included in the underlying purpose of the project in the FSDD.

Second, the underlying purpose states two distinct purposes, the second of which is not necessarily connected to the first. The first purpose is to connect oil production from the Bakken Formation in North Dakota to Superior, WI. The second is to "then connect to various other pipelines,[1] expanding access to refinery markets in the US Midwest and beyond." In order to meet the second purpose of accessing these markets, the scoping document does not need to assume the beginning and end of the Bakken Formation and the Superior, WI terminal. The

[1] Note – the DSDD does not include this comma, which makes the underlying purpose statement confusing. The Enbridge Certificate of Need Notice Plan from June 7, 2013 does include the comma, which I included in order for the sentence to make sense grammatically

underlying purpose should include the larger connection to Midwest markets, not the proposer-defined beginning and end to the route. The two end points should be left out of the underlying purpose in the FSDD in order to facilitate an environmental review that better meets the needs and purposes of the citizens of Minnesota, rather than meeting the private business purposes of the proposer.

3.3.1 Alternative Technologies Rail – Page 8 of DSDD
Under the alternative technologies part of the DSDD, the document states

> As proposed, the project would transport 25,000 barrels per day (bpd) from Beaver Lodge to Berthold, 225,000 bpd from Beaver Lodge to Superior, and up to 150,000 bpd from Clearbrook to Superior. To carry an equivalent amount of oil on unit trains would require several additional unit trains per day. NDPC estimates that more than 2,000 rail tank cars would be required to transport an equivalent amount of oil on a daily basis, given the number of cars loading, unloading, and making return empty trips per day.[2]"

These assumptions come from a report dated December 2014, and while the price of oil had begun to decline the full effects of this decline in the Bakken Formation had not yet been felt… and likely the full extent of the decline has not been seen in the markets to this day. As such, the assumptions about rail transport from that time should not be taken as fact in the Sandpiper DSDD and should be removed in the FSDD.

3.8 No Action Alternative – Page 14 of DSDD
The no action alternative section states

> The EIS will describe the expected condition if the project is not developed with respect to the potential environmental and socioeconomic effects outlined in Section 4 of this document. The No Action Alternative assumes transport of Bakken oil will continue by other means, including rail, interstate highways and other pipeline systems.

As stated earlier in my comments, the production of oil in the Bakken formation has declined significantly since the original Enbridge filing for a Certificate of Need in 2013. To assume continued transport of oil explicitly in the No Action Alternative is not helpful in ensuring public trust in a thorough and unbiased assessment of this alternative and the unfolding economic and oil market realities of the Bakken Formation. In the final EIS. The second sentence in the No Action Alternative should be removed in the FSDD.

4.7 Cumulative Effects – Page 28 of DSDD
The cumulative effects section should explicitly include consideration of impacts of climate change as one of the cumulative effects of the proposed pipeline project.

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2 http://mn.gov/commerce/energyfacilities/documents/33599/Environmental%20Review%20of%20System%20Alternatives%20MASTER%2020141218_Final.pdf

Minnesota has made a strong commitment to reducing greenhouse gas (GHG) emissions in statute. Statute 216H.02 states

> It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050.

Additionally, in 2015 Minnesota signed onto the Under 2 MOU[3], committing to state action to keep global GHG emissions below 2 degrees C.

Minnesota's commitment to reducing GHG emissions and mitigating climate change should be reflected in the FSDD through the explicit consideration of climate change cumulative effects. One addition should be in the addition of cumulative effects of the addition of the proposed pipeline to the system on GHG emissions. For this part of the EIS, analysis and data from the federal EIS of the Keystone XL pipeline should be used. The second addition to the cumulative effects section should be about the impact of a changing climate on Minnesota's natural resources. Minnesota's ecosystems are expected to undergo significant change due to a changing climate, and these should be considered when discussing the cumulative effects of the proposed project on natural resources. Both of these changes related to climate change should be included in the FSDD.

5.0 Special Studies or Research – p. 30 of DSDD

The FSDD should include an additional special study for inclusion in both the Sandpiper and Line 3 Replacement and Expansion EISs. This special study should cover the following

> An updated economic analysis of need for proposed pipeline considering changes in production in the Bakken Formation and the Alberta Oil Sands particularly considering MN Statute 216H.02, Minnesota's commitment to the Under 2 MOU, and the Paris Climate Agreement under the UN Framework Convention on Climate Change.

The world is at turning point when it comes to the use and exploitation of fossil fuel resources. Not all fossil fuel reserves will be developed if the world (and Minnesota) meets its climate commitments. As a result, there are serious concerns in the financial sector about the impact of fossil-fuel-related stranded assets, or financial assets that have become obsolete well ahead of their useful life, and must be recorded as a loss of profit. The Financial Stability Board has begun a project on climate-related financial disclosures[4], and reports from this project should be included a part of the special study/research on climate change risk. The FSDD should be clear in its considerations of these risks, and in particular the risk of stranded assets, as part of

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[3] http://under2mou.org/

[4] http://www.fsb.org/what-we-do/policy-development/additional-policy-areas/developing-climate-related-financial-disclosures/

the scope of the EIS. Minnesotans need good information about whether the proposed pipeline(s) carry significant financial and economic risk associated with Minnesota and the world seriously addressing climate change.

Comments about Process and Release of the Final Scoping Decision Document

As a member of the Environmental Quality Board (EQB) I have been closely following the environmental review process for both the proposed Sandpiper and Line 3 projects. Clearly, there are public concerns and a lack of public trust in the process of the environmental review. This is particularly a concern with the memorandum of understanding among the Department of Commerce, Pollution Control Agency, and the Department of Natural Resources for preparation of environmental review. In order to make progress on reestablishing public trust, the commissioners of all three of these state agencies should publicly sign off of the FSDD before its release. The public expects the full input of all three of these agencies in the process, and this agency input should be reflected by all three commissioners signing off on the work product of the FSDD.

Comments of the Draft Scoping Decision Document for proposed Line 3 Replacement Project
Submitted by Kate Knuth, Citizen Member of the Minnesota Environmental Quality Board,
Resident of Minneapolis, MN
May 23, 2016

I am submitting comments on the proposed Sandpiper Pipeline Project draft scoping decision document(DSDD) of April 8, 2016. Overall, the comments can be summarized as supporting the need for Minnesota to fully consider the impacts of climate change when seeking to understand the environmental impacts and economic risks of the proposed pipeline.

I realize Minnesota's environmental review statutes and rules were written before climate change was seen as a major societal and public policy issue. However, this fact does not mean the environmental review process should not consider climate change in a substantive way. To not fully consider climate change would not meet the letter and spirit of Minnesota's environmental laws. I have specific suggestions below.

Underlying Purpose of the Project – Page 5 of the DSDD
The DSDD states the underlying purpose of the project as follows:

> The purpose of the project is to address safety and integrity concerns of the existing Line 3 pipeline.

This proposed underlying purpose is problematic for the scope of the EIS.

The purpose project purpose is only about the safety and integrity concerns of the existing line 3 pipeline. This purpose is important, and it should be included in the FSDD. However, the underlying purpose does not reflect the fact that the pipeline replacement is more than simply a replacement, and is functionally a major expansion of current pipeline capacity shipping crude oil from the oil sands of Alberta into Midwestern US markets by over 300,000 barrels per day (bpd). To not reflect the expansion of pipeline capacity in the underlying purpose obscures the realities of what is being proposed in the Line 3 Replacement and Expansion. I would further argue the title of the overall FSDD should reflect this reality and be "Line 3 Replacement and Expansion Pipeline Project."

3.2 Alternative Sites – p. 7
The DSDD states that no alternative sites will be considered because they will not address safety and integrity concerns. However, as stated above and in section 1.2 Description of Proposed Project, the Line 3 replacement and expansion would increase the capacity of the pipeline by more than 300,000 bpd, which is a significant increase in pipeline capacity in this area. Other pipeline routes either existing or proposed should be considered. Language similar to the alternative sites section in the Sandpiper DSDD should be used in the Line 3 FSDD.

4.7 Cumulative Effects – Page 27 of DSDD
The cumulative effects section should explicitly include consideration of impacts of climate change as one of the cumulative effects of the proposed pipeline project.

Minnesota has made a strong commitment to reducing greenhouse gas (GHG) emissions in statute. Statute 216H.02 states

> It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050.

Additionally, in 2015 Minnesota signed onto the Under 2 MOU[1], committing to state action to keep global GHG emissions below 2 degrees C.

Minnesota's commitment to reducing GHG emissions and mitigating climate change should be reflected in the FSDD through the explicit consideration of climate change cumulative effects. One addition should be in the addition of cumulative effects of the addition of the proposed pipeline to the system on GHG emissions. For this part of the EIS, analysis and data from the federal EIS of the Keystone XL pipeline should be used. The second addition to the cumulative effects section should be about the impact of a changing climate on Minnesota's natural resources. Minnesota's ecosystems are expected to undergo significant change due to a changing climate, and these should be considered when discussing the cumulative effects of the proposed project on natural resources. Both of these changes related to climate change should be included in the FSDD.

5.0 Special Studies or Research – p. 28 of DSDD
The FSDD should include an additional special study for inclusion in both the Sandpiper and Line 3 Replacement and Expansion EISs. This special study should cover the following

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The world is at turning point when it comes to the use and exploitation of fossil fuel resources. Not all fossil fuel reserves will be developed if the world (and Minnesota) meets its climate commitments. As a result, there are serious concerns in the financial sector about the impact of fossil-fuel-related stranded assets, or financial assets that have become obsolete well ahead of their useful life, and must be recorded as a loss of profit. The Financial Stability Board has

[1] http://under2mou.org/

begun a project on climate-related financial disclosures[2], and reports from this project should be included a part of the special study/research on climate change risk. The FSDD should be clear in its considerations of these risks, and in particular the risk of stranded assets, as part of the scope of the EIS. Minnesotans need good information about whether the proposed pipeline(s) carry significant financial and economic risk associated with Minnesota and the world seriously addressing climate change.

Comments about Process and Release of the Final Scoping Decision Document

As a member of the Environmental Quality Board (EQB) I have been closely following the environmental review process for both the proposed Sandpiper and Line 3 projects. Clearly, there are public concerns and a lack of public trust in the process of the environmental review. This is particularly a concern with the memorandum of understanding among the Department of Commerce, Pollution Control Agency, and the Department of Natural Resources for preparation of environmental review. In order to make progress on reestablishing public trust, the commissioners of all three of these state agencies should publicly sign off of the FSDD before its release. The public expects the full input of all three of these agencies in the process, and this agency input should be reflected by all three commissioners signing off on the work product of the FSDD.

[2] http://www.fsb.org/what-we-do/policy-development/additional-policy-areas/developing-climate-related-financial-disclosures/

Ingrid Kimball

From: Mary J Kowalski <mjkowalski@earthlink.net>
Sent: Thursday, May 26, 2016 6:04 PM
To: *COMM_Pipeline Comments
Subject: Comments on the Sandpiper/Line 3 scoping

To: PUC -Ms Macalister concerning

SANDPIPER PIPELINE PPL-13-473

CN-13-474
Line 3 Pipeline Replacement Project

PPL-15-137 CN-14-916

The following is my concerned citizen appeal to you and your cohorts to serve the citizens of MN in doing the job of conducting an EIS on the Sandpiper/ Line 3 pipelines with the most care and diligence possible so as insure the future of MN water and natural wildlife well onto a future that at best will be challenging for our children.

Minnesota has many bodies of water-many beautiful lakes and some very uniques features that allow for our rich natural environment.

My concern for the scoping of the pipeline process has many aspects but two of the most serious to me personally are the unnecessary risk in the routing of the Enbridge proposal and the threat to the unique feature of the trout hatchery in Spire Valley north of Lake Roosevelt.

My first concern for the routing of this pipeline:

There is no current, nor forecasted, excess refinery capacity in Superior WI, nor anywhere in the north of the Great Lakes states of MN, WI, and MI. In fact, the Superior WI capacity is at most about 5% of this pipeline's delivery capacity. Please consider in your scoping the final destination of this crude oil and the danger that it poses to our best lakes in the state.

Secondly and most important to me personally is the destruction to the trout fish hatchery that will occur if the proposed Sandpiper line is routed through Spire Valley fish hatchery.

Spire Valley, in Cass County, MN is a unique site for Mn, the trout streams of MN. The hatchery relies on natural springs of flowing water to enable trout eggs to hatch. If the aquifer pressure, flow or the quality of water is damaged then the hatchery is lost. The construction of this pipeline has been assessed by the DNR to cause disruption to this aquifer. This would mean the loss of millions of dollars from the hatchery and probably the end of trout to fresh water streams in Mn. The scoping should include the seriousness of impact in this sensitive area.

Thank You for attending to this EIS carefully on behalf of the citizens of MN and our children.

Mary Kowalski
1407 Wachtler Ave
Mendota Hts, Mn 55118

May 10, 2016

RECEIVED
MAY 13 2016
MAILROOM

Jamie MacAlister
MN Dept of Commerce
85 7th Place East Suite 500
St. Paul, MN 55101

Comments regarding the proposed pipelines:

Yesterday in the news, it was reported that the MN Pollution Control Agency needed to add 10 new sites to the super fund for clean up. 9 are in the metro area, and 1 in Cloquet area. This is added to 83 existing superfund sites. These aren't necessarily related to oil contamination but certainly highlights the existing problems that end up on tax dependent programs to hopefully eradicate.

For many years I traveled in the Aitkin County area on work related business and saw the lakes where wild rice was growing. Leaks or spills from an oil pipeline would be disasterous. A month ago there was news on TV and radio of oil found by a farmer in his ND field. For a few days there were reports that the oil company had been digging up the field looking for the pipe problem causing the leak, but haven't heard anything since. So if the pipeline company is dependent on a farmer to notify them of a problem, there is no hope that the company would ever find a leak in non-farm areas before the disaster would be huge! The contamination of rivers, lakes and ponds and ultimately ground water is too risky to consider putting oil pipelines where the environment would be so seriously damaged.

There must be respect for the earth and all who live on it!

Sincerely yours,

Gertrude Lambert

Gertrude Lambert

MINNESOTA DEPARTMENT OF COMMERCE

Comment Form: Scoping

Energy Environmental Review and Analysis

Please provide your contact information. This information and your comments will be publicly available.

Name: Terry Langley Phone: 918-606-5543

Street Address: P.O Box 568

City: Pottsville State: AR ZIP: 72858

Email: terry@Local 798.ORG

My comments pertain to:

- ☐ **Sandpiper Pipeline Project**
- ☐ **Line 3 Replacement Project**
- ☑ **Both Projects**

Contractors are Expected To Finish project on Time and On Budget. The M.D. OF Commerce should be Abe To produce A high-quality EIS with in 280 days period. The EIS should Only study Alternatives that meet the need of the Projects proposed routes that go To Clearbrook and Superior.

Thanks

Terry Langley

Organizer 798

If including additional pages please number them and tell us how many you are providing: _____ pages

PL-6668/CN-13-473 PPL-13-474

PL-9/CN-14-916 PPL-15-137

To Scott Ek, Tracy Smetana, Jamie MacAlister

RE: EIS Scoping Hearing Crookston 4/27/2016

My concerns are the long term impacts both economic and environmental, associated with leaving unused, unneeded pipelines in the ground for an indefinite, and as of now, an undetermined period of time. Will the EIS address these issues? How many miles of decommissioned pipelines are there in Minnesota right now? How long have they been unused? What problems have been associated with their existence. While in use, the weight and the heat of the oil, kept movement from frost and buoyancy in check. Without those factors what will keep the pipeline from being forced to the surface eventually? When that happens , who will be responsible, and what will be the landowners recourse to get the problem corrected in a timely manner. Does the State of Minnesota have rules and regulations in place dealing with decommissioned pipelines? Why are they not required to be removed after they are no longer being used? While they are in service the argument can be made that they serve the public good and therefore are allowed usurp landowner rights. After decommissioning that argument is no longer valid and the land should be returned to the landowner unencumbered by the existence of the pipeline and the hazards and economic loss the pipeline represents. At some point in time someone will have to deal with the cost of removing abandoned pipelines, the time should be now, and it should be assumed by the consumers demanding energy and the corporations profiting currently from its transportation, and not future generations and not the taxpayers of Minnesota. There is no time better than the present to deal with these issues, the stakes are high, the need is current, the attention should be focused on legislatively requiring the removal of decommissioned pipelines before any new certificate of need or route permits are granted.

Mario LaPlante

Affected Landowner Line 81 and proposed Sandpiper expansion.

PO Box 2756
Warba, Minnesota 55793
26 May 2016

Jamie MacAlister, Environmental Review Manager
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul MN 55101

Re: Comments regarding adequacy of Draft Scoping EAW and Scoping Decision Document for EIS, Enbridge Line 3 Replacement Project
PUC Docket Numbers PL-9/CN-14-916 *Certificate of Need*
PL-9/PPL-15-137 *Route Permit*

Having reviewed the Environmental Assessment Worksheet issued in April 2016, which serves as a scoping document for the EIS to be performed with regard to the proposed abandonment of the Enbridge Line 3 and its replacement, I see what I believe to be a major shortcoming in coverage by the EAW which would lead to a major shortcoming in the scope of the EIS, in the certificate of need and route permit proceedings, and in any permits and requirements requested and to be issued thereafter.

Specifically: a major component of the proposed project would be abandonment of much of the existing Line 3 as it traverses several counties (Beltrami, Cass, Itasca, St. Louis). The portion of Line 3 to be abandoned traverses both public and privately owned lands. Enbridge apparently proposes a plan to empty, flush, and fill the abandoned line 3 in such manner as, it says, that would reduce, minimize, or eliminate short term and long term environmental risks and threats. A major flaw or gap in the EAW is that the EAW appears to have totally missed considering the risks and costs associated with abandonment of hundreds of miles of line 3, the efficacy and risk of the abandonment methods proposed by Enbridge, and the negative short term and long term effects of leaving such large quantities of pipe in the ground for perpetuity.

With reference to that major shortcoming in the scoping EAW, the major concerns and shortcomings of the EAW that should be remedied before confirming adequacy of the EAW and finalizing the scope of the EIS are:

1. The main text of the EAW has only a single mention of line 3 abandonment, that being on page 27 where there is one mention of abandonment where the pipe to be abandoned crosses over, under, or through a navigable water body. In other words, there is no reference to or consideration or study of the risks and implications of the hundreds of miles of abandoned Line 3 that traverse land or non-navigable waters.

2. Appendix C of the EAW provides regulatory provisions pertaining to abandonment of buried pipelines. These address means of abandoning pipe, but none of the regulations mentioned include study of the environmental impacts of such abandonment nor is there provision for short term or long term remediation or mitigation of the negative impacts of having such abandoned pipe in the ground in perpetuity.

3. None of the Enbridge right of way agreements with public or private entities with which I am familiar include, anticipate, or provide for perpetual abandonment of line pipe in the ground after their end of service, such as Enbridge is proposing, which action essentially turns the entire length of abandoned pipe into a large, long distance, perpetual dump or major waste disposal site, which for any other purpose would require an EIS of its own. In addition to long term risks to the natural environment, there is risk to public health and safety and it creates a permanent and substantial encumbrance of property to landowners both public and private, which encumbrance is not removed until the pipe is itself removed - for which there is no provision. This long term impact should also be part of the EIS and subsequent certificate of need, route permit, and construction and operating permits.

Negative impacts of a large pipeline buried for perpetuity are easily foreseeable, avoidance or remedial alternatives to negative impacts exist, hence the subject should be addressed in the EIS, but these impacts and alternatives are not identified in the scoping EAW so requirements to address these should be included in the scope of work for the EIS and the resulting certificate of need and permitting actions. These include items such as:

a. Possible negative environmental aspects of creating a multi-hundred-mile waste disposal site for abandoned Line 3 pipeline;
b. Long-term adequacy of the proposed emptying/cleaning/filling methods proposed by Enbridge;
c. Contractual easement/right-of-way permission and compensation agreements with public and private landowners that do not provide for use of pipe for transport but which do NOT provide for permanent abandonment of pipe within the right of way and for which no encumberment compensation has been proposed or provided.

With regard to public and private easement land owners, in public hearings it has been abundantly clear that many properties through which Enbridge pipelines cross have pipe laid either very close to the surface or pipe has floated to the surface after installation, in both cases creating medium and short term hazards to landowners and to others using public and private land for hunting, agriculture, infrastructure construction, residential, or other normal purposes. These, and other issues and impacts on the natural and human

environments that can also be identified, need to be addressed by the EIS but are not referred to by the scoping EAW. Therefore, the scoping EAW is insufficient. In other cases where there are possible long term impacts, these long terms impacts, which can be very serious are addressed by measures such as financial assurance to public and private owners; such measures with respect to perpetual abandonment of Line 3 should also be addressed as part of the EIS. As further information and for discussion on this subject:

1. While Enbridge has stated their plan to clean the existing Line 3 and has cited the risks and benefits (from their point of view; other points of view also exist) of not removing the existing Line 3 in the short term, Enbridge also has stated that the existing Line 3 will not again be fit for future service. To restate and summarize Enbridge, they have no intention of ever using major segments of the existing Line 3 nor do they intend to remove it now nor do they propose any plan or intention of removing it in the future. Despite reasons that Enbridge gives for not removing the existing line at this time and statements that the pipe will be cleaned and decommissioned after cessation of use, de facto this becomes a perpetual abandonment and disposal of major pipeline waste in the ground, a use which was not part of the permits granted when the pipeline was installed nor, apparently, by existing regulations.
2. Pipeline easement agreements with which I am familiar and which I expect are common in most or all of the easement agreements which were entered by Enbridge and its predecessors describe the easements as "perpetual"; however, they also describe the easement as being to "operate, maintain, inspect (including aerial patrol), remove, replace and reconstruct one or more pipelines", and "constructing, continuously operating and maintaining multiple pipelines", both of which envision and grant use for operating pipelines but do not mention, include, contemplate, provide for nor allow short term or long term abandonment of a pipeline in the ground on either public or private property. It appears that Enbridge is attempting to circumvent terms of existing easement agreements and, if permits that have been granted include reclamation or restoration provisions, leaving and disposing of unused and unusable piping in the ground would appear to violate those permit provisions and easement agreements;
3. My experience is that other major industrial-type projects, especially those with a long term ("perpetual", as used in Enbridge easement agreements and as described in Enbridge permit documents certainly qualifies the proposal as long term) such as mining projects, are now being viewed as requiring irrevocable financial assurance before a project can proceed. Such significant financial assurance to be provided by Enbridge as part of permitting should also be required in this case to compensate private and public landowners for both loss of property value and for eventual pipe removal, and for mitigation of any detrimental environmental impacts that may result from Enbridge's direct or indirect environmental consequences or failure to remove the pipe under whatever timeframe is determined by the study and permits issued.
4. My experience and perception as a landowner that contends with many miles of Enbridge pipeline on easements across my property is that Enbridge has a history

of not fulfilling and complying with laws, rules, and/or contracts. For example, problems that occurred in constructing and starting their Alberta Clipper project in 2008 (eight years ago) have still not been resolved. This is the type of situation, as are such possibilities such as bankruptcy or dissolution of Enbridge itself, that solid financial assurance should be evaluated in the analysis to be done because of the potential human financial impact as well as the potential physical/environmental impact.

5. Public/human safety is another reason that the lack of Line 3 removal should be studied in the EIS. Buried pipe, even when properly buried using customary methods and good practice, can result in problems: pipe have been observed gradually floating to the surface resulting in myriad problematic situations, especially over the long term.

More discussion would be possible but I hope that the comment offered, when associated with the discussion, will suffice and be helpful as the abandonment part of Enbridge's Line 3 proposal is scoped for inclusion in the EIS and for the following regulatory purposes.

Thank you.

R. D. Learmont

MINNESOTA DEPARTMENT OF COMMERCE

Comment Form: Scoping
Energy Environmental Review and Analysis

Please provide your contact information. This information and your comments will be publicly available.

Name: Colleen LeBlanc Phone: 218-828-6233

Street Address: 441 20th St.

City: Fort Ripley State: MN ZIP: 56449

Email: leblancecolleen@yahoo.com

My comments pertain to:

- ☐ **Sandpiper Pipeline Project**
- ☐ **Line 3 Replacement Project**
- ☑ **Both Projects**

No pipeline through MN 1st priority!

We must keep our waters pure. There is no way we can be guaranteed there will not be oil leaks. There always are.

Minnesota takes all the risks. What is the public purpose.
Minnesota's commerce depends on our clean, pure waters.!!

What have you overlooked?? My answer to that is our children's children,... 7+ generations
Our children are not mentioned anywhere.

Is the dept of commerce the best agency to handle this process? Isn't this a conflict of interest --- unless you ~~are~~ believe Minnesota's Commerce depends on our pure, clean waters.

I travel a lot, I love the places which have clean H2O
Let's not go backward!

If including additional pages please number them and tell us how many you are providing: _____ pages

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Long Lake Area Association
P.O. Box 808
Park Rapids, MN 56470

Long Lake Area
ASSOCIATION

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May 20, 2016

Jamie MacAlister
Environmental Review Manager
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul, MN 55101

Subject: PUC Docket Numbers: Sandpiper: PL-6668/CN-13-473 and PPL-13-474, Line 3: PL-9/CN-14-916 and PPL-15-137

Dear Ms. MacAlister,

The Board of Directors for the Long Lake Area Association (Hubbard County) Inc. met 5/14/16. We discussed the MN Department of Commerce's scoping for the Environmental Assessment Worksheet (EAW) and Environmental Impact Statement (EIS). Our comments relate to human and environmental impacts for study in the EIS.

The Long Lake Area Association (Hubbard County) Inc. Board of Directors is very concerned regarding the proximity of the proposed Sandpiper and potentially Line 3 Replacement Route Alternative RA-15 to Long Lake, 29-0161-00, in Hubbard County between Hubbard, MN and Park Rapids, MN. The MN Department of Commerce maps show RA-15 being very close to Long Lake (see attached). The DOC description of RA-15 does not mention Long Lake which has 500 unique lakeshore parcel owners based on 2013 Hubbard County GIS and Assessor information on Long Lake below. The south end of the lake is in the town of Hubbard MN also. Therefore, we request that the MN Department of Commerce, the MPCA and MN DNR working together through the Memo of Understanding be cognizant of, document in the EIS and consider the sensitive and valuable resource that Long Lake is as route alternatives are compared and spill scenarios are determined.

Details on Long Lake 29-0161-00 based on 2013 Hubbard County GIS and Assessor information:

> Based on 2013 Hubbard County GIS data, Long Lake has 500 unique lakeshore parcel owners. There are 622 parcels on this 1926.07 acre lake. There are 136 residential parcels (full homestead) and 364 non-homestead or "seasonal" residents. There are 5 resorts and 1 campground plus 2 public accesses with parking. Long Lake is the largest of 3 lakes in Hubbard Township. This township is the 4th most valuable (tax base wise) in Hubbard County. It has a taxable market value (TMV) for water-related properties of about $166M. This is 70% of the TMV of all property in the township. These properties provide almost 71% of the tax revenue. Long Lake is the most valuable lake in the county based on the county assessor data from 2013. The agricultural lands are part of the other 30% of the TMV in Hubbard Township.

Long Lake is part of the MN DNR's Straight River Pilot Groundwater Management Area. The Minnesota Legislature created groundwater management areas as a tool for the DNR to address difficult groundwater-related resource challenges. The goal of the Groundwater Program is to ensure that use of groundwater is sustainable and does not harm ecosystems, water quality, or the ability of future generations to meet their needs.

[Page 2 - Long Lake Area Association (Hubbard County) Inc. comments continued.]

The MPCA 1989 Ground Water Contamination Susceptibility Map depicts this area with the highest susceptibility to groundwater contamination. Private wells surround Long Lake. Some of these wells currently have nitrate problems causing the water to be above the acceptable level for drinking water. Irrigation pivots also dot the landscape as potato crops are raised in part for the largest employer in the area.

A spill or a leak would affect Long Lake, its residents, tourists, the groundwater and sandy soil of the area with a ripple effect on the townships and county. Please be cognizant of these important environmental and pipeline safety concerns in the EIS and assess the risks in the EIS.

If the Long Lake Area Association (Hubbard County) Inc. can be of assistance, please let us know. Thank you.

Sincerely,

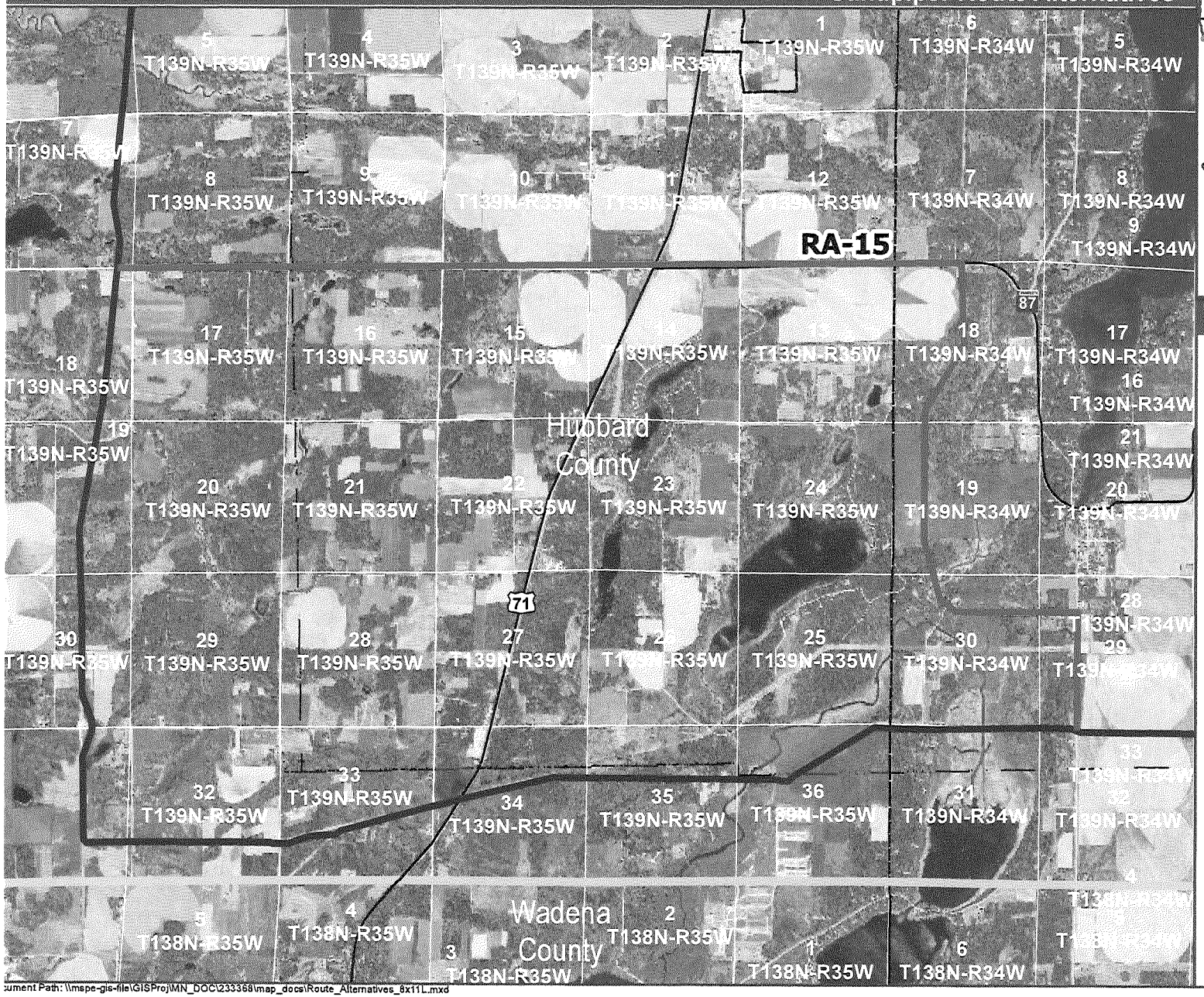
The Board of Directors, Long Lake Area Association (Hubbard County) Inc. SMN

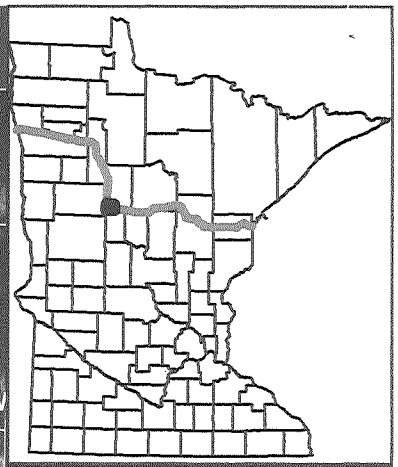
The Board of Directors, Long Lake Area Association (Hubbard County), Inc.

CC: Hubbard County Commissioners, Henrietta and Hubbard Township Supervisors

MINNESOTA DEPARTMENT OF
commerce

RA-15
Sandpiper Route Alternatives





Legend

- Sandpiper Route Alternative
- Sandpiper Proposed Route
- Adjacent Route Alternatives
- Reservation Boundary
- Chippewa National Forest
- Scientific & Natural Area
- Wildlife Management Area
- State Forest
- County Boundary
- City / Township Boundary

0 — 1 Miles

HDR

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MINNESOTA DEPARTMENT OF COMMERCE

Comment Form: Scoping

Energy Environmental Review and Analysis

Please provide your contact information. This information and your comments will be publicly available.

Name: Marti Lundin Phone: (218) 444-7623

Street Address: 4320 Elliot Rd NE

City: Bemidji State: MN ZIP: 56601

Email: martina@midco.net

My comments pertain to:

- ☑ **Sandpiper Pipeline Project**
- ☐ **Line 3 Replacement Project**
- ☐ **Both Projects**

(attached)

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If including additional pages please number them and tell us how many you are providing: 1 pages

May 24, 2016

Jamie Macalister

MN Department of Commerce

85 7th Place East Ste. 500

St. Paul MN 55101-2198

As a lifelong Minnesotan resident and taxpayer, as a professional health advocate who has worked conscientiously by transforming social norms and through supporting legislative change to provide children and adults of our state with healthier environments, and as a 38-year resident of Northern Minnesota's lake country, I fervently oppose Enbridge's proposed route for the Sandpiper Pipeline. I have witnessed the massive pile of pipes by Highway 71 near Itasca State Park demonstrating Enbridge's confidence that what they propose is a done deal, ready to put at risk our state's most sensitive areas. As state leaders you must carefully consider whether this area, including the Mississippi Headwaters, wetlands, shallow aquifers, and lakes is the best location for two huge oil and tar sands pipelines. The route doesn't need to cross the state to Superior to get to its destination in Illinois. One better, safer and more ideal route (if a new pipeline is indeed needed) is along the borders of the Dakotas.

Minnesotans are not benefiting from the oil that is taking a shortcut through our state. Environmental experts tell us that oil spills from pipelines are more difficult to clean up than spills from rail, and that there is no effective method of cleaning up tar sands spills. At a DOC scoping hearing in Bemidji earlier this month it was stated that the current plan does not include a clean-up process for tar sands spills. Please carefully consider the facts from environmental professionals and ensure that the Environmental Impact Statement is comprehensive, performed by independent specialists who are not relying on Enbridge data, and monitored by scientists.

Also, please take into account the economic impact due to a drastic reduction in tourism, including fishing if there were a spill in the northern lakes regions. The long-term damage of inevitable spills needs to be included in the economic impact plan.

My husband and I decided to move from the Twin Cities to Northern MN after witnessing the beauty of Itasca State Park. We appreciate those leaders of long ago, like Mary Gibbs, who stood her ground against environmental destruction in order to preserve that pristine woods and water for wildlife and people of the future to enjoy. Residing near the Headwaters, we have a responsibility to preserve and protect water quality for those downstream and for future generations.

Please consider the entire state of Minnesota and those downstream from us by researching and relying on scientific data rather than Canadian petroleum interests for your Environmental Impact Statement.

Sincerely,

Marti Lundin

Marti Lundin

Bemidji