



EXHIBIT 1
TO CONSOLIDATED APPLICATION OF
VANTAGE PIPELINE US LP for
CERTIFICATE OF CORRIDOR COMPATIBILITY AND ROUTE PERMIT
PSC Case No. PU-11-109

Environmental Report

Prepared by
Gary Holsan Environmental Planning

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EXECUTIVE SUMMARY

Vantage Pipeline US LP (Vantage) has applied to the Department of State (DoS) for a Presidential Permit for the construction, operation, and maintenance of a pipeline facility on the United States-Canada border. DoS considers applications for Presidential Permits for facilities such as pipelines pursuant to the authority delegated to it by the President of the United States under EO 13337, as amended (69 Federal Register 25299). DoS has determined that issuance of a Presidential Permit for the proposed Vantage pipeline project (Vantage Pipeline) would necessitate the preparation of an Environmental Assessment (EA) providing sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) as set forth in National Environmental Policy Act (NEPA) (42 U.S. Code § 4321 et seq.). This document provides an assessment of the existing environment along the proposed pipeline route, an analysis of human and environmental impacts that could potentially result from pipeline right-of-way preparation, construction, operation, and maintenance of the proposed pipeline facilities, and a summary of the protection and restoration measures to be implemented to avoid and/or minimize environmental impacts.

As designated by EO 13337, the DoS is the lead federal agency reviewing the Vantage Pipeline in accordance with the requirements of NEPA. A number of other federal agencies have permitting, environmental review, and regulatory roles with respect to the Vantage Pipeline, including the U.S. Army Corps of Engineers and the U.S. Fish & Wildlife Service (USFWS). State and local agencies were also consulted to identify issues arising during their permitting reviews. On January 11, 2011, the DoS issued in the Federal Register a Notice of Receipt of Application for a Presidential Permit to Construct, Operate and Maintain Pipeline Facilities on the Border of the United States for the Vantage Pipeline project (76 Fed. Reg. 1659). No comments were received during the public comment period, which ended on February 10, 2011.

PURPOSE AND NEED FOR THE PROPOSED PROJECT

The purpose of the Vantage Pipeline is to efficiently transport liquid ethane from natural gas facilities in North Dakota, including the Hess Corporation's natural gas processing plant in Tioga, North Dakota, to the Alberta Ethane Gathering System (AEGS) in Alberta, Canada. Vantage submits that the Pipeline will serve the national interest by providing the oil and gas producing Bakken Formation region of North Dakota with access to the existing ethane AEGS infrastructure and market in Alberta. Currently no market exists for petrochemical grade (also known as "specification" or "pure grade") ethane in North Dakota; however, the construction of the Vantage Pipeline will make it feasible to extract the ethane byproduct from North Dakota-produced natural gas and export it for use in the Canadian petrochemical industry. The pipeline would therefore enhance exports from the United States, consistent with national policy. It would also allow U.S. natural gas producers to recognize additional revenue from an existing resource, and it would contribute to the national economy in terms of jobs and tax payments.

PROPOSED ACTION AND ALTERNATIVES

Vantage, as noted above, seeks a Presidential Permit for that portion of the Vantage pipeline from the northern-most valve to the U.S.-Canada border. As identified on the map provided as Attachment 1, the Vantage Pipeline would cross the U.S.-Canada border near 151st Avenue NW, Divide County, North Dakota at approximately 48.99986 Lat., 104.01050 Long. The Vantage Pipeline's border crossing is approximately 12.2 miles northwest of Fortuna, North Dakota and approximately 9.3 miles south of Beaubier, Saskatchewan. The border crossing is located on pasture land typical of the area and is used by local farmers/ranchers for cattle grazing or hay cropping. For purposes of this Environmental Assessment,

the entire length—79.8 miles—of new 10-inch diameter underground high vapor pressure pipeline, including block valve sites, that make up the Vantage Pipeline project were assessed.

Under the No Action Alternative, the DoS would not issue the Presidential Permit and the project would not be constructed. Environmental impacts discussed in this EA would not occur if the Proposed Action were not realized. Although these impacts would not occur under this alternative, the purpose and need of the Proposed Action would not be met.

POTENTIAL IMPACTS AND MITIGATION

Air Quality

Construction of the proposed pipeline and associated facilities could result in intermittent and short-term fugitive emissions. Pipeline construction proceeds at a relatively rapid pace. Consequently, air emissions would be localized, intermittent, and short term in duration. Construction equipment and other mobile sources used during construction are the primary source of any emissions during construction. Likewise, infrequent and short-term emissions would also result from vehicles used for pipeline maintenance during operation.

Emissions from construction and/or operation are not expected to cause or significantly contribute to a violation of an applicable ambient air quality standard because all equipment would be operated on an as-needed basis and for short duration. All equipment used during construction will be compliant with the national and local emissions standards.

Incremental emissions from the gas plants in North Dakota that are expected to produce specification ethane were examined and it was concluded the amount of incremental emissions as compared to the total emissions in North Dakota would be minimal and have no measurable impact.

Cultural Resources

Measures to minimize impacts to cultural resources identified within the project corridor have been implemented, including re-routing the pipeline to avoid identified sites. The project corridor that was used for the Vantage Pipeline was 300 feet or 150 feet from either side of the center line of the proposed pipeline route. Any sites within the vicinity of the temporary construction right-of-way would be avoided by the use of buffer zones. Conventional boring would additionally be used to bore beneath two identified railroad sites which cannot otherwise be avoided.

If unforeseen changes in the pipeline route and/or construction do occur, a cultural resource specialist would conduct a survey of the area to be impacted. If unanticipated cultural resources are encountered, Vantage would implement procedures as outlined in the Environmental Protection Plan (EPP), Section 8.10, included as Appendix A. These procedures include: ceasing construction, evaluating the site, consulting with the DoS and the State Historic Preservation Officer (SHPO), notifying law enforcement, SHPO, and/or Tribes if human remains are discovered, and implementing measures to avoid, minimize and/or mitigate adverse impacts if the site is eligible for listing on the National Register of Historic Places (NRHP). With the implementation of these measures, no impacts are anticipated during the operational phase of the project.

Since consultation with affected Native American tribes has not yet occurred, it is unknown whether they may attach religious and/or cultural significance to any historic properties that may be affected by the project. The DoS has responsibility to consult with the Tribes, and upon completing the Section 106

consultation process, would consult with any other federal agencies, the SHPO, and Vantage to avoid or mitigate any adverse effects to any identified eligible sites.

Geology, Minerals and Paleontology

No unique geological features that have received state or federal protection would be disturbed by the Vantage Pipeline. Construction and operation of the proposed Vantage Pipeline would result in minor impacts on topography and geology. Primary impacts would be limited to construction activities and consist of temporary alteration of slopes on the construction right-of-way due to grading and trenching operations. These disturbances would be necessary to create a level and safe construction corridor. Impacts would be minimized by returning contours to pre-construction conditions to the extent practicable.

No impacts associated with natural geologic hazards such as landslides, mass movements, and/or earthquakes are anticipated. Due to the limited potential for seismically induced ground movements, there is minimal risk of earthquake related impacts on the Vantage Pipeline. No additional disturbance or loss of unique geological features and/or mineral resources would occur during operations because there would be no additional surface disturbance required beyond that used for construction.

There is some potential for discovery of Pleistocene-era fossils during pipeline grading and trenching where the proposed pipeline route would cross continental glacial drift in North Dakota. Any significant fossils incidentally excavated during pipeline construction would be recovered and studied for the scientific record. Disposition of such finds would be handled in accordance with the directives of qualified personnel.

Health and Safety

To prevent pipeline failures resulting in inadvertent releases, Vantage would construct and maintain the Vantage Pipeline to meet or exceed industry and federal pipeline safety regulatory standards.

Once installed, the pipeline would be subjected to testing to verify its integrity and compliance with specifications. The pipeline would be placed into service only after inspection to ensure all construction and integrity standards are met. The pipeline will be buried to provide a depth of cover of at least 4 feet. This depth will ensure normal agricultural practices on the surface above the pipeline are not hindered or restricted.

Accidental leaks from the pipeline system during operations can also potentially affect the natural and human environments. Ethane is a non corrosive fluid therefore the risk of internal corrosion of the pipeline is minimal. The pipeline would be monitored by a central control facility 24 hours per day, 365 days per year. The pipeline would have automated block valves approximately every 15 miles that could be closed remotely or automatically on sensing of any operational anomaly. Vantage would also implement an emergency response plan were a rupture to occur. Such procedures would include air monitoring, restricting access to the leak site and notifying and coordinating a response with the appropriate state and federal authorities.

Noxious Weeds and Invasive Species

Construction activities would result in surface disturbance that would contribute to the spread of noxious weeds and other undesirable species. In order to mitigate the spread of any noxious weeds, Vantage would implement the Best Management Practices, and weed control practices, identified in the EPP. Such

practices would include: cleaning of construction equipment, conducting a weed survey prior to construction, and consulting with the appropriate authorities to develop weed management plans.

Land Use

The proposed pipeline route would affect approximately 483 acres of agricultural land that would be temporarily disturbed during construction. Temporary disturbance would be caused by trenching, pipe installation, backfilling, and areas necessary for access. Agricultural land would be restored to pre-construction conditions, including re-constructing any fences and/or gates crossed by the pipeline. Agricultural production would resume following construction. Any Conservation Reserve Program (CRP) tracts crossed by the pipeline would be restored to requirements established by the NRCS Farm Service Association.

The proposed pipeline would also impact approximately 0.58 acres necessary to accommodate eight block valve locations. The acreage is used for agricultural purposes, and therefore, would be removed from crop production and pasture use during the operational life of the pipeline. Each block valve location would be fenced, and a permanent access road would also be necessary to allow for maintenance and inspections. Any trees on the permanent pipeline right-of-way would need to be cleared and not replanted.

Noise

Noise impacts would be temporary and largely associated with construction equipment. To mitigate any noise impacts, Vantage would limit construction activities to daylight hours. Noise impacts during operation are not anticipated since pump stations and/or other facilities associated with the pipeline, are not located in North Dakota. Temporary noise, however, may result from the vehicles used during maintenance, inspection, and/or repair activities.

Recreation

Construction of the Vantage Pipeline could temporarily impact wildlife-related recreation activities, including hunting and bird watching. Construction is anticipated to take place in summer through fall of 2012, and therefore, likely avoid the hunting season. All disturbances caused by construction would also be re-vegetated in order to avoid long-term impacts and restore the right-of-way to pre-construction recreational conditions.

Socioeconomics

The Vantage Pipeline is expected to create short-term and long-term economic benefits for communities within North Dakota. It is anticipated that a workforce of approximately 60-75 individuals would be employed for pipeline construction. These jobs are projected to support an average of 0.8 to 1.2 additional jobs elsewhere in the North Dakota economy, and create a total of \$0.7 to \$0.9 million in additional income for local households and businesses. These impacts, however, would be short-term and exist only during construction. Operation of the Vantage Pipeline is also expected to create 2-3 permanent jobs.

Landowners would realize economic benefits from arrangements with Vantage for use of the permanent pipeline right-of-way and for the use of the temporary right-of-way for maintenance and inspection activities during operations. North Dakota natural gas producers would also gain an additional 20-30 percent value for their produced natural gas by extracting the ethane and transporting it to Canada via the pipeline. Likewise, tax revenues created by the project are expected to benefit the state of North Dakota, and also Divide and Williams Counties. The state of North Dakota would receive approximately \$1.38 million in a one-time tax revenue owed due to the construction of the project. Divide and Williams

Counties would also realize annual property tax revenues, totaling approximately \$3.4 million over the first 15 years of operation. These taxes would, among others, benefit local schools.

Local populations may temporarily increase during construction depending on the number of local workers available, but long-term population increases are not expected from the project. Housing may also be temporarily impacted during pipeline construction due to the need for rooms and/or other lodging for the temporary construction workforce. Public facilities and services may also be temporarily impacted, mostly in the law enforcement and emergency medical service fields.

With regard to environmental justice, the Vantage Pipeline is not anticipated to adversely impact areas in the state of North Dakota with higher percentages of minorities and/or individuals below statewide poverty levels. Any health impacts caused by the project would be insignificant and not disproportionately impact a particular community.

Soils

Construction activities such as clearing, grading, trench excavation, and backfilling, as well as the movement of construction equipment along the right-of-way, may result in impacts on soil resources. Soil mixing caused by these activities would be mitigated by procedures outlined in the EPP. These procedures include conducting soil analyses and segregating salvaged soils into appropriate piles. Long term impacts caused by soil compaction would also be mitigated by procedures outline in the EPP, including: ripping, discing, traffic management, and avoiding construction during moist conditions. Soil erosion would be mitigated by restoration of the right-of-way. Any operational impacts on soils are anticipated to be very localized and not significant.

Threatened, Endangered, Candidate, and Sensitive Animal and Plant Species

Endangered and/or threatened species may be impacted by construction of the Vantage Pipeline, however, mitigation measures would be implemented to ensure such impacts are avoided. In consultation with the USFWS and North Dakota Fish & Game Department, six species were identified as occurring within vicinity of the Vantage Pipeline, including: the Grey Wolf, Interior Lease Terns, Whooping Cranes, Piping Plover, Sprague's Pipit, and the Pallid Sturgeon. Of the identified species, the Whooping Crane, Piping Plover, and Sprague's Pipit were identified as potentially being impacted by construction of the Vantage Pipeline. The Whooping Crane's annual migration area occurs in the vicinity of the pipeline. Vantage would cease all construction activities if Whooping Cranes were sighted within one mile of the pipeline corridor and the USFWS would be consulted. Critical habitat for the Piping Plover also occurs within vicinity to the pipeline corridor. To avoid impacts, Vantage would conduct surveys and limit construction activities to take place outside of the breeding season in areas of known habitat. A 200-foot buffer zone would be maintained around known habitat during construction and construction traffic would also not be allowed within 200 feet of habitat. Impacts to the habitat of the Sprague's Pipit would also be mitigated by avoiding construction during the nesting period, implementing pre-construction measures to remove grass and cover, and reclaiming that disturbed habitat.

Vantage reviewed the pipeline route with USFWS for any potential impacts to migratory birds, as well as Bald and Golden Eagles during pipeline construction. In the event construction is to occur during the nesting season period of February 1 to July 15, the construction area may need to be mowed and/or disced prior to the nesting period to remove vegetation cover in order to discourage ground and shrub nesting. Reclamation of the disturbed area would occur immediately following construction. Vantage would also coordinate with USFWS to develop additional strategies to avoid taking any migratory birds during construction, such as avoiding construction during the period from February 1 to July 15 unless migratory bird surveys were completed. If active eagle nests are found, Vantage would delay construction in those

areas until they are uninhabited unless a one-half mile buffer can be maintained. Vantage would also consult with USFWS if occupied eagle nests were identified within a one-half mile buffer during the construction process.

Transportation

Short-term impacts to transportation resources may be caused by the construction of the Vantage Pipeline. Such impacts would be caused mainly to traffic flow on roads used to access the pipeline right-of-way and deterioration of roads due to such use. Vantage would mitigate such impacts by coordinating transportation of construction materials, as well as crews, outside of commuting hours. Multi-lane highways would be used to the extent possible to transport large, slow-moving equipment. Impacts at road crossings would be insignificant due to horizontal boring at all gravel and paved roads. At areas requiring open cuts, detours and emergency crossings would be available. Any damaged roads would be repaired.

Vegetation

Clearing of herbaceous vegetation during pipeline construction would be a short-term impact. Active revegetation and rapid colonization in the disturbed areas would restore most vegetative cover within the first growing season. Vantage would seed the impacted areas to assist with revegetation. Clearing of trees and other woody shrubs would also be temporary in the construction right-of-way, however, would not be restored/replanted in the permanent pipeline right-of-way to allow for inspection and maintenance activities. Both herbaceous and woody vegetation would also be permanently impacted within the block valve locations. These locations would encompass a total of only 0.45 acres, and therefore, would be insignificant.

Wetland vegetation would also be temporarily impacted during construction. A total of 1.05 acres would be crossed by the pipeline and temporarily impacted due to trenching, pipe installation and backfilling. To reduce temporary impacts to wetland vegetation, Vantage would follow the procedures prescribed in the EPP.

Visual Resources

Impacts to visual resources caused by the construction of the Vantage Pipeline would be only temporary and caused by clearing of vegetation and grading activities. Such impacts would be mitigated by restoring the cleared right-of-way to pre-construction conditions pursuant to agreements with private landowners.

Permanent impacts to visual resources may occur, but would be insignificant. Pipeline operations would require eight block valve locations, which would be built above-ground and fenced. The block valves would likely not be apparent from a distance of more than a quarter of a mile due to the varying topography of Divide and Williams Counties. Signs identifying the pipeline corridor would also be necessary. Such signs, however, are commonplace in Divide and Williams Counties where facilities associated with oil and/or natural gas production are frequent.

Water Quality

Pipeline construction could result in temporary impacts to groundwater and surface waters. Pipeline construction activities, such as trenching and backfilling, are limited to five feet in depth, and therefore, should avoid the water table of most aquifers. Dewatering, however, may result in short-term fluctuations to groundwater levels, but would restore quickly after construction. Impacts to groundwater may also be caused by spills of fuels, hydraulic fluids and/or other chemicals associated with construction. Vantage

would implement a Spill Prevention and Control Countermeasures (SPCC) Plan to mitigate any accidental spills during construction, including: response, containment, reporting, and cleanup measures.

Surface waters may also be temporarily impacted during construction due to sedimentation caused by pipeline backfilling and trenching activities. All disturbed construction areas would be handled in accordance with the procedures described in the Storm Water Pollution Prevention Plan (SWPPP), including the use of silt fences and sediment barriers. Permanent impacts to surface waters caused by accidental spills would be mitigated by implementing the measures described in the SPCC Plan.

Hydrostatic testing to evaluate the integrity of the Vantage Pipeline prior to operation would also occur. Approximately 300,000 gallons of water would be necessary to conduct such testing and would be obtained from local water supplies. Separate testing would be conducted between each valve site in order to conserve water. All necessary permits to conduct such testing would be obtained from appropriate authorities and no chemicals or other pollutants would be added to the water.

Wetlands

Construction of the Vantage Pipeline would cause temporary impacts to wetlands crossed by the pipeline right-of-way. Approximately 13 wetlands, totaling 1.05 acres, would be temporarily impacted during construction through the temporary and permanent right-of-way. Temporary wetland impacts include loss of wetland vegetation and wildlife habitat as a result of construction activities; soil disturbance associated with trenching; and increases in turbidity and alterations of hydrology as a result of trenching and soil stockpiling. Vantage would avoid disturbance of wetlands to the extent possible by implementing the measures described in the EPP, including restoration of native soils and vegetation in impacted wetlands, and other measures to decrease sedimentation. Many wetlands within the construction right-of-way can be avoided by decreasing the size of the right-of-way in those areas, thereby allowing a sufficient buffer between the wetlands and the permanent right-of-way. At a minimum, all activities would comply with Section 404 of the Clean Water Act and the U.S. Army Corps of Engineers (ACOE) would be properly consulted.

No wetlands would be permanently filled or drained as a result of constructing and/or operating the project, including all above ground facilities.

Wildlife and Fisheries

Temporary impacts would occur to wildlife due to clearing of vegetation, disturbance of soils, and human presence during construction. The clearing of the right-of-way would cause a short-term impact due to the relatively quick recolonization of plant species. Consequently, wildlife species that use these habitats would also return. Since the pipeline would not cross any perennial streams, impacts to aquatic wildlife would be insignificant. Any temporary impacts would be caused by runoff during snowmelt and/or storm events, and or sedimentation caused by the crossing of temporary waterbodies. Sensitive fish, eggs, fry and other invertebrate habitats downstream of any runoff/sedimentation may be impacted more heavily. Vantage would mitigate any temporary impacts by implementing the procedures outlined in the EPP for erosion and sediment control.

Permanent impacts to wildlife are not anticipated. Pipeline operations necessitate the fencing of eight block valve locations and also the maintenance of permanent access roads. All fences would be built to specifications prescribed by the North Dakota Game and Fish Department and access roads would only result in the loss of approximately 0.58 acres of wildlife habitat.

Cumulative Impacts

Cumulative impacts from the construction of the Vantage Pipeline are not expected to be significant. The ethane transported by the pipeline is not expected to increase oil or natural gas production/development, which would continue regardless of whether or not the Vantage Pipeline is constructed. Any impacts at gas facilities caused by increased ethane extraction as a result of the construction of the Vantage Pipeline, such as air emissions, are expected to be insignificant. With the implementation of mitigation procedures, including those prescribed in the EPP, no significant cumulative impacts to resources, such as soil, water quality, wetlands, wildlife, and vegetation caused by the construction of the Vantage Pipeline and other reasonably foreseeable gas plants/expansions and/or pipelines are anticipated.

1. INTRODUCTION

1.1 BACKGROUND AND OVERVIEW

This Environmental Assessment (EA) was prepared in support of the Vantage Pipeline US LP (Vantage) Application to the U.S. Department of State (DoS) for a Presidential Permit for the construction, operation, and maintenance of a pipeline facility to be known as the Vantage Pipeline originating in the Williston Basin near Tioga, North Dakota, United States, extending northwest across the U.S./Canada border into Saskatchewan near the junction of the North Dakota-Montana-Saskatchewan borders, and terminating south of Empress, Alberta, Canada. The pipeline would be used to transport liquid ethane, a component of natural gas. The DoS has determined that consideration of a Presidential Permit for the proposed Vantage Pipeline project will necessitate compliance with the National Environmental Policy Act, 42 U.S.C. § 4321, *et seq.* The DoS has opted to prepare an EA providing sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Action (FONSI). This document provides an assessment of the existing environment along the proposed pipeline route; an analysis of human and environmental impacts that could potentially result from pipeline right-of-way preparation, construction, operation, and maintenance of the proposed pipeline facilities; and a summary of the protection and restoration measures to be implemented to avoid and/or minimize environmental impacts.

Natural gas production in North Dakota has increased as oil reserves are developed. Natural gas, which is primarily comprised of methane along with smaller amounts of ethane, propane, butane, and condensate (natural gasoline), is produced along with the oil. Natural gas production in North Dakota is now at a level that makes it economically feasible to extract ethane from the natural gas and sell it to ethane consumers. Ethane is used as a feedstock for the world-scale petrochemical facilities located in the province of Alberta where it is converted to ethylene. Ethylene is a building block for a wide range of consumer and industrial products such as plastics, antifreeze, rubber, detergents, and solvents. The proposed Vantage Pipeline would transport ethane from a natural gas processing plant near Tioga, North Dakota to an existing pipeline near Empress, Alberta which currently transports ethane to the Alberta petrochemical industry.

In total, as per the DoS notice in the Federal Register dated January 11, 2011, the proposed Vantage Pipeline would consist of approximately 430 miles of new, high vapor pressure (HVP) steel pipeline and two pump stations. The proposed system would include the construction of approximately 80 miles of new 10-inch diameter pipeline in North Dakota; approximately 350 miles in Saskatchewan, Canada; and approximately 2 miles in Alberta, Canada. One pump station would be located at the midpoint of the pipeline between Lafleche and Assiniboia, Saskatchewan. The second pump station would be located at the terminus near Empress, Alberta. The general location of the project is shown on Figure 1.1-1. Appropriate regulatory authorities in Canada would conduct an independent environmental review for the Canadian facilities. Unless specified, the remainder of this EA describes and evaluates the United States portion of the Vantage Pipeline.

Vantage proposes to begin construction of the project in 2012. Construction would occur over approximately 6 months, with an in-service date on or before January 1, 2013. Land reclamation and environmental impact monitoring would continue through 2013.

1.1.1 Project Proponents

Vantage, the proponent of the Project, is a limited partnership duly organized under the laws of the State of Delaware. Its general partner is Vantage Pipeline US GP LLC, a Delaware limited liability company. Vantage's limited partner is Mistral Energy US Inc., a subsidiary of Mistral Energy Inc. Mistral Energy Inc. is a private company based in Calgary, Alberta.

Mistral Energy US Inc. intends to transfer its ownership position in Vantage to Riverstone Vantage Pipeline US LP prior to construction of the Vantage Pipeline. The limited partners of Riverstone Vantage Pipeline US LP will be Mistral Energy US Inc., an affiliate of Mistral Energy, Inc., and R/C IV Mistral Holdings L.P., an affiliate of Riverstone/Carlyle Global Energy & Power Fund IV, L.P. which is co-sponsored by Riverstone Holdings, LLC and affiliates of The Carlyle Group.

Riverstone Holdings LLC is an energy and power-focused private equity firm founded in 2000 that has over \$17 billion under management across six investment funds. With offices in New York, London and Houston, Riverstone Holdings LLC conducts buyout and growth capital investments in the midstream, exploration & production, oilfield services, power and renewable sectors of the energy industry. Riverstone Holdings LLC is owned by its two founders, David Leuschen and Pierre Lapeyre, Jr.

R/C IV Mistral Holdings L.P. and Riverstone/Carlyle Global Energy & Power Fund IV, L.P. are each Delaware limited partnerships. Riverstone/Carlyle Energy Partners IV, L.P. is the general partner of each of R/C IV Mistral Holdings L.P. and Riverstone/Carlyle Global Energy & Power Fund IV, L.P. R/C Energy GP IV, LLC is the general partner of Riverstone/Carlyle Energy Partners IV, L.P., and Riverstone Holdings LLC is the managing member of R/C Energy GP IV, LLC. R/C Energy GP IV, LLC is managed by a Managing Committee comprising up to 10 members, with Riverstone Holdings LLC appointing up to eight representatives and affiliates of The Carlyle Group appointing up to two representatives. Vantage, the proponent of the Project, is a limited partnership duly organized under the laws of the State of Delaware. Its general partner is Vantage Pipeline US GP LLC, a Delaware limited liability company. Vantage's limited partner is Mistral Energy US Inc., a subsidiary of Mistral Energy, Inc. Mistral Energy, Inc. is a private company based in Calgary, Alberta.

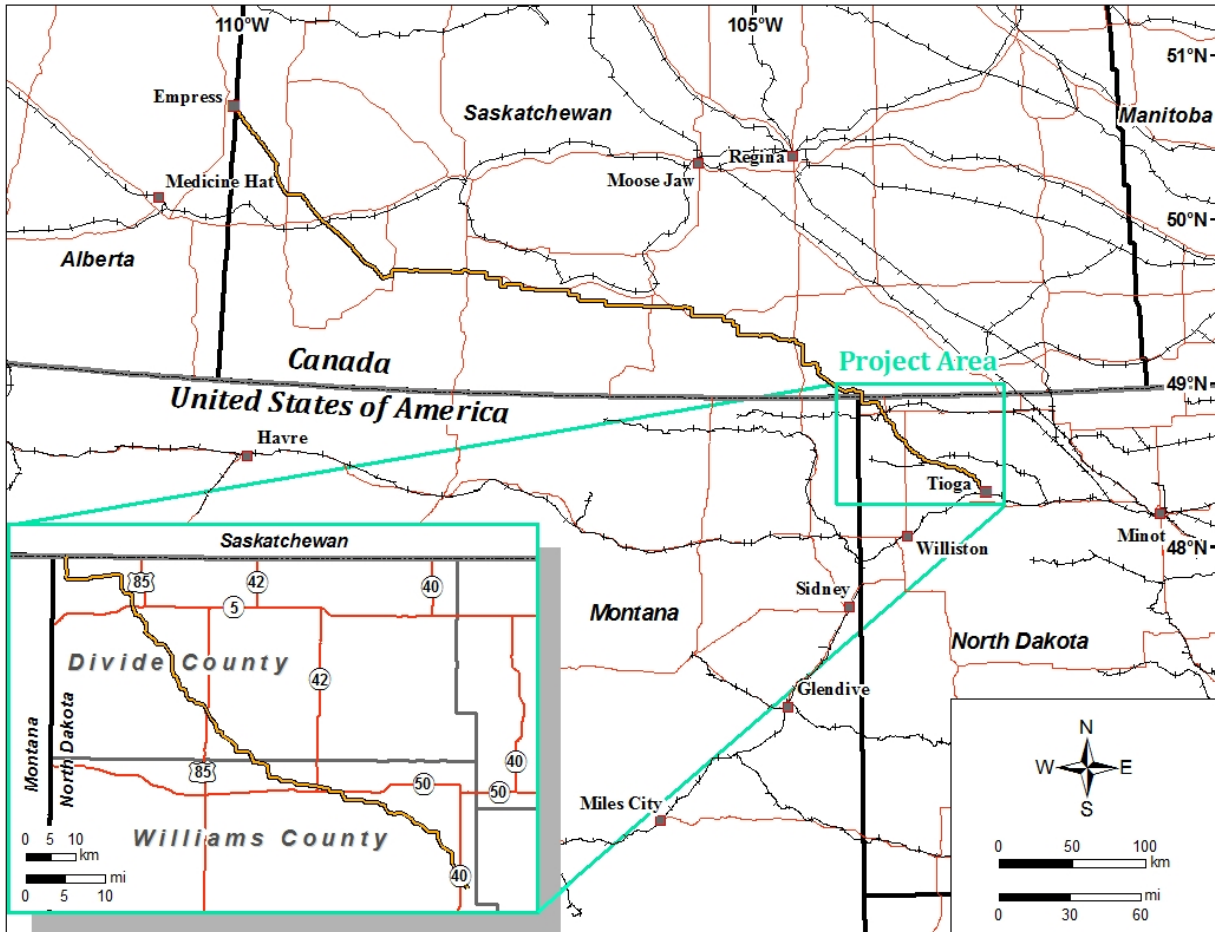


Figure 1.1-1. Project Area Location

1.2 PURPOSE OF AND NEED FOR THE PROJECT

The purpose of the Vantage Pipeline is to transport ethane from existing natural gas facilities in the Williston Basin of North Dakota to meet the market created by the petrochemical industry in Alberta, Canada.

The need for the project is dictated by the increasing ethane supplies in the Williston Basin, and demonstrated interest from the petrochemical industry in Alberta to purchase these increased supplies. Vantage has signed a contract with Hess Corporation (Hess) and NOVA Chemicals Corporation (NOVA) to purchase and transport ethane from Hess' Tioga Gas Plant to NOVA's Joffre Petrochemical Complex in Alberta under a long-term agreement.

1.2.1 Supply Component

The primary initial source of supply for the Vantage Pipeline is the Hess Corporation's Tioga Gas Plant in the Williston Basin of northwestern North Dakota. Additional producers may be added in the future.

1.2.2 Demand Component

The Vantage Pipeline would provide ethane to Nova's Joffre Petrochemical Complex at an initial rate of approximately 40,000 barrels per day, expandable to 60,000 barrels per day with a 10-inch pipe and 2 additional pump stations. This expansion capability would accommodate future ethane supply from other Williston Basin producers.

1.2.3 National Interest

The construction of the Vantage Pipeline would serve the national interest by providing the ethane-producing Bakken Formation region of North Dakota with access to the existing Alberta Ethane Gathering System (AEGS) pipeline infrastructure and market in Alberta, thereby helping to meet the President's goals of increasing U.S. exports, while also helping energy producers in the United States to increase revenues from existing resources. In addition, the Vantage Pipeline would contribute to employment and the tax base of North Dakota.

In recent years, natural gas production in the Bakken Formation region of North Dakota has been increasing as oil reserves are developed. Natural gas, which is primarily comprised of methane along with smaller amounts of ethane, propane, butane, and condensate (natural gasoline), is produced along with oil. Many of these materials are extracted separately from the natural gas and sold to consumers. For instance, propane, butane, and condensate are currently extracted from the natural gas by North Dakota producers and separately transported to market via pipeline, truck, or rail. However, ethane is not currently extracted from produced natural gas since no infrastructure presently exists to transport it to those markets that use ethane as a feedstock. Natural gas production in North Dakota is now at a level that makes it economically feasible to extract ethane from the natural gas, provided that access to an ethane market can be obtained.

A market for the sale of ethane as a feedstock does not exist in North Dakota; however, ethane is currently used as a feedstock by the petrochemical industry in Alberta, Canada. These petrochemical facilities convert ethane to ethylene, which is the building block for a wide range of consumer and industrial products, such as plastics, antifreeze, rubber, detergents, and solvents. Because of its use as a feedstock, a robust market and demand for ethane exists in Alberta. Ethane is currently transported to/distributed amongst the Alberta petrochemical industry by way of the existing AEGS ethane pipeline infrastructure, which has been in operation since 1978. Construction of the Vantage Pipeline would provide North Dakota natural gas producers with access to the AEGS, thereby making it economically feasible to begin extracting ethane from processed natural gas.

The Vantage Pipeline would also assist in meeting national interests to increase exports. On March 11, 2010, through Executive Order, the President issued a National Export Initiative ("NEI") focused on "ensuring that U.S. businesses can actively participate in international markets by increasing their exports of goods, services and [] products." See NEI, available at <http://www.whitehouse.gov/the-press-office/executive-order-national-export-initiative>. The NEI was issued to help meet the President's "goal of doubling U.S. exports in 5 years by," among others, "helping firms ... overcome the hurdles to entering new export markets." *Id.* In a report recently issued on September 16, 2010, the Export Promotion Cabinet established by the NEI, recommended to the President that "Canada and Mexico play a special role as the United States' largest export markets," and are therefore "a high priority in terms of broadening the base of exporting U.S. companies." Report, at 23, available at http://www.whitehouse.gov/sites/default/files/nei_report_9-16-10_full.pdf. The Cabinet reiterated that increasing U.S. exports to countries, including Canada, is "good for American business, good for American workers and good for American jobs." *Id.* at 1. The Vantage Pipeline would assist in meeting

the goals of the President's NEI by increasing exports of ethane to Canada by 2012 by providing an economic ethane market to North Dakota natural gas producers.

Apart from the national benefit of expanded export opportunities, North Dakota producers of ethane would receive an additional 20-30 percent value for selling ethane to consumers in the Canadian petrochemical industry, in contrast to the value received if the ethane is not extracted from the produced natural gas. Thus, the Vantage Pipeline would benefit the nation's energy sector, and make more productive use of existing resources, with a minimal level of investment and no significant adverse environmental impact.

Further, the \$300 million investment in the construction of the Vantage Pipeline would provide additional economic benefits to those communities where the Vantage Pipeline is being constructed/operated. In the United States, approximately \$60 million would be invested in North Dakota. North Dakota towns and communities along the pipeline route would benefit from increased spending during pipeline construction. Individuals would also benefit from the fact that 60 – 75 persons would be employed during the proposed six month-long construction period. Long-term employment opportunities would be created for 2 – 3 individuals for ongoing pipeline operations.

1.2.4 Project Financing

Riverstone Holdings LLC, through a subsidiary, would provide Vantage with the capital necessary to construct and operate the Vantage Pipeline. Riverstone would in turn fund these requirements through a combination of equity and funds obtained from Canadian and U.S. capital markets. Riverstone may secure debt financing for the construction and operation of the Vantage Pipeline. If debt financing is arranged, it is expected that the debt to equity ratio would be approximately one-third debt and two-thirds equity. As an interstate carrier of ethane, the rates, tariffs, and accounting practices for the Vantage Pipeline would be subject to the regulatory jurisdiction of the Federal Energy Regulatory Commission in the United States and the National Energy Board in Canada.

1.3 SUPPLY AND MARKETS

This section provides an overview of the ethane supply available to the Vantage Pipeline project and a description of the ethane market in Alberta, Canada that can be accessed by the Vantage Pipeline project. A detailed analysis of ethane supply and demand related to the Vantage Pipeline is provided in a report entitled, "Ethane Supply and Demand for the Vantage Pipeline" prepared by Purvin & Gertz Inc. and included as Appendix C.

1.3.1 Alberta Ethane Supply

The production of ethane in Alberta is directly related to natural gas production and exports from the province. Traditionally, the majority of the ethane has been recovered by the straddle plant system in Alberta which processes natural gas exports. All economically available ethane is being recovered from the existing gas supply.

Gas-directed drilling has declined sharply in Alberta and throughout western Canada in recent years largely as a result of low prices and high costs. The development of unconventional gas resources in North America has also been a significant contributing factor to the decline in gas-directed drilling in western Canada.

Exports of natural gas from Alberta and western Canada have in turn declined. Ongoing decline of the gas supply coupled with an increase in Alberta demand is expected to further reduce gas exports.

As natural gas supply and exports from Alberta have dropped, ethane supply has fallen. A shortfall exists between the Alberta petrochemical demand and what the western Canadian ethane market can supply. While additional ethane supply is potentially available in Alberta, significant new investments in gas processing and natural gas liquids (NGL) infrastructure would be required. In spite of available incentives, no large incremental ethane supply projects have been developed to address the supply shortfall. This is a strong indication that the costs associated with recovering incremental ethane supply are so high that they are currently uneconomic to produce. Therefore, the shortfall is expected to grow and continue for the foreseeable future.

1.3.2 Alberta Ethane Demand

Petrochemical consumption in Alberta is the primary driver of ethane demand in Western Canada. Virtually all of the ethane produced in Western Canada is consumed by the Alberta petrochemical industry. There are two large ethylene production complexes, one operated by Dow Chemical Canada LLC (Dow) in Fort Saskatchewan and the other operated by NOVA in Joffre. There was a significant increase in ethane demand with the expansion of the Dow facility in 1999 and the NOVA facility in 2000.

Forecasts show that potential ethane demand would exceed ethane supply in Western Canada, and that the Alberta petrochemical industry would continue to consume all available ethane over the next 15 years. Current petrochemical consumption in Alberta is approximately 215,000 barrels per day (bpd). The nameplate ethane consumption capacity of the Alberta petrochemical industry is approximately 250,000 bpd. The petrochemical facilities currently have approximately 35,000 bpd of unutilized capacity. Forecasts show that this unutilized capacity would continue to grow. It is expected that the western Canadian petrochemical industry will be faced with a shortfall of greater than 76,000 bpd of ethane by 2014.

1.3.3 North Dakota Ethane Supply

The Williston Basin, which covers parts of western North Dakota, eastern Montana, and parts of Saskatchewan and Manitoba, is primarily an oil play. It is estimated to contain several hundred billion barrels of oil in place. Of the estimated oil in place, approximately 4 billion barrels of oil are considered recoverable with existing technology.

The Williston Basin has seen rapid production increases in recent years due largely to high oil prices and technological improvements, such as horizontal drilling and multistage fracturing. The Bakken geological formation has been the most significant target of Williston Basin exploration activity, although producers are now also looking at the Three Forks formation for production. Associated gas production has increased coincident with the oil production, and this associated gas has high ethane content (typically in excess of 20 percent ethane). Virtually all of the ethane produced with natural gas is currently left in the gas stream.

In 2009, oil production in North Dakota was approximately 220,000 bpd, compared to only 80,000 bpd in 2003. North Dakota natural gas production was relatively flat at 150 million cubic feet per day (mmcf) from 2000 through 2005. From early 2006 to late 2010, gas production has more than doubled to approximately 340 mmcf. A number of producers have significant development plans in the prime areas for production growth in northwestern North Dakota, in the counties of Mountrail, Williams and McKenzie.

The recovery and sale of specification ethane provides an additional source of revenue to Bakken producers. Estimates suggest that there will be approximately 40,000 to 45,000 bpd of ethane available to the Vantage Pipeline.

Further, several new gas plants or gas plant expansions have been announced to occur within North Dakota. The largest expansion is at the Hess plant near Tioga, ND. The Tioga plant is currently the largest and oldest natural gas processing plant in the state of North Dakota. The expansion will more than double the current capacity of the Tioga plant to exceed 250 mmcf/d of natural gas. In addition to the plant expansion, Hess plans to construct a 120,000 bpd oil and natural gas liquid rail loading terminal. Construction of both the plant expansion and rail loading terminal has commenced and these facilities are expected to be in service by the end of 2012. In addition to the gas plant, gas gathering and railcar terminal expansion, Hess has announced production expenditures of approximately \$3.1 billion in the Bakken oil shale where Hess plans to operate 15 rigs.

The Hess plant at Tioga is the initial ethane supply source for transport to Canada via the Vantage Pipeline. The Vantage Pipeline may in the future also transport ethane produced from other North Dakota-area natural gas producers. Any cumulative impacts associated with the Hess plant expansion are addressed in Sections 5.2 – 5.7 below.

1.3.4 Shipper Demand for Transportation Service

Vantage has negotiated a binding commitment with NOVA for service on the Vantage Pipeline. The transportation service agreement entered into with NOVA commits capacity on the Vantage Pipeline to NOVA for ethane purchased directly from and originating at Hess's natural gas plant located in Tioga, North Dakota. Ethane transportation service under this agreement is scheduled to commence in the 4th quarter of 2012, with initial contract service quantities escalating to approximately 30,000 bpd by the calendar year 2015. The term of the agreement is 10 years, with options for two 5-year extensions.

In addition, in a news release dated July 15, 2010, NOVA announced a memorandum of understanding with Hess to purchase 100 percent of the ethane produced at the Hess Tioga gas plant under a long term arrangement. The Vantage Pipeline fills a need for liquid ethane transportation service from the growing supply regions of North Dakota and Saskatchewan, to supply the ethane constrained market in Alberta. There are and will be adequate markets to support the long-term utilization of the Vantage Pipeline.

As the maximum capacity of the 10-inch Vantage Pipeline is 60,000 bpd, NOVA Chemicals' transportation commitment represents approximately 50 percent of the capacity available for shippers. Uncommitted capacity would be marketed and made available to qualified shippers through the ongoing business development efforts of Vantage. Primary qualifications for shippers include creditworthiness, along with confirmation of supply at an approved receipt point and an AEGS offtake arrangement at the delivery end of the Vantage Pipeline.

1.4 FEDERAL APPROVAL PROCESS AND AUTHORIZING ACTIONS

The DoS is the lead federal agency reviewing the project in accordance with the requirements of NEPA. A number of additional federal agencies have permitting, environmental review, and regulatory roles with respect to the Vantage Pipeline, and are summarized below.

1.4.1 Department of State

Executive Order (EO) 11423, as amended by EO 12847 and EO 13337, governs the DoS' issuance of Presidential Permits authorizing the construction of pipelines carrying petroleum, petroleum products, and other hydrocarbon liquids across United States international borders. Within the DoS, the Bureau of Economic and Business Affairs, Office of International Energy and Commodity Policy, receives and processes Presidential Permit applications. Upon receipt of a Presidential Permit application for a cross-border pipeline, the DoS is required to request the views of the Secretary of Defense, the U.S. Attorney General, the Secretary of the Interior, the Secretary of Commerce, the Secretary of Transportation, the Secretary of Energy, the Secretary of Homeland Security, the Administrator of the U.S. Environmental Protection Agency (EPA), and other government department and agency heads as the Secretary of State deems appropriate. The DoS also solicits comments from the public through publication of a notice in the Federal Register.

In evaluating Presidential Permit applications, the DoS complies with the environmental review requirements of NEPA, as well as other applicable statutes. After consideration of the views obtained from various authorities and interested party commenters, the DoS makes a determination as to whether the proposed project would serve the national interest. If it is determined that the project would serve the national interest, the DoS prepares a Presidential Permit that includes terms and conditions as the national interest may, in the DoS' judgment, require. The DoS is further required to notify those agencies required to be consulted of its proposed determination. If any of those agencies disagrees with the determination within 15 days of notification, it may ask the DoS to refer the matter to the President of the United States for his/her consideration and a final decision. If no agency disagrees within the 15-day period, the DoS shall issue or deny the permit in accordance with the proposed national interest determination.

1.4.2 U.S. Army Corps of Engineers Section 404 Clean Water Act and Section 10 Rivers and Harbors Act

Section 404 of the Clean Water Act (CWA) establishes a permit program administered by the ACOE to regulate the discharge of dredge and fill materials into the waters of the United States, including their adjacent wetlands. The Vantage Pipeline would be under the jurisdiction of the Omaha District of the USACE. Vantage conducted a desktop analysis and started field surveys in the summer of 2010 to identify USACE jurisdictional waters of the United States.

Regulations prescribed in 33 CFR part 320 and procedures of 33 CFR part 325 define the process to be followed by the USACE to issue Department of the Army (DA) permits to authorize certain structures or work in or affecting navigable waters of the United States pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) (hereinafter referred to as Section 10). Work in or affecting navigable waters of the United States is also regulated under authorities of the DA, including discharges of dredged or fill material into waters of the United States, pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344; see 33 CFR part 323). Nationwide permits are used for authorization by the DA for a category or categories of activities on a nationwide or regional basis when those activities are substantially similar in nature and cause only minimal individual and cumulative environmental impacts, or when the general permit would result in avoiding unnecessary duplication of the regulatory control exercised by another federal, state, or local agency provided it has been determined that the environmental consequences of the action are individually and cumulatively minimal.

Nationwide Permit 12 – Utility Activities (NWP 12) authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. Coverage under NWP 12 is available when the Proposed Action would not result in greater than

one-half acre loss of waters of the United States. Since construction of the Vantage Pipeline would only result in temporary disturbance, the land would be returned to its original topography, the loss of waters of the United States would be less than one-half acre, NWP 12 is applicable to the construction activities and related impact to waters of the United States that would result during construction of the Vantage Pipeline.

1.4.3 Advisory Council on Historic Preservation

Section 106 of the National Historic Preservation Act (NHPA), as amended, requires the lead federal agency to take into account the effects of its undertakings on historic properties or historic resources that are listed in, or eligible for listing in, the NRHP, and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment if there would be adverse effects on NRHP-eligible properties. Historic properties are defined as prehistoric or historic districts, sites, buildings, structures, objects, or properties of traditional religious or cultural importance, which are listed or eligible for listing in the NRHP, including artifacts, records, and material remains related to such a property or resource.

The DoS, as the lead federal agency, is responsible for NHPA Section 106 compliance for all lands, both public and private, affected by the Vantage Pipeline. The DoS is using the services of Vantage, as the applicant, to prepare information, analyses, and recommendations necessary to comply with Section 106 in accordance with ACHP's regulations at 36 Code of Federal Regulations (CFR) Section 800.2. To date, Vantage has completed a record review for the Proposed Action study areas (i.e., Class I inventories). Field inventories (i.e., Class III surveys) and architectural surveys have been completed for the proposed pipeline route. Information from record searches and field inventories would be compiled into reports to be submitted to the DoS and other jurisdictional agencies, as appropriate. The DoS would consult with the North Dakota State Historic Preservation Office (NDSHPO) to determine site eligibility for the NRHP and the project's effects on historic properties within the Area of Potential Effect. If the proposed project would adversely affect historic properties, the DoS would require the preparation and implementation of treatment plans to mitigate adverse effects. No construction would begin in these areas until the required consultations and approvals are received.

As the lead federal agency, the DoS is also responsible for complying with Section 101(d) of the NHPA and the American Indian Religious Freedom Act. Compliance involves contacting Native American groups with an interest in the lands affected by the proposed Vantage Pipeline and ensuring that the requirements of the Native American Graves Protection and Repatriation Act are met.

1.4.4 U.S. Fish and Wildlife Service

The USFWS is responsible for ensuring compliance with the Endangered Species Act (ESA). The DoS, as the lead federal agency, is responsible for initiating informal consultation with the USFWS to determine the likelihood of effects on listed species. The DoS, or the applicant as a non-federal party, is required to consult with the USFWS to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitat occur in the vicinity of the proposed project. If, upon review of existing data, the DoS determines that these species or habitat may be affected by the proposed project, the DoS is required to prepare a Biological Assessment (BA) to identify the nature and extent of adverse impact and to recommend mitigation measures that would avoid the habitat and/or species or that would reduce potential impact to acceptable levels. If, however, the DoS determines that no federally listed or proposed endangered or threatened species or their designated critical habitat would be affected by the proposed project, no further action is necessary.

1.4.5 Pipeline and Hazardous Materials Safety Administration

The Office of Pipeline Safety (OPS), Pipeline and Hazardous Materials Safety Administration (PHMSA), within the U.S. Department of Transportation (DOT) is the primary enforcement agency that regulates the safety of interstate transportation of hazardous liquids. To comply with federal regulations (49 CFR Part 195), Vantage would be required to develop a comprehensive Emergency Response Plan for the Vantage Pipeline and areas of operation.

1.5 PERMITS AND RELATIONSHIP TO NON-FEDERAL POLICIES, PLANS, AND PROGRAMS

A preliminary list of federal, state, and local permits and approvals is provided in Table 1.4-1.

Table 1.5-1. Permits and Approvals for the Vantage Pipeline			
NAME OF AGENCY	PERMIT/ACTIVITY APPLICATION	SUBMITTAL DATE	ANTICIPATED RECEIPT
FEDERAL			
U.S. Army Corps of Engineers	§ 10 Navigable Water Crossing Permits	Not applicable	
	Nationwide Permit 12		Prior to construction, preconstruction notification may be required
U.S. Department of State	Presidential Permit for Facility on the United States – Canada Border		
U.S. Fish and Wildlife Service	Section 7 Consultation		Informal consultation is ongoing
STATE OF NORTH DAKOTA			
Public Service Commission	Certificate of Corridor Compatibility and Route Permit		
Department of Health-Division of Water Quality	Water quality certification pursuant to section 401 of Clean Water Act		Prior to construction, after completion of the final pipeline design.
	Pollution Discharge Elimination System general permit for temporary dewatering, Hydrotest Water Discharge		
	Pollution Discharge Elimination System general permit for temporary dewatering, Trench and Well Point Dewatering Discharge		
	General permit for Construction Stormwater Discharge		
State Water Commission- State Engineer	Sovereign Land Use Permit		
State Water Commission	Temporary Water Use Permit, water appropriations for hydrotesting ¹		Permit not anticipated

Table 1.5-1. Permits and Approvals for the Vantage Pipeline			
NAME OF AGENCY	PERMIT/ACTIVITY APPLICATION	SUBMITTAL DATE	ANTICIPATED RECEIPT
State Historical Preservation Office	Section 106 Historic Preservation Act Consultation		
COUNTIES – NORTH DAKOTA			
Divide County	Waterway Crossing Permit	Not applicable	
Williams County	Waterway Crossing Permit	Not applicable	
North Dakota Department of Transportation	State Highway Crossing Permit (4 crossings)	4/14/2011	4/28/2011
Burlington Northern Santa Fe Railroad	Railroad Crossing Permit	4/11/2011	12/07/11
Canadian Pacific Railroad	Railroad Crossing Permit	4/06/2011	08/06/2011
Divide County	County Road Crossings (3 crossings)	4/08/2011	6/15/2011
Williams County	County Road Crossings	4/08/2011	5/03/2011
North Dakota Land Department	State Land Crossing Permit	9/09/2010	Not Applicable due to alignments re-routes

¹ Permit not anticipated since surface water will not be used for hydrostatic testing.

1.6 RIGHT-OF-WAY ACQUISITION PROCESS

The Vantage Pipeline would be constructed within Vantage’s right-of-way within Williams and Divide Counties, North Dakota.

Construction of the proposed pipeline would generally require a 70-foot-wide construction right-of-way to allow temporary storage of topsoil and spoil and to accommodate safe operation of construction equipment. The spoil side (i.e., topsoil and ditch spoil stockpile area) would typically be 25 feet wide and located within the permanent right-of-way. The working side (i.e., equipment work area and travel lane) would typically be 45 feet wide and 40 feet of this width would be located outside of the permanent right-of-way. Following construction, a 30-foot-wide permanent right-of-way would be maintained for operation of the pipeline.

Vantage would seek to acquire any additional right-of-way for the Vantage Pipeline by negotiating easements with landowners along the pipeline route. Vantage would negotiate permanent easements that would grant the company the right to construct, operate, and maintain the pipeline in the permanent right-of-way. Vantage would also negotiate temporary easements for additional workspace needed to construct the pipeline. Landowners would receive monetary compensation in return for granting easements, including compensation for temporary loss of use during construction, crop damages, and the restoration of unavoidable damage to property during construction. If an easement cannot be negotiated with the landowner, Vantage may acquire easements needed for pipeline construction under state eminent domain laws. State statutes define the prerequisites to utilizing eminent domain and set forth the eminent domain process.

1.7 AGENCY REVIEW AND PUBLIC OUTREACH

Vantage initiated discussions with federal and state agencies in mid-summer 2010 regarding the proposed project. Additionally, Vantage initiated preliminary outreach with landowners and local, county, state, and federal elected officials along the proposed pipeline route. To continue this outreach, Vantage is prepared to hold applicant-sponsored public informational sessions (i.e., open houses) and/or participate in agency-led scoping meetings at key locations along the pipeline route to assist in identifying issues and receiving public input and to include results of such in their applications to the DoS.

1.7.1 Public Outreach and Open Houses

Vantage has initiated preliminary outreach with landowners and local, county, state, and federal elected officials along the proposed pipeline route. All landowners of record have received a mailing introducing the project. The letters dated August 13 through August 23, 2010 provided an overview of the project and a fact sheet addressing the specifics of the project along with a map depicting location. A website was established to provide stakeholders with an array of information about the project, including maps and points of contact if more information is needed.

Vantage attended meetings with the Divide and Williams County Commissioners and made presentations about the project on August 24, 2010. Vantage also phoned county commission chairs in both counties. The Commissioners gave unanimous approval to the project. Vantage has incorporated messaging regarding easement, safety, environmental stewardship, land use and reclamation and tax benefits into their information materials.

1.7.2 Agency Coordination and Consultation

Following is a summary of meetings and phone calls with federal, state, and county agencies contacted during preparation of the Presidential Permit application and environmental review. An initial meeting was held between the DoS and Vantage in June, 2010 to discuss Vantage's plans and DoS involvement, as well as the environmental review process being undertaken by DoS. Further follow-up phone calls were undertaken to keep the DoS apprised of the project. In June of 2010 an information package was sent to the EPA and a follow-up phone call was made to answer any questions regarding the project. In September 2010, a meeting was held between Vantage and the Pipeline and Hazardous Materials Safety Administration (PHMSA). A project review was provided and a number of questions regarding the design of the pipeline were answered.

In September, 2010 a meeting was held between Vantage and staff from North Dakota Senator Kent Conrad's office. A project review was provided and no outstanding concerns noted. In September, 2010 a meeting was held between Vantage and staff from U.S. House Representative Earl Pomeroy's office. A project review was provided and no outstanding concerns noted.

A meeting was held between Vantage, USACE, NDSHPO, USFWS, ND Department of Health, ND Game and Fish and ND State Water Commission in August, 2010 to review the project and receive initial feedback regarding the proposed pipeline route and any known environmental concerns along the proposed route. A follow up meeting was held with USACE, USFWS, ND Department of Health, ND Office of the State Engineer in December 2010 to review findings of the environmental surveys along the proposed pipeline route that were completed in the 3rd and 4th quarters of 2010.

Further, as discussed in Sections 3.3 and 4.1.2, certain Native American Tribes may be affected by the construction and/or operation of the Vantage Pipeline. During initial fieldwork, a representative of either

the Fort Peck Tribes or the Three Affiliated Tribes was present and aided in the identification and recording of sites with religious and cultural significance. The DoS still has yet to, but will complete consultations with Tribal Historic Preservation Officers (THPO) of affected Tribes pursuant to Section 106 of the NHPA in order to take into account the presence or absence of Traditional Cultural Properties of religious and/or cultural significance.

Stakeholder meetings were held in Bismarck, North Dakota. Results of these meetings are summarized in Table 1.7.1-1.

Table 1.7-1. Summary of Issues Identified During Preliminary Stakeholder Review		
ISSUE/ENTITY	LETTER/ MEETING DATE	COMMENTS
AGENCY COORDINATION U.S. Fish & Wildlife Service (USFWS), U.S. Army Corps of Engineers, State Historical Society of North Dakota	August 1, 2010	Coordinate with USFWS on the following: <ul style="list-style-type: none"> • Known locations of piping plover critical habitat. • Available protective measures for Aransas Wood Buffalo Population of whooping cranes. • Potential habitat for Sprague's pipit. • Avoid all property interests within the National Wildlife System, when possible, during construction. • Obtain Special Use or right-of-way permits for construction affecting property interests administered by USFWS. • Coordinate with the Zone Archeologist regarding cultural resources. • Coordinate with USFWS and the Army Corps of Engineers if a 404 permit is required.
North Dakota Game & Fish Department	August 4, 2010 July 19, 2011	<ul style="list-style-type: none"> • Contact NDG&F if the route crosses land enrolled in the access program to determine if there will be any payment deductions due to the pipeline construction. • Inform NDG&F if there are any significant changes to the alignment. • For areas within ¼ mile of a sharp-tailed grouse active ground, construction should not occur March 1 through May 15. Construction activities should not occur until 2 hours after official sunrise.
North Dakota Department of Health (NDDH)	August 1, 2010	<ul style="list-style-type: none"> • A construction storm water permit (NDR10-0000) from the NDDH will be required and Vantage would be required to prepare a Storm Water Pollution Prevention Plan (SWPPP). • A Temporary Dewatering and Hydrostatic Testing permit (NDG07-0000) would be required from the NDDH for construction dewatering and discharge from hydrostatic testing.

Table 1.7-1. Summary of Issues Identified During Preliminary Stakeholder Review		
ISSUE/ENTITY	LETTER/ MEETING DATE	COMMENTS
SENSITIVE RESOURCES USFWS	August 1, 2010	<ul style="list-style-type: none"> Avoid documented and potential nesting wetlands for piping plover from April 1 through September 1. Maintain a one-half mile no-entry buffer around all shorelines during construction, which may entail rerouting the pipeline if nesting season cannot be avoided; and Avoid all vehicle use on any wetland shoreline, including a 200-foot buffer, in the project area. Cease construction and immediately contact the USFWS if a whooping crane is sighted within one mile of a pipeline or associated facilities during construction. Maintain a one-half-mile buffer around golden and bald eagle nests. To the extent practicable, schedule construction for late summer or fall/early winter so as not to disrupt waterfowl or other wildlife during breeding season (February 1 to July 15). Provide a detailed plan to avoid or mitigate for unavoidable impacts to wetlands. Make no stream channel alterations or changes in drainage patterns. Install and maintain appropriate erosion control measures to reduce sediment transport to adjacent wetlands and stream channels.
	December 7, 2010	<ul style="list-style-type: none"> Avoid construction during periods when ground nesting species are present within construction right-of-way. Habitat modifications may be considered. Surveys should be performed prior to construction disturbance. USFWS would review the route within wetland easements during the spring of 2011.
	February 3, 2011	<ul style="list-style-type: none"> USFWS reviewed species sections of draft EA, finding the timing restrictions and buffer zones to be adequate. USFWS recommended additional measures to avoid impacts to migratory birds, including: conducting surveys if construction occurs from February 1 to July 15; and if nests and/or birds are discovered within the construction area, to consult with the USFWS prior to construction in that area.
	August, 2011	<ul style="list-style-type: none"> Ongoing informal Section 7 Consultation with the USFWS regarding the results of any surveys will continue. If piping plover nesting is present within a 0.5 mile radius of the proposed project, all construction activities will cease or will not be implemented within that radius until the birds are done utilizing those breeding habitats.
	North Dakota Game & Fish	August 4, 2010

Table 1.7-1. Summary of Issues Identified During Preliminary Stakeholder Review		
ISSUE/ENTITY	LETTER/ MEETING DATE	COMMENTS
North Dakota State Water Commission	December 7, 2010	<ul style="list-style-type: none"> and ensure that erosion control BMPs are in place during the construction. Construction of the pipeline should not result in drainage of wetlands or other waterbodies. North Dakota Century Code, Chapter 61-32 – Wetlands addresses rules related to drainage of wetlands. A Conditional Water Permit or Temporary Water Permit would be required for appropriation of surface or ground water for use in hydrostatic testing.
U.S. Department of Agriculture (USDA) North Dakota State office and USDA Farm Service Association	August 13, 2010 August 31, 2010	<ul style="list-style-type: none"> Provided pipeline routing maps to USDA personnel and inquired regarding existence of parcels enrolled in conservation programs along proposed alignment.
RESTORATION USFWS	August 1, 2010	<p>Reseed disturbed areas with a mixture of native grass and forb species immediately after construction to reduce erosion.</p> <p>If trenching is performed in grassland habitat, complete post-construction reseeding of native prairie grasses, forbs, and legumes. Planting of diverse species is encouraged.</p>
<ul style="list-style-type: none"> PIPELINE INTEGRITY FENCING AND CATTLE EFFECT OF WATER ON PIPE TEMPERATURE OF PIPE DAMAGE TO ROADS DEPTH OF BURIED CABLE <p>Landowners along the pipeline route, Tioga and Fortuna, SD</p>	March 22 and 23, 2011	<p>Provided overview of projects. Concerns addressed include:</p> <ul style="list-style-type: none"> Driving over pipeline Pipeline integrity Compensation Land reclamation Radius of pipeline bends Depth of pipeline Will above-ground block valves need power? Will locator signs be installed?

1.6.3 Canadian Approval Process

The proposed Vantage Pipeline would cross the provincial boundary between Alberta and Saskatchewan 19 miles south of Empress, Alberta and the international border between Canada and the U.S. 45 miles southwest of Estevan, Saskatchewan. Accordingly, it is a federal work and undertaking that is subject to the regulatory authority of the National Energy Board (NEB) pursuant to the National Energy Board Act (NEBA) and the associated regulations, including the Onshore Pipeline Regulations, 1999. The Pipeline will require a Certificate of Public Convenience and Necessity (CPCN) under section 52 of the NEBA. A Project Description was filed with NEB on September 23, 2010, and an application with NEB was filed on February 8, 2011 and is available at <https://www.neb-one.gc.ca/ll-eng/livlink.exe?func=ll&objId=667006&objAction=browse>.

The NEB and other federal agencies with decision-making authority in relation to the Vantage Pipeline (including: Fisheries and Oceans Canada, International Boundary Commission, Transport Canada) will be required to complete an assessment under the Canadian Environmental Assessment Act (CEAA). Vantage

will also be securing permits and/or approvals from the following provincial agencies: Alberta Environment, Alberta Culture and Community Spirit, Alberta Sustainable Resource Development, Alberta Special Areas Board, Saskatchewan Culture, Youth and Recreation, Heritage Resources Branch, Saskatchewan Environment, and Saskatchewan Ministry of Highways and Infrastructure. The NEB has an independent mandate to consider and take into account potential socio-economic and environmental impacts of the Pipeline under the provisions of the NEBA. The dual responsibilities of the NEB under the CEAA and the NEBA are expected to be satisfied through a coordinated process, based on a single environmental impact assessment.

The Canadian portion of the Pipeline is proposed to be in-service in late 2012. Additional permits, licenses, and/or approvals may be necessary as Pipeline design and planning progresses.

2. PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

Vantage Pipeline Canada, ULC and Vantage Pipeline US LP (Vantage) are proposing the construction of a new pipeline, the Vantage Pipeline, in North Dakota, United States, Saskatchewan, Canada and Alberta, Canada to transport ethane from the Williston Basin in North Dakota to the petrochemical industry in Alberta. The Vantage Pipeline would transport ethane from Hess’s existing Tioga Gas Plant near Tioga, ND to an existing pipeline, the AEGS, near Empress Alberta. AEGS would transport the ethane the NOVA’s Joffre Petrochemical Complex. The Vantage Pipeline would provide the capacity needed to transport the growing ethane production from North Dakota’s Williston Basin reserves to the market in Alberta. The proposed Vantage Pipeline would require construction and operation of the following:

- approximately 79.8 miles of new 10 inch diameter underground high vapor pressure (HVP) pipeline on Vantage right-of-way from near Tioga, North Dakota to an international border crossing near Beaubier, Saskatchewan;
- approximately 350 miles of new 10 inch diameter underground HVP pipeline on Vantage right-of-way from the United States-Canada border extending northwest near the junction of the North Dakota-Montana-Canada borders through Saskatchewan to the Saskatchewan-Alberta border;
- approximately 2 miles of new 10 inch diameter underground HVP pipeline on Vantage Pipeline right-of-way from the Saskatchewan-Alberta border to an area near McNeil, Alberta;
- two new pump stations: one located at the midpoint of the pipeline between Lafleche and Assiniboia, Saskatchewan, and a second located near Empress, Alberta;
- mainline valve sites;
- in-line inspection facilities;
- a cathodic protection system;
- a supervisory control and data acquisition (SCADA) system; and
- associated miscellaneous works such as pipeline warning signs and markers.

The steel pipeline would be in HVP service with a maximum operating pressure of 1,440 pounds per square inch.

A general location map depicting the proposed pipeline route is included on Figure 1.1-1. The proposed Vantage Pipeline would follow Vantage right-of-way along the entire route in North Dakota. The pipeline would cross portions of Williams and Divide counties. Table 2.1-1 summarizes the length of pipeline proposed in each county.

COUNTY, STATE	MILEPOSTS	PIPELINE LENGTH (MILES)
Williams County, ND	0 to 37.5	37.5
Divide County, ND	37.5 to 79.8	42.3

Vantage proposes to begin construction of the project in summer 2012. Construction would occur over approximately 6 months, with an in-service date of January 1, 2013.

2.1.1 Land Requirements

Table 2.1-2 summarizes the overall land requirements for the proposed Vantage Project.

FACILITY	APPROXIMATE DIMENSIONS	AREA AFFECTED (ACRES)
Temporary construction right-of-way	40 feet x 79.8 miles	384.1
Permanent right-of-way	30 feet x 79.8 miles	290.5
Additional temporary work space	dimensions vary	51.6
Contractor/pipe yards	400 feet x 200 feet	8.0

¹ Above-ground facilities associated with this project would be constructed entirely within the permanent Vantage right-of-way.

2.1.1.1 Pipeline Right-of-Way

Construction of the proposed pipeline would generally require a 70-foot-wide construction right-of-way to allow for temporary storage of topsoil and spoil and to accommodate safe operation of construction equipment. The spoil side (i.e., topsoil and ditch spoil stockpile area) would typically be 25 feet wide and generally located partially within the existing maintained right-of-way.

The working side (i.e., equipment work area and travel lane) would typically be 45 feet wide and generally located outside the existing maintained right-of-way. Following construction, Vantage would generally maintain a 30-foot-wide permanent right-of-way for operation of the pipeline. A total of 79.3 miles of new right-of-way would be needed for construction.

Ownership of land crossed by the Vantage Pipeline route is identified in table 2.1-3.

LAND TYPE/LOCATION	CROSSING LENGTH (MILES)	PERCENTAGE OF ROUTE
Federal lands	0.0	0.0
State lands	1.0	1.3
County lands	0.0	0.0
Incorporated areas (Tioga)	0.0	0.0
Private land outside incorporated areas	78.8	98.7
Totals	79.8	100.0

2.1.1.3 Pipe Storage and Contractor Yards

During construction, Vantage would temporarily use off-right-of-way areas for pipe and materials storage. In addition, construction contractors would require off-right-of-way areas to park equipment and stage construction activities. Proposed locations of contractor yards and pipe storage are identified in the attached maps. Use of these locations during construction will depend on the materials delivery schedule.

2.1.1.4 Access Roads

Public roads would typically be used to gain access to the construction right-of-way. In areas where public roads are limited, existing privately owned roads may be used to provide access to the construction right-of-way. If neither public nor privately owned roads are available, Vantage may need to construct new access roads. Use of private access roads, modifications to existing non-private roads, and construction of any new access roads would require obtaining landowner permission and environmental surveys prior to use. Access roads would provide access to seven of the eight block valve locations. Access road locations are identified in the attached alignment sheets.

2.1.1.5 Above-ground Facilities

Above-ground facilities associated with the Vantage Pipeline would include two new pump stations, one located at the midpoint of the pipeline between Lafleche and Assiniboia, Saskatchewan, and one located near Empress, Alberta. These 500 to 600-horsepower, electrically driven pumps would be located in buildings designed to minimize noise impacts during operation of the pipeline.

There would be eight above-ground mainline block valves approximately 6 to 15 miles apart along the pipeline route in North Dakota. Mainline valves would be installed at:

- all pump stations,
- both sides of major watercourse crossings,
- significant environmental locations, and
- other locations as necessary to facilitate system operations.

Installation of the mainline valve sites would be accommodated within the permanent and temporary workspace obtained for the pipeline construction. The sites would be fenced. Access to most of the valve sites, for pipeline operations, would be by new permanent access roads.

A pipeline internal inspection receiver would be located at the AEGS interconnection near Empress, Alberta. An internal inspection launcher would be located at Tioga, North Dakota. An internal inspection receiver and launcher would also be located at the midpoint pump stations and at two valve sites located in Canada.

Custody transfer meter stations would be located on the Tioga Plant site before the ethane enters the pipeline, and at the interconnect with the AEGS near Empress, Alberta.

2.1.1.6 International Border Crossing

Vantage seeks a Presidential Permit for that portion of the Vantage Pipeline from the northern-most valve to the U.S.-Canada border. The Vantage Pipeline's crossing of the international border between the United States and Canada will be located near 151st Avenue NW, Divide County, North Dakota at approximately 48.99986 Latitude, -104.01050 Longitude. The Pipeline's border crossing is approximately 12.2 miles northwest of Fortuna, North Dakota and approximately 9.3 miles south of Beaubier, Saskatchewan. The northern-most valve in the United States is located near Fortuna, North Dakota, approximately 15 miles south of the U.S.-Canada border. The border crossing is located on pasture land typical of the area and is utilized by local farmers/ranchers for cattle grazing or hay cropping.

At the border crossing, the Pipeline would be buried to a minimum depth of four (4) feet below ground level within a permanent right-of-way; such segment would connect at the international boundary line

with like facilities in the Province of Saskatchewan, Canada. Access to the crossing point in both Canada and the United States is available via non-maintained country roads. Permanent access roads would be necessary to maintain the block valve site.

2.1.2 Construction Procedures

Schematics depicting a typical pipeline construction in various environments are provided as part of Vantage's EPP. The typical construction sequence is described below. Specialized construction techniques (e.g., waterbody crossings) are discussed in section 2.1.3.

Survey and Staking

Before construction, Vantage crews would survey and stake the centerline and exterior boundaries of the construction right-of-way. The exterior boundary stakes would mark the limit of approved disturbance areas which would be maintained throughout the construction period. The North Dakota State One Call system would be contacted to identify and mark the locations of underground utilities. During this period, equipment involved in pipeline construction would be moved onto the right-of-way using existing roads for access wherever practicable.

Clearing and Grading

Vantage would clear the 70-foot-wide construction right-of-way and temporary extra workspaces of shrubs and trees. The clear width may be necked down to avoid sensitive locations accordance with the EPP. The clearing crew would typically mow, chip, mulch, and/or haul off all non-merchantable timber. Burning of non-merchantable wood may be allowed when the contractor has the necessary permits and approvals.

Following clearing, grading of the ground surface may be done to provide a relatively smooth working surface and a safe working area. Typically, a 50-foot-wide buffer would be left relatively undisturbed at waterbody crossings except where grading is needed for bridge installation. This would occur just prior to the pipeline installation across the waterbody.

Following clearing and grading, temporary bridges may be installed at waterbodies, except for drainage ditches, intermittent waterbodies, and other non-fisheries water, along the pipeline route to provide temporary access for equipment traveling along the construction right-of-way. In addition, temporary erosion control measures would be installed in accordance with the EPP.

Topsoil Stripping

Topsoil would be stripped and segregated in agricultural areas, cropland, hayfields, pasture, and other areas as requested by the landowner, along the pipeline route in accordance with the EPP. In other areas, a maximum of 12 inches of surficial soils would be stripped from directly over the trench, in accordance with the EPP.

Stringing and Bending

Before excavating pipeline trenches, individual joints of pipe would be strung along the construction right-of-way and arranged to be accessible to construction personnel. This operation typically involves specially designed stringing trucks to deliver pipe from pipe yards to the right-of-way.

Small portable cranes and/or side-boom tractors are used to unload the stringing trucks and place pipe along the right-of-way. A mechanical pipe-bending machine would bend individual joints of pipe to the

desired angle to accommodate natural ground contours or pipeline alignment. In certain areas, prefabricated fittings would be used where field bending is not practicable.

Welding and Coating

After stringing and bending are complete, pipe sections would be aligned, welded together, and placed on temporary supports along the edge of the trench. The welds would be inspected, both visually and radiographically. The pipe is typically delivered with a factory coating of yellow jacket or similar material to prevent corrosion. Coating sleeves would be applied at the welded joints and then the coating would be electronically inspected before the pipe is lowered into the trench.

Trenching

Backhoes and/or ditching machines would be used to excavate trenches in accordance with the DOT, which stipulates a minimum 4 feet of cover for normal excavations and 18 to 30 inches of cover in rocky areas. The trench walls would generally be kept vertical to the extent practicable and the trenches would typically be 2 feet wide at the base of the trench. In unstable and saturated soils, trenches may be wider.

Where trench dewatering is needed, water would be discharged in accordance with requirements for the temporary discharge permit issued by the North Dakota Department of Health – Division of Water Quality. Best Management Practices would be used to mitigate potential for erosion and sediment discharge. Where vegetation is sparse or absent, or in environmentally sensitive areas (e.g., adjacent to waterbodies or wetlands), straw bale dewatering structures or suitable filtering alternatives would be used to minimize siltation in adjacent waterbodies.

Lowering-in and Backfilling

After welding and coating are completed and the trench is excavated, the pipe would be lowered into the trench by side-boom tractors. Bladed equipment or a specially designed backfilling machine would be used to backfill the trench to the approximate ground surface elevation. This generally consists of replacing the material excavated from the trench. In areas where topsoil has been segregated, subsoil would be replaced first, and topsoil would be spread uniformly on top. Directly above the pipeline, an excess of soil or “crown” would be placed to allow for future settling. Construction debris, including wooden supports, welding rods, containers, brush, trees, or refuse of any kind, would not be permitted in the backfill. If an excessive amount of rocks are present in the backfill, the pipeline would be protected with rock shielding or similar protective coating and/or backfilled with clean padding prior to backfilling with the rocky material.

Hydrostatic Testing

After backfilling, the pipeline would be hydrostatically tested in accordance with regulations of the OPS within the DOT’s PHMSA to ensure that the system is capable of operating at the design pressure. The testing process would involve filling a segment of the pipeline with water and maintaining a prescribed pressure for a specified amount of time.

The length of individual test segments would be determined by topography and water availability. Water withdrawals used to fill and test the pipelines would be consistent with applicable regulations and the EPP. Vantage would obtain hydrostatic test water from major waterbodies crossed by the pipeline and/or municipal or private sources along the pipeline route. Adequate flow would be maintained in surface water sources to protect aquatic life and allow for downstream uses. The test water would be discharged

through energy dissipation devices to the ground surface or to a nearby waterbody. These discharges would be done in accordance with the EPP and permits issued by applicable agencies.

Cleanup

After the backfilling is completed, Vantage would regrade and restore work areas as nearly as practicable to the original contour of the land. Topsoil would be redistributed over areas from which it was originally removed. Permanent soil stabilization efforts would primarily include revegetation of the right-of-way. Fences removed to install the pipelines would be reconstructed across the right-of-way.

Restoration and Revegetation

Following installation and final cleanup, original grade and contours would be restored to the extent practicable and permanent erosion controls would be installed. Disturbed areas would be revegetated in accordance with the EPP, other permit requirements, and site-specific landowner requests.

2.1.3 Special Construction Procedures

In addition to standard pipeline construction methods, Vantage would use special construction techniques where warranted by site-specific conditions. These special techniques would be used when constructing across paved roads, highways, railroads, steep terrain, waterbodies, wetlands, and when blasting through rock. These special techniques are described below.

2.1.3.1 Road, Highway, and Railroad Crossings

Vantage would typically construct the pipeline across paved roadways and railroads using road-boring equipment. This equipment installs the pipeline beneath the transportation corridor, thereby avoiding disruptions to vehicular or railcar movement and physical impacts on road/railroad beds.

Unpaved roadways would be crossed by boring or by using the open-cut method. The latter method could temporarily disrupt road traffic as the pipe trench is excavated across the roadway. To minimize traffic delays at open-cut crossings, Vantage would establish traffic detours before excavating the roadbed. If no reasonable detours are feasible, at least one traffic lane of the road would be maintained, except for brief periods when road closure is essential to install the pipeline. Vantage would minimize the duration of open-cut crossings and in most cases would complete these road crossings in one day or less. Vantage would notify local authorities and obtain the necessary approvals to allow open-cut crossings prior to road closures. Additionally, Vantage would attempt to avoid closing roads during peak traffic hours.

2.1.3.2 Steep Terrain

Additional grading may be required in areas where the proposed pipeline route would cross steep slopes. Steep slopes often need to be graded to create a gentler slope for safe operation of construction equipment and to accommodate pipe-bending limitations. In such areas, the slopes would be excavated prior to pipeline installation and reconstructed to their original contours during restoration.

In areas where the proposed pipeline route would cross laterally along the side of a slope, cut-and-fill grading may be required to obtain a safe, flat work terrace. Topsoil would be stripped from the entire right-of-way and stockpiled prior to cut-and-fill grading on steep terrain. Generally, on steep side-slopes, soil from the high side of the right-of-way would be excavated and moved to the low side of the right-of-way to create the level work terrace. After the pipeline is installed, the soil from the low side of the right-of-way would be returned to the high side and the slope's original contours would be restored. Topsoil

from the stockpile would be spread over the surface, erosion control features installed, and seeding implemented.

In steep terrain, temporary sediment barriers such as silt fence and straw bales would be installed during clearing to prevent the movement of disturbed soil into wetlands, waterbodies, or other environmentally sensitive areas. Temporary slope breakers consisting of mounded and compacted soil would be installed across the right-of-way during grading and permanent slope breakers would be installed during restoration. Following construction, seed would be applied to steep slopes and the right-of-way would be mulched with hay or non-brittle straw or covered with erosion control fabric. Sediment barriers would be maintained across the right-of-way until permanent vegetation is established.

2.1.3.3 Waterbody Crossings

The proposed Vantage Pipeline route would avoid perennial streams in Divide and Williams counties. In several locations the alignment would cross ephemeral or intermittent streams. Special construction methods would be required in these locations to minimize impacts to wetlands. The wetlands affected by the Vantage Pipeline are discussed in further detail in section 3.18.

The Vantage Pipeline would not cross any navigable waters; therefore, a Section 10 Navigable Water Crossing Permit would not be required.

Clearing and Grading

Vantage would clear existing vegetation from the construction right-of-way as necessary to prepare for grading operations. A 10-foot buffer of undisturbed non-woody and woody vegetation less than 4 inches in diameter at breast height would be maintained on streambanks until the trenching begins at the stream crossing. Woody vegetation within this buffer may be cut manually and removed during initial clearing of the right-of-way. Additionally, some limited grading at streambanks may be necessary to install temporary bridges across waterbodies where required. Grading would be directed away from the waterbody to reduce the potential for material to enter the waterbody. Spoil containment devices such as silt fence and/or straw bales would be installed and set back from the waterbody bank to minimize the potential for sediment to flow off the construction right-of-way and back into the waterbody.

Prior to trenching, Vantage may need to grade approaches to waterbodies to create a safe working surface and to allow for limitations on pipe bending. Temporary erosion control measures (e.g., silt fences, straw bales) would be installed as necessary to minimize the potential for disturbed soils to enter the waterbody from the right-of-way (see the EPP). Extra workspaces at waterbody crossings would typically be set back 10 feet from the water's edge where topographic and other site conditions permit.

Temporary Equipment Bridges

Temporary bridge crossings would not likely be required since the Vantage Pipeline would not cross any permanent streams. Several wetland crossings were identified during the field surveys; special construction methods for wetlands crossings are described below.

2.1.3.4 Wetland Crossings

Vantage identified wetlands along the pipeline route using National Wetland Inventory (NWI) map data in digital format. This allowed digital analysis of wetland crossings using Geographic Information System (GIS) software. Digital, aerial images of the pipeline route were used in conjunction with the NWI data to identify the most favorable routes for the pipeline right-of-way. To the extent possible the alignment was adjusted to avoid wetlands that could be affected by pipeline construction.

For preliminary routing and planning purposes, Vantage used the NWI data to identify locations of wetlands along the pipeline route. During the fall of 2010, Vantage conducted a wetland mapping survey to field-proof the NWI data along the preliminary pipeline route to more accurately identify the wetlands that could be affected during project construction. Based on the wetlands mapping data, the preliminary route was revised in order to avoid construction within the mapped wetland areas. Additional wetland surveys were conducted in 2011 to address re-routes. Wetlands were identified and mapped in accordance with the Routing Determination method as specified in the *Corps of Engineers Wetland Delineation Manual* (USACE, 1987).

Under NWP 12 delineation of wetlands must occur in cases when preconstruction notification is required. The permittee must submit a pre-construction notification to the District Engineer prior to commencing the activity if any of the NWP 12 notification criteria are met. Based on the information gathered during the 2010 and 2011 field studies the Vantage Pipeline route would not trigger any of the NWP 12 notification criteria. In August and November of 2010, Vantage met informally with the District Engineer's office to advise the District Engineer of the proposed impacts to waters of the United States related to construction of the Vantage Pipeline, and to discuss the need for preconstruction notification.

Typical pipeline construction in most wetlands would be similar to construction in uplands and would consist of clearing, trenching, dewatering, installation, backfilling, cleanup, and revegetation. However, due to the unstable nature of some wetland soils, construction activities may differ somewhat from standard upland procedures. Construction activities would be minimized in wetlands and/or special construction techniques would be used to minimize the disturbance to vegetation and soils and to maintain wetland hydrology. Where a wetland cannot support construction equipment, construction activities would be accomplished from timber construction mats or by the use of low ground-pressure equipment, thus limiting disturbance to the wetland. Typical construction schematics illustrating wetland crossings are provided in the EPP.

Clearing and Grading

Vegetation within wetlands would be cut off at the ground level, leaving existing root systems intact to preserve natural sources of rootstock and to facilitate revegetation of the native wetland species after construction. Stumps would only be removed over the trench line and where necessary for safe operation of equipment. Trees, shrubs, and stumps that are removed would be properly disposed of outside of wetlands. Timber construction mats, if needed and temporary erosion control measures would be installed at this time.

Trenching and Installation

The pipeline trench would typically be excavated in wetlands using a backhoe excavator. In unsaturated wetlands up to 1 foot of topsoil would be stripped from the trench line and stockpiled separately from trench spoil.

If the soils in the wetland area are stable and capable of supporting equipment with or without timber construction mats, the pipe would be strung, welded, and lowered into the trench as in upland areas. When water is present in the trench, the trench may be temporarily dewatered and/or the pipe flooded to sink it into the trench.

It may not be feasible to use the construction methods described above for crossing large wetlands with standing water and saturated soils. In these wetlands, the trench would be dug by a backhoe supported on timber mats but it is often not feasible to separate topsoil. The pipe would be assembled in an upland area and floated across the wetland in the excavated trench using the "push-pull" and/or "float" techniques.

When the pipeline is in position, floats, if used, would be removed and the pipeline would be sunk into position and the pipe tied into the upland portion of the pipeline.

After the pipe has been installed, the trench would be backfilled and the original contours would be restored to the extent practical. In areas where the topsoil has been segregated, the topsoil would be replaced after backfilling to facilitate the natural revegetation process. Any excess backfill material would be removed to an upland area.

Cleanup and Revegetation

Cleanup and rough grading would begin as soon as practical after the trench is backfilled. Timber mats, if used, would be removed during the cleanup operations. Disturbed wetland areas would be revegetated with a cover crop in accordance with Natural Resources Conservation Service recommendations, unless standing water is prevalent or as otherwise directly by landowners or regulatory agencies. No fertilizer, lime, or mulch would be applied in wetlands.

2.1.3.5 Blasting

Blasting may be required if bedrock is encountered within the depth of the trench. However, the likelihood of blasting is low, as none of the proposed pipeline route crosses areas with known shallow bedrock. If blasting is required, Vantage would conduct these activities in accordance with applicable regulations.

Blasting to install the pipeline in a bedrock aquifer has the potential to adversely affect water quality and water yields in nearby water wells. However, as indicated previously, no areas of shallow bedrock have been identified within the project area; therefore blasting is not anticipated to be necessary as part of this project.

2.1.3.6 Existing Structures

Vantage reviewed 2009 aerial photography to identify areas containing residences or other structures located within 50 feet of the construction right-of-way. If necessary, Vantage would develop site-specific construction plans to address construction near residential, agricultural, and commercial structures.

2.1.3.7 Fences and Grazing

Fences would be crossed or paralleled during construction of the Vantage Pipeline. Before cutting any fences for pipeline construction, each fence would be braced and secured to prevent slacking of the fence. To prevent the passage of livestock, each fence line opening would be temporarily closed when construction crews leave the area. If gaps in natural barriers used for livestock control are created by pipeline construction, the gaps would be fenced according to the landowner's requirements. All existing improvements, such as fences, gates, irrigation ditches, cattle guards, and reservoirs would be maintained during construction and repaired to pre-construction conditions or better.

2.1.4 Operation and Maintenance

Vantage would operate and maintain the project facilities in accordance with DOT regulations in 49 CFR Part 195 and other applicable federal and state regulations. During normal operations and routine maintenance, the pipeline would be inspected periodically from the air and on foot as operating conditions permit but no less frequently than as required by 49 CFR Part 195. These surveillance activities would provide information on possible encroachments and nearby construction activities, erosion, exposed pipe, and other potential concerns that may affect the safety and operation of the pipeline.

In order to maintain accessibility of the right-of-way and to accommodate pipeline integrity surveys, woody vegetation along the pipeline right-of-way periodically would be cleared over the pipeline. Cultivated croplands (such as wheat, peas, and sunflowers) would be allowed to grow in the permanent right-of-way. Large trees would be removed from the permanent right-of-way. Vantage would use mechanical mowing or cutting along its right-of-way for normal vegetation maintenance.

2.2 ALTERNATIVES

In developing its pipeline route, Vantage studied a variety of alternatives for routing the proposed pipeline facilities. These alternatives consisted of system alternatives, route alternatives, and route variations. Vantage evaluated and compared several factors, including ability to meet project objectives, technical and economic feasibility, and potential environmental impacts for each alternative. The following sections describe Vantage's process for selecting the preferred route and provide an analysis of the alternatives.

2.2.1 No Action Alternative

Under the No Action Alternative, the DoS would not issue the Presidential Permit and the project would not be constructed. The Vantage Pipeline would not be built and, therefore, the capacity to transport ethane from the Williston Basin area to the market in Alberta, Canada would not be achieved.

2.2.2 System Alternatives

System alternatives are options to the Proposed Action that would make use of other existing pipeline or transportation systems to meet the stated objectives of the project. No other pipelines currently exist in the area to transport ethane to markets located in Alberta. Rail or truck transport is not an economic alternative to transport ethane. Neither rail nor truck transport would therefore be considered viable system alternatives.

2.2.3 Route Alternatives

A rational and defensible route selection process for new pipeline facilities involves consideration of environmental, engineering, and economic factors in a multi-disciplinary and iterative fashion. Vantage initially identified and evaluated three options for routing the project along existing right-of-way within Canada. Maximizing routing along existing right-of-way would decrease environmental and land acquisition costs. These studies were designed to define a preferred route that achieves project objectives, is technologically and economically feasible to construct, and minimizes impacts on landowners and the environment. The following sections provide a general discussion of the pipeline route selection process, and a more detailed comparison of the major route alternatives.

2.2.3.1 Initial Route Selection Process

Pipeline control points were identified along the project route, as follows:

Primary control points

- Source Control Point: Hess Tioga North Dakota Plant
- Delivery Control Point: Alberta Ethane Gathering System (AEGS), Empress

Secondary control points

- United States/Canada border

- Town of Cadillac, Saskatchewan
- Great Sand Hills Prairie Farm Rehabilitation Administration (PFRA) Pasture

Publicly available environmental data was collected to identify routing constraints. Environmental data was aggregated from several federal GIS databases including: U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS) National Hydrologic Database (NHD), U.S. Department of Agriculture (USDA) Soil Survey Geographic Database (SSURGO) and USDA – Aerial Photography Field Office (APFO) National Agricultural Inventory Project (NAIP) 2009 aerial photography. The North Dakota GIS Hub (NDGH) was also heavily relied upon to secure many reference GIS layers. Vantage also consulted with the North Dakota Game and Fish Department (NDGFD) to identify other environmental routing constraints that may not be included in these publicly available data.

Selected layers of the collected GIS data were then mapped on digital aerial photography to identify the locations of environmental constraints within the study area. Existing major utility corridors were also identified for potential use in collocation.

2.2.3.2 Refined Route Selection Process

Subsequent route refinement took into consideration the following criteria:

- Accommodate landowner and government requests, where feasible.
- Minimize the pipeline length in order to limit the total area of disturbance.
- Follow existing linear disturbances (pipelines, maintained roads, etc.).
- Avoid or minimize:
 - the crossing of steep/moderate slopes,
 - the crossing of sensitive wildlife habitat,
 - impact to wetlands
 - the crossing of areas of high archeological/paleontological sensitivity,
 - the quantity of watercourse crossings, and
 - close proximity to communities.
- Where watercourses could not be avoided, cross at or near right angles where straight and stable reaches occur and where a successful directionally drilled or bored crossing would be likely.

Vantage conducted a number of route reconnaissance efforts to further examine specific areas of concern identified during the desktop review. During the field review, the pipeline route was examined and adjustments were made to avoid or minimize potential impact on sensitive environmental features, adjust for preferred construction alignment, or to accommodate landowner concerns. Cultural surveys were completed along the study corridor and alignment adjustments were made to avoid cultural sites. Further refinement of the pipeline route was completed as detailed engineering design efforts led to identifying specific facility modifications or additions. Vantage completed the pipeline route refinement process after engineering, environmental, and landowner issues were identified and addressed.

2.2.4 Comparison of Proposed Route and Major Route Alternatives

Major route alternatives consisted of routing options that encompass both the Canadian and U.S. segments of the Vantage Pipeline. Routes considered would locate the pipeline in Alberta, Saskatchewan, Montana, and North Dakota. The location of the international border crossing would change for each of the major route alternatives.

Vantage conducted a detailed quantitative analysis of environmental impacts along each major route alternative. This analysis used the same sources of publicly available environmental data described in Section 2.2.3.1, supplemented by field reviews. The analysis primarily focused on land use issues and wetland and waterbody crossings. Vantage identified and compared a variety of factors for each route, including total length, proximity to an existing right-of-way, NWI-mapped wetlands, proximity to streams and requirement for stream crossings, depth to water table, hydric soils, agricultural land, herbaceous lands, intermittent and perennial waterbodies, railroads, roads, and major highways. After review, Vantage identified no major route alternatives in North Dakota for the Vantage Pipeline.

2.2.4.1 Proposed Route

The proposed route is shown in Figure 2.2-1. In total, the pipeline length would be approximately 430 miles and would follow existing linear disturbances for approximately 81 percent of its length. The proposed route would enter Canada in Township 1, Range 16 West of the 2nd Meridian (T1 R16W 2M). While there were some opportunities to follow existing pipelines on the eastern portion of the route, the proposed route would predominantly follow existing roads until the Ponteix area (T9 R12W 3M). The proposed route then parallels an existing pipeline until approx. T9 R18W3M. The route begins to parallel the Foothills/TransCanada Pipeline system in T8 R19W3M and runs northwest to the AEGS delivery point. The route would deviate from the Foothills pipeline in T14 R25W 3M to avoid an environmentally sensitive area which is called the Great Sand Hills, and follow existing pipelines/roads west and north until it returns to the Foothills line in T16 R26W 3M.

2.2.4.2 Alternate Route 1

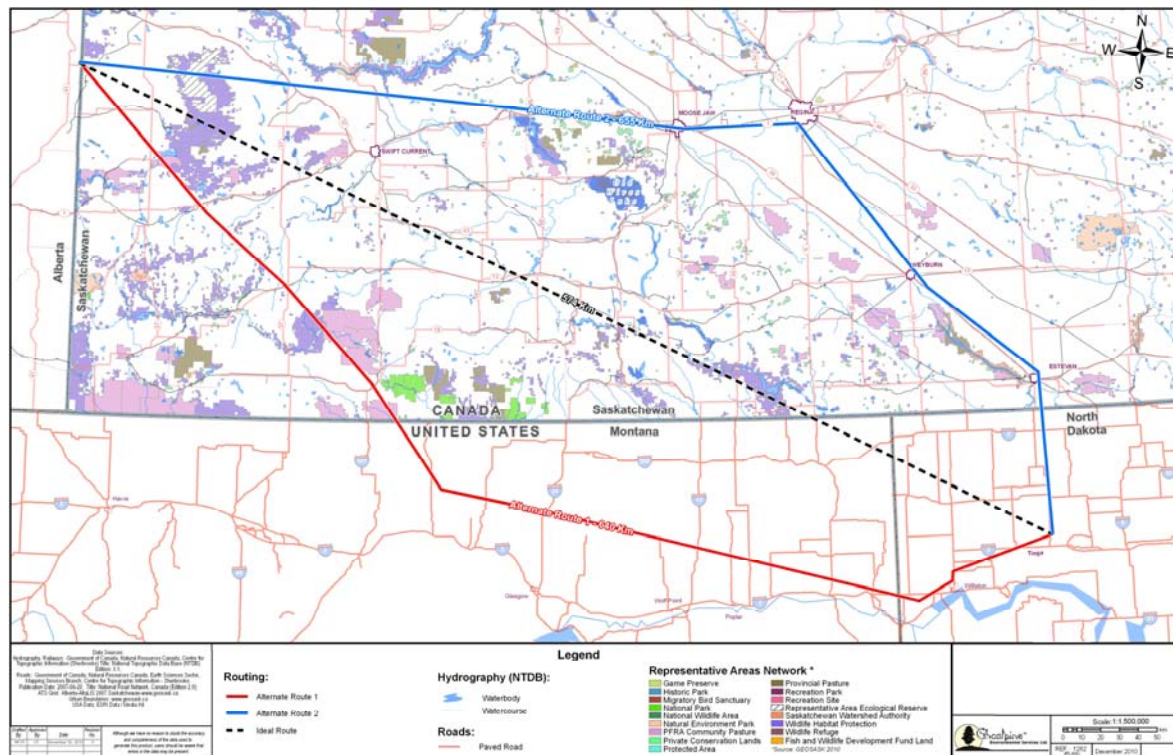
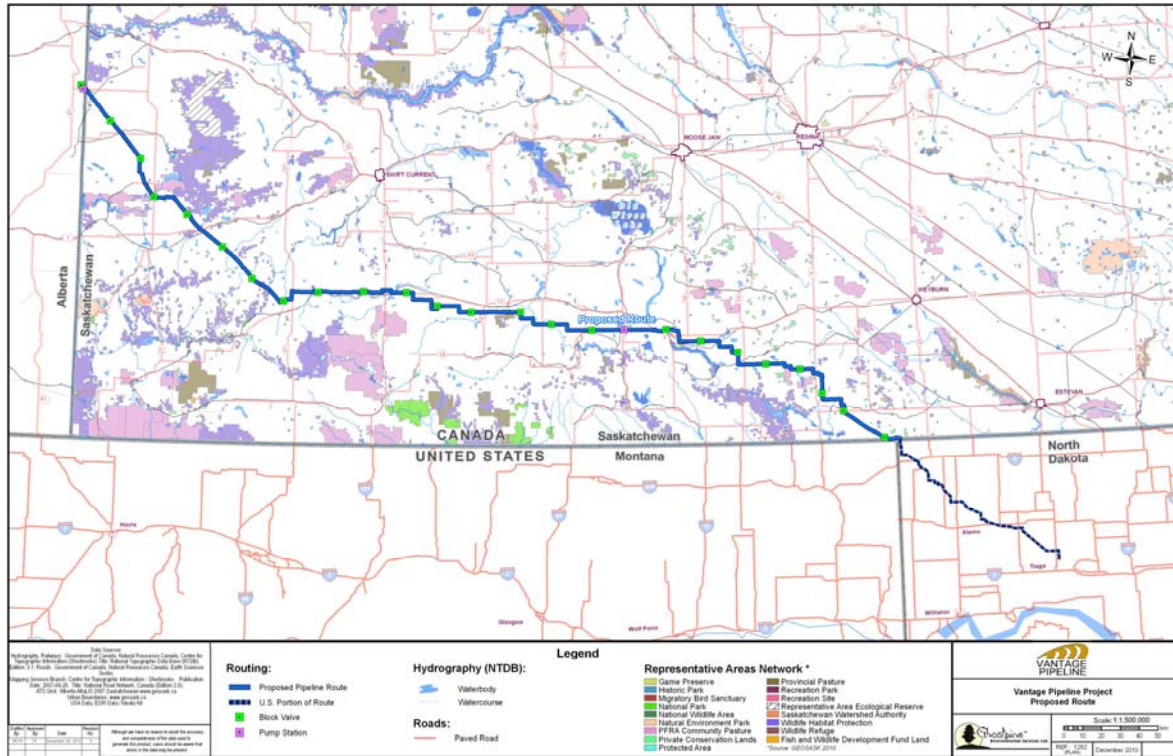
Alternate Route 1 (Figure 2.2-2) would follow the Foothills/TransCanada System and Northern Border pipelines from Empress, Alberta, through Saskatchewan and Montana to North Dakota. At a point south of Williston, North Dakota, the pipeline right-of-way would carry north to the Hess natural gas processing plant near Tioga. The overall distance for this route would be approximately 399 miles. Alternate Route 1 was eliminated as an alternative for the following reasons:

- Overall length (398.92 miles),
- The need to traverse extensive areas of native prairie in southern Saskatchewan, and
- Additional level of regulatory approvals required for the portion of the route running through Montana.

2.2.4.3 Alternate Route 2

Alternate Route 2 (Figure 2.2-2) was developed to potentially capture volumes around the Regina and Weyburn areas in Saskatchewan. The route would follow the TransCanada Canadian Mainline and Keystone pipelines to Regina. It would then follow the existing TransGas Pipeline System rights-of-way to Estevan, Saskatchewan. The route would then head south to the Hess natural gas processing plant near Tioga, following existing infrastructure where possible. The overall length of this route would be approximately 407 miles. Alternate Route 2 was eliminated as an alternative for the following reasons:

- Overall length (406.99 miles), and
- It would traverse the Great Sand Hills Ecological Reserve in southern Saskatchewan.





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3. AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section of the EA discusses environmental, social, and economic factors as they currently exist within the Area of Potential Effects (APE) within the United States. As used throughout this Section, the APE refers to the geographic area or areas within which the Proposed Action may directly or indirectly affect any particular resource where it may exist within that geographic area. The extent of the APE will vary for each resource related to the Proposed Action. When the APE is used for any of the resources described in this section, a definition of the APE for that resource will be provided. The material presented here has been guided by management issues identified by public and agency outreach identified in Section 1.6, and by field analysis of the area.

This proposal could potentially affect critical and non-critical elements of the environment as defined by NEPA. These elements and potential affects are discussed in sections 3.2 through 3.19.

3.2 CLIMATE AND AIR QUALITY

Regional air quality is influenced by a combination of factors including climate, meteorology, the magnitude and spatial distribution of local and regional air pollution sources, and the chemical properties of emitted pollutants. Within the lower atmosphere, regional and local-scale air masses interact with regional topography to influence atmospheric dispersion and transport of pollutants. The following sections summarize the climatic conditions and existing air quality within the project area and surrounding region.

3.2.1 Climate

The project area is located in northwest North Dakota, within a semiarid to continental climate typified by low to moderate precipitation, hot summers, and winter temperatures cold enough to support a fixed period of annual snow cover.

The closest climate measurements to the project area were recorded at Tioga, North Dakota (1905–2010). The Tioga station is located near the origin of the project area at an elevation of 2,260 feet above mean sea level (HPRCC 2010). Table 3.2-1 summarizes the mean temperature range, mean total precipitation, and mean total snowfall by month at the Tioga station.

Table 3.2-1. Temperature, Precipitation, and Snowfall at Tioga, North Dakota (1905–2010)

SEASON	MONTH	AVERAGE TEMPERATURE RANGE (° F)	AVERAGE TOTAL PRECIPITATION (inches)	AVERAGE TOTAL SNOWFALL (inches)
Spring	March	13.6-34.9	0.53	5.1
	April	27.9-52.6	1.07	3.6
	May	39.5-65.8	1.90	0.9
	Total Spring Average	27.0-51.1	3.50	9.6
Summer	June	49.3-74.6	2.80	0.0
	July	53.8-81.5	2.08	0.0
	August	51.6-81.4	1.72	0.0
	Total Summer Average	51.6-79.2	6.60	0.0
Fall	September	40.5-68.7	1.36	0.4
	October	28.8-54.5	0.83	2.3
	November	14.6-35.1	0.47	4.9
	Total Fall Average	28.0-52.8	2.66	7.7
Winter	December	1.6-21.8	0.47	6.2
	January	-4.1-16.4	0.46	6.3
	February	1.6-22.5	0.40	5.0
	Total Winter Average	-0.3-20.2	1.33	17.5
Total Annual Average		26.49-43.07	3.53	8.7

Source: High Plains Regional Climate Center (2010).

The annual mean precipitation at Tioga is 14.1 inches, and ranges from a minimum of 6 inches recorded in 1934, to a maximum of 23 inches recorded in 1993. On average, February is the driest month with a monthly mean precipitation of 0.40 inches and June is the wettest month with a monthly mean precipitation of 2.80 inches. The annual average snowfall is 34.8 inches. December and January are the snowiest months. A maximum annual snowfall of 62 inches was recorded in the winter of 1984.

The area has an annual mean temperature of 38.7°F. There are often large and rapid changes in weather conditions, and thus, temperatures in the region fluctuate widely on an annual, seasonal, and daily basis. Average winter temperatures range from -0.3°F to 20.2°F, while average summer temperatures range from 51.6°F to 79.2°F. Recorded annual daily extreme temperatures are 108°F in 1981 and -50°F in 1983.

The closest comprehensive wind measurements are collected at the Williston airport in Williston, ND, approximately 50 miles southwest of the pipeline origin. Table 3.2-2 presents the relative frequency of winds, distribution of winds by speed class, and direction of the wind source. Winds originate from the northwest to northeast more than 50 percent of the time, and the average annual wind speed is 6.7 mph.

Table 3.2-2. Wind Direction Frequency Distribution for Williston, North Dakota

WIND DIRECTION	PERCENT OF OCCURRENCE	WIND DIRECTION	PERCENT OF OCCURRENCE	WIND DIRECTION	PERCENT OF OCCURRENCE
N	8.8	SE	6.3	W	6.9
NNE	5.7	SSE	5.6	WNW	7.4
NE	4.1	S	6.5	NW	8.5
ENE	2.8	SSW	8.4	NNW	7.6
E	2.9	SW	8.3		
ESE	4.3	WSW	5.7		

Source: Williston, North Dakota meteorological data collected 1988-1992.

The frequency and strength of the winds greatly affect the dispersion and transport of air pollutants. Table 3.2-3 shows the wind speed distribution and Table 3.2-4 shows the stability class distribution. The atmospheric stability class is the measure of atmospheric turbulence, which directly affects pollutant dispersion. The stability classes are divided into six categories designated ‘A’ (unstable) through ‘F’ (very stable). The ‘D’ (neutral) stability class, which implies good atmospheric dispersion conditions, occurs approximately 54 percent of the time.

Table 3.2-3. Wind Speed Distribution

WIND SPEED (MPH)	PERCENT OF OCCURRENCE
0–4.0	5.3
4.0–7.5	27.2
7.5–12.1	31.7
12.1–19.0	27.6
19.0–24.7	5.8
Greater than 24.7	2.3

Table 3.2-4. Stability Class Distribution

STABILITY CLASS	PERCENT OF OCCURRENCE
A (unstable)	0.16
B	2.50
C	10.64
D (neutral)	53.92
E	14.99
F (very stable)	17.79

Source: Williston, North Dakota meteorological data collected 1988-1992.

A discussion of the impacts to climate posed by the construction and operation of the Vantage Pipeline is provided in Section 4.1.1 below.

3.2.2 Air Quality

Federal and State Regulations. The Vantage Pipeline Project would generate air emissions through both short-term construction activities and long-term maintenance of the pipeline. Maintenance activities would generally be subject to federal, state, and local air quality regulations that are driven by the CAA and its amendments. The provisions of the CAA that are potentially relevant to this project are CAA Title II, governing moving sources such as on-road mobile sources and non-road engines such as construction equipment. However, no federal permitting requirements would apply to the construction or operation phases of this project.

Under the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act (CAA), incremental increases of specific pollutant concentrations are limited above a legally defined baseline level. Many national parks and wilderness areas are designated as PSD Class I, including Theodore Roosevelt National Park, located approximately 120 kilometers south-southwest of the project area. The PSD program protects air quality within Class I areas by allowing only slight incremental increases in pollutant concentrations. The project area is designated as PSD Class II. For Class II areas, greater incremental increases in ambient pollutant concentrations are allowed to result from controlled industrial

growth. Because the proposed activities are not subject to PSD requirements, neither a Class II nor Class I Impact analysis is required.

All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility. Such an analysis would be conducted as part of the New Source Review process for a major source, as would an evaluation of potential impacts to Air Quality Related Values (AQRV) such as visibility, aquatic ecosystems, flora, fauna, etc. performed under the direction of the North Dakota Department of Health Division of Air Quality (NDDAQ), in consultation with federal land managers. Such an analysis would be conducted to determine minor source increment consumption.

The NDDAQ, under its EPA-approved State Implementation Plan, is the primary regulatory agency responsible for determining potential air quality impacts once detailed industrial development plans have been made. The NDDAQ has the ultimate responsibility for reviewing the development plan to ensure it complies with all applicable air quality laws, regulations, standards, control measures and management practices before permitting the project prior to operation. Unlike the conceptual ‘reasonable, but conservative’ engineering designs used in NEPA analyses, any air quality preconstruction permitting demonstrations required for the project would be based on very site-specific, detailed engineering values, which would be assessed in the permit application review and compliance processes by NDDAQ.

Criteria Pollutants. National Ambient Air Quality Standards (NAAQS) have been promulgated by EPA for six common air pollutants, called criteria pollutants. The criteria pollutants are: carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), lead (Pb), particulate matter (PM), and ozone (O₃). The NAAQS is based on comprehensive studies of available ambient air monitoring data, health effects data, and material effects studies. NAAQS regulates criteria pollutants by setting ambient air concentration and time standards and taking actions to attain these standards. Within North Dakota, NDDAQ, under the North Dakota Air Pollution Control Rules, Chapter 33-14-02, has set forth Ambient Air Quality Standards for criteria pollutants including sulfur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), particulate matter less than 10 and 2.5 microns in aerodynamic diameter (PM₁₀ and PM_{2.5}), and ozone (O₃), and has also adopted the federal NAAQS for SO₂. Unlike other pollutants, ozone is not usually emitted directly into the air, but is created by a chemical reaction between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight.

The region around Tioga is designated as attainment for all pollutants, meaning that the concentration of criteria pollutants in the ambient air is less than the NAAQS established by EPA. Site-specific air quality monitoring data are not available for the project area; however, ambient air pollutant monitoring has been conducted in northwestern North Dakota (Table 3.2-5). As shown in Table 3.2-5, monitored concentrations of all pollutants are well below NAAQS and Ambient Air Quality Standards established by NDDAQ.

Table 3.2-5. Monitored Concentrations of Air Pollutants in the Region

POLLUTANT	AVERAGING PERIOD	REGIONAL BACKGROUND CONCENTRATION (µg/m3)	NDDAQ AAQS (µg/m3)	NAAQS (µg/m3)
SO ₂	Annual	2.6	60	80
	24-hour	15.7	260	365
	3-hour	57.6	715	1,300
	1-hour	112.7	--	196.5
NO ₂	Annual	1.9	100	--
	1-Hour	41.1	--	188
PM ₁₀	24-hour	30	150	150
PM _{2.5}	Annual	5.2	15	15
	24-hour	17.3	35	35
CO	8-hour	1.2	10,000	10,000
	1-hour	6.5	40,000	40,000
O ₃	8-hour	115.6	147	147

Source: AIRS (2010).

SO₂, NO₂, and PM₁₀ concentrations from Burke County monitoring site, most recent available data year, 2008.

PM_{2.5} concentrations from McKenzie County monitoring site, most recent available data year, 2006.

CO concentrations from only North Dakota CO monitoring site of record available on AIRS, located in Cass County, data year 2008.

O₃ concentration is fourth highest 8-hour concentration from Burke County monitoring site, 2008.

Hazardous Air Pollutants (HAPs). HAPs are pollutants that are known or suspected to cause acute or long-term serious health effects such as cancer, reproductive effects or birth defects, or adverse environmental impacts. The EPA lists a total of 187 HAPS under the CAA. AAQS, in general, have not been established for HAPs. However, federal, state, and local regulations, such as the National Emission Standards for Hazardous Air Pollutants (NESHAP), have been established to reduce their release into the atmosphere.

Greenhouse Gases (GHGs). GHGs occur in the atmosphere both naturally and as a result of human activities, such as the burning of fossil fuels. These gases are the integral components of the atmosphere's greenhouse effect that warms the earth's surface and moderates day/night temperature variation. The most abundant GHGs are: water vapor, CO₂, methane (CH₄), nitrous oxide (N₂O), and O₃. The primary GHGs emitted from the construction and operations in the natural gas industry are CO₂, CH₄, and N₂O. Emissions of GHGs are typically expressed in terms of CO₂ equivalents (CO₂e), where the potential of each gas to increase heating in the atmosphere is expressed as a multiple of the heating potential of CO₂, or its global warming potential (GWP). This project's GHG emissions are discussed in section 4.1.1.

The Vantage Pipeline's potential impacts to air quality, including emissions of criteria pollutants, HAPs, and GHGs, are discussed below in Section 4.1.1.

3.3 CULTURAL RESOURCES

The APE for cultural resources is defined as the geographic area or areas within which the proposed action may directly or indirectly cause changes in the character or use of historic properties. The APE for direct impacts is 45 ft. For secondary impacts, the APE is equal to the 300-foot-wide corridor.

Cultural resources are protected by federal laws enacted to protect these resources from damage or loss due to federally funded or permitted activities. These laws include the Antiquities Act of 1906, Historic Sites Act of 1935, EO 13007, the NHPA of 1966, as amended, the Archeological and Historic Preservation Act of 1974, the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), and the Archeological Resources Protection Act of 1979 (ARPA). EO 11593 also provides necessary guidance on protection and enhancement of cultural resources. Since the Vantage Pipeline does not cross any federal or tribal lands, the Antiquities Act, EO 13007, NAGPRA and ARPA do not apply. The Vantage Pipeline also crosses one mile of state land, on which all applicable state cultural resource protection laws apply. All human remains shall be treated as indicated in Section 8.1.3.

Specifically, Section 106 of the National Historic Preservation Act (NHPA), as amended, requires the lead federal agency with jurisdiction over a federal undertaking (i.e., a project, activity, or program that is funded by a federal agency or that requires a federal permit, license, or approval) to consider effects on historic properties before that undertaking occurs. Historic properties are defined as prehistoric or historic districts, sites, buildings, structures, objects, or properties of traditional religious or cultural importance (“Traditional Cultural Properties”), which are listed or eligible for listing in the NRHP, including artifacts, records, and material remains related to such a property or resource. Under this definition, other historic and archeological resources may be present within a project’s APE, but are not historic properties if they do not meet the eligibility requirements for listing in the NRHP. For the purposes of this section, the term “historic resource” refers to buildings, structures, objects, and districts that may or may not meet NRHP criteria of evaluation. Likewise, the term “archeological resource” refers to a site that may or may not meet the NRHP criteria of evaluation. The term “sites of religious and/or cultural significance” refers to areas of concern to Indian tribes that, in consultation with the respective tribe(s), may or may not be eligible for listing in the NRHP.

To be considered eligible for listing in the NRHP, a property generally must be greater than 50 years of age, although there are provisions for listing cultural resources of more recent origin if they are of “exceptional” importance. The intent of Section 106 is for federal agencies to take into account the effects of a proposed undertaking on any historic properties situated within the APE and to consult with the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Officers (SHPOs), federally recognized Indian tribes, applicants for federal assistance, local governments, and any other interested parties regarding the proposed undertaking and its potential effects on historic properties. The implementing regulation of Section 106 is 36 CFR Part 800. This regulation establishes a process of identifying NRHP-eligible or -listed historic properties that may be affected by the proposed undertaking; assessing the undertaking’s effects on those resources; and engaging in consultation that seeks ways to avoid, reduce, or mitigate any adverse effects on NRHP-listed or -eligible properties. Adverse effects include, but are not limited to, destruction or alteration of all or part of a property; isolation from or alteration of its surrounding environment; introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting; transfer or sale of a federally owned property without adequate conditions or restrictions regarding preservation, maintenance, or use; and neglect of a property resulting in its deterioration or destruction (36 CFR 800.5).

36 CFR Part 800 specifies that certain parties must be consulted. These parties include each State Historic Preservation Officer (SHPO) whose state would physically include any portion of the APE. Similarly, these parties include each Tribal Historic Preservation Officer (THPO) whose reservation lands would physically include any portion of the APE. The SHPO is appointed by each state to protect the interests of its citizens with respect to issues of cultural heritage. Section 101(b)(3) of the NHPA provides each SHPO a prominent role in advising the responsible federal agencies and ACHP in their efforts to carry out Section 106 requirements. The lead federal agency, as well as the SHPOs and Tribal Historic Preservation

Officers (THPOs), have an obligation to work with state and local governments, tribes, private organizations, and individuals during the initial planning and development of the Section 106 process.

As discussed below, certain cultural resources associated with the physical remains of past human activity, including artifacts, features, sites, districts, or landscapes, were identified during investigations of the APE. These cultural resources are both historic and prehistoric. Prehistoric resources include physical properties resulting from human activities predating written records. They typically consist of isolated artifacts and sites. Prehistoric isolates consist of five or less artifacts within a 50 meter (m) square area. Prehistoric sites contain artifacts (e.g., stone tools and ceramic sherds), features (e.g. campfires and tipi rings), and plant and animal remains that exhibit evidence of cultural utilization. Prehistoric site types common to the region include lithic scatters, cultural material scatters, animal kill/processing sites, and stone feature sites.

Historic resources consist of physical properties that were created after the advent of written records in the region (post-1805). Historic property categories include architectural buildings (e.g. log cabins, houses), architectural structures (e.g., dams, bridges) and archeological features (e.g. trails, trash dumps). Historic cultural resources expected in the vicinity of the project area include buildings, homesteads, ranches, transportation features, and refuse dumps.

Traditional Cultural Properties for which affected Tribes may attach religious and/or cultural significance have not yet been identified since consultation, as required under Section 106, has not yet occurred. If identified, such sites would include traditional cultural properties that are associated with the cultural or religious practices of a particular Tribal community. The populations anticipated to have interest in the APE are several Native American populations, including the Arikara, Assiniboine, Chippewa, Cree, Hidatsa, Mandan, Northern Cheyenne, and Sioux. Although neither the construction nor operation of the proposed project would cross any Native American reservations, various Native American populations may identify traditional cultural properties within the project area.

3.3.1 Methods

The cultural resource studies were conducted and consisted of both Class I and Class III investigations. The Class I investigation entailed a review of local histories, examination of historic maps and a review of previous inventory and field survey efforts (Class I). The Class I study incorporated all sections located within one mile of each pipeline centerline.

The Class III inventory was aimed at locating and recording all historic properties and archeological resources that have surface and exposed-profile indications. This was accomplished through systematic pedestrian inspection of the defined 300 foot corridor using parallel transects spaced no more than 30 m apart. The pipeline centerline was ascertained from shapefiles downloaded to global positioning system (GPS) units. Site forms accompanied the field crew, and the location of previously recorded sites and site leads were placed on a GPS unit to aid identification in the field. As reroutes were identified, a pedestrian survey was conducted to ensure all previously uninvestigated areas were examined. In some cases, the archeologist expanded the survey to identify a site-free corridor. The investigation did not include subsurface testing.

A designated Tribal monitor from either the Fort Peck Tribes or the Three Affiliated Tribes participated in cultural resource fieldwork. The Tribal monitor aided in the identification and recording of sites with religious and cultural significance. Tribal consultation was not conducted during this phase of the investigation. The DoS would undertake consultation with affected Tribes after it has received all appropriate information. Through consultations with affected Tribes, the DoS would take into account the presence or absence of sites of religious and/or cultural significance within the APE.

3.3.2 Results

The Class I files and literature review identified 37 previous projects that crossed within one mile of the pipeline centerline. Cultural resource investigations were previously conducted for each of these 15 projects and all investigations were completed to current cultural resource survey standards. These investigations identified four sites and 38 isolated finds. The identified sites include a segment of a railroad, a cemetery, and two historic buildings. The identified isolated finds consist of 33 locations with four or fewer lithic artifacts, four site leads of historic buildings and one site lead for a historic mine.

A Class I literature review identified 38 previous projects that crossed within one mile of the pipeline centerline. Of these, two were completed prior to the establishment of current inventory standards and one was designed to identify rural churches. Thirty-five were completed to current cultural resource survey standards. These investigations documented 16 sites and 70 site leads/isolated finds. The identified sites include two railroads, 11 historic buildings, a farmstead, a bridge, a cemetery, and a prehistoric stone feature site. The site leads/isolated finds consist of 54 locations with chipped stone artifacts, 12 historic building leads, two townsite leads, a historic coal mine, and a stone ring site leads. Bethel Lutheran Church (32WI1887) and two lithic scatter site leads (32WIX301 and 32DVX177) are located within the project corridor.

The Class III inventory identified 79 sites and 19 isolated finds. The sites consist of 50 prehistoric, 22 historic, and 7 sites that contain both historic and prehistoric resources. The prehistoric components consist of four lithic scatters in cultivated fields, 54 sites with stone features. Three of the multi-component sites contain isolated prehistoric artifacts within a site that is predominantly historic. The historic components consist of 11 trash scatters, 7 farmsteads, a site that contains a farm outbuilding and a coral, 2 barrow pits, 2 railroads, a church, and a coal mine. Four sites contain isolated historic artifacts within a predominantly prehistoric site. The NRHP eligibility of the identified sites is not determined. There are 19 localities that do not contain sufficient materials to meet the North Dakota definition of a site. These are identified as isolated finds, or isolates. Isolates are not considered eligible for listing on the NRHP. The investigation observed no cultural districts or rural historic landscapers. Although there are similarities in the type of stone features observed in the project area, the site are not sufficiently concentrated, and do not demonstrate sufficient linkage to indicate a shared relationship. There is no evidence for planned or designed development. Over 60 percent of the project area is cultivated and reflect rural use. However, the landscape is not associated with an important event, an important person, or shared architectural elements. None of the prehistoric components are evaluated for Traditional Cultural Properties.

In initial planning, Vantage rerouted the proposed pipeline route to avoid 38 of the previously identified sites. Of the 79 sites located within the 300-foot survey corridor, 33 are located in abandoned routes and 37 are least 45 feet from the temporary construction corridor, and thus, can be properly avoided. While 6 sites are outside the temporary construction corridor, but still within the 45-foot buffer, Vantage would either “neck down” or adjust the temporary workspace to ensure the appropriate buffer is maintained and these sites are avoided. To avoid impacting the two identified railroad sites, Vantage would bore beneath the railroad grade. The pipeline would go through one farmstead. If determined eligible for listing on the National Register of Historic Places, Vantage would bore beneath the site to avoid adversely affecting this site.

In addition, to avoid secondary impacts associated with artifact collecting and vandalism from/to any of the identified sites, Vantage would limit all activities by workers to the defined temporary construction corridor. This would provide a 45-foot buffer to the identified sites and would minimize the visibility of all but the standing structures and buildings. The construction of the pipeline and the associated facilities

would constitute a temporary visual impact to National Register eligible properties with standing structures.

It is unlikely that any surface disturbance activities during construction could cause impacts to deposits capable of containing paleontological resources because the bedrock of the region is covered by varying thickness of Quaternary deposit, chiefly glacial drift, which rarely contains fossils.

3.4 GEOLOGY AND MINERALS

3.4.1 Regional Geologic Overview

The proposed Vantage Pipeline traverses parts of Williams and Divide Counties in northwestern North Dakota, near the center of the Williston Basin. The Williston Basin is a large, oval-shaped structural and sedimentary basin that covers approximately 300,000 square miles in eastern Montana, western North and South Dakota, and southern Saskatchewan. The basin overlies an ancient Precambrian geologic basement feature that developed about 1.8-1.9 billion years ago and began to subside during the Ordovician Period or about 495 million years ago. Subsidence was episodic and marine sediments were not deposited in the basin continuously. The basin contains an unusually thick (more than 14,800 feet) section of Paleozoic, Mesozoic, and Cenozoic rocks and complete rock record with rocks preserved that represent every geological time period from the Cambrian to present. These rocks generally dip to the south toward the center of the Williston Basin, except along the flanks of the north-south oriented Nesson Anticline that trends along eastern Divide and Williams counties.

Overlying Precambrian-aged crystalline basement rocks that form the ancient core, or craton, of North America are as much as 7,000 feet of Paleozoic rocks that accumulated chiefly as marine carbonates and evaporites. These Paleozoic rocks are overlain by as much as 6,600 feet of Mesozoic and Cenozoic rocks that are clastic in origin and that are thick. Most of the Mesozoic rocks accumulated as marine shales, but there are a few continental beds of Late Cretaceous age. With the exception of the Cannonball Formation of Paleocene age, which is marine in origin, the Cenozoic rocks accumulated in terrestrial environments.

The proposed Vantage Pipeline right-of-way occurs in the glaciated section of the Great Plains Province. The northeastern-most part of Williams County and much of central Divide County is underlain by the Missouri Coteau, morainic hills comprising a band 30-40 miles wide that extends from South Dakota to Saskatchewan that forms the continental divide between the Gulf of Mexico and Hudson Bay. The Coteau is a region of dead-ice moraine which lacks a well-integrated drainage system and lies between the Missouri escarpment on the northeast and the well-drained ground moraine adjacent to the Missouri River on the southwest. To the north of the Coteau are the plains of the Central Lowland Province (Freers 1970, Hansen 1967).

The surface underlying the proposed Vantage Pipeline right-of-way is covered by glacial drift deposits. In Divide County, directly underlying glacial drift deposits, are the Paleocene age formations of the Bullion Creek Formation (Tongue River Formation), Cannonball Formation, and Sentinel Butte Formation that together reach about 900 feet in thickness. These formations are exposed as small, isolated bedrock outcrops, chiefly along the Missouri River escarpment in the northeastern part of Divide County. The Bullion Creek Formation consists of yellow-brown silt, sand, clay, sandstone, and lignite that accumulated in a variety of fluvial and paludal environments such as rivers, lakes, swamps, and floodplains. The Sentinel Butte Formation consists of gray-brown silt, sand, clay, sandstone, and lignite; river, lake, and swamp sediment accumulated in fluvial (river and floodplain) environments. It has also produced scientifically important fossils. The Cannonball Formation accumulated in the restricted

epicontinental seaway that connected the Gulf of Mexico with the Arctic Ocean in Cretaceous and Paleocene time and represents the last marine incursion into central North America.

In some places are late Tertiary and early Quaternary-age river gravels that form the base of the overlying glacial sequence and accumulated in the northeastward drainage systems of the Missouri and Yellowstone rivers. Overlying these gravels or directly overlying bedrock is glacial drift. Glacial drift is a general term used to denote all deposits of glacial origin. Drift includes unsorted ice-laid rock debris called till, sorted melt-water-laid sand and gravel called outwash, and fine-grained sediments laid down in lakes. Usually associated with drift are windblown deposits of silt and sand. Glacial drift in Divide County is about 650 feet thick. Sags in the overlying glacial drift probably indicate the location of these buried drainage systems.

Bedrock maps depict bedrock geological units underlying the proposed Vantage Pipeline right-of-way as including only Paleocene-age formations of the Bullion Creek Formation, Cannonball Formation, and Sentinel Butte Formation. Surficial maps depict various Quaternary geological units underlying the proposed right-of-way along its entire length.

3.4.2 Minerals

Geological resources that occur along and in the vicinity of the proposed Vantage Pipeline right-of-way include petroleum; coal, lignite, and associated potential shallow coalbed methane and trace metals including uranium, molybdenum, and germanium; construction materials including clay, sand and gravel, and scoria; salts, including sodium sulfate, sodium chloride, and potassium chloride. Geothermal resources also exist along the Pipeline right-of-way in Williams County.

3.4.3 Geologic Hazards

Of known geologic hazards, naturally occurring hazards (excluding soil hazards which are discussed in Section (3.12), such as fault-generated earthquakes, floods, landslides, or other mass movement are the most likely to affect the Vantage Pipeline project area. Flooding may become a hazard along waterways and in other waterlogged areas that experience rapid spring snowmelt while the ground is still frozen, or already saturated.

Faults, earthquakes, and seismicity. There are no known Quaternary faults in North Dakota (<http://geohazards.usgs.gov/qfaults/map.php>). Older, deeper faults do underlie North Dakota, including the Tabernor fault zone which is hypothesized to separate the Superior Craton to the east and Wyoming Craton to the west. These two cratonic masses, which formed about 2.5 billion years ago, collided and fused forming part of modern North America. Reactivation of these faults could cause earthquakes.

Due to the absence of quaternary faults, and the dormancy of deeper fault zones, North Dakota is located in an area of low earthquake probability. In July 8, 1968, an earthquake did strike near Huff, where a television set shifted and sounds similar to thunder were heard (intensity IV). The quake was a magnitude of 4.4 and was felt over approximately 7,700 square kilometers. This is the only earthquake to be verified instrumentally to have had an epicenter within North Dakota. Other, unidentified earthquakes may also have occurred.

No earthquakes of intensity V or greater (Modified Mercalli Scale) have occurred within North Dakota during historical times. However, earthquakes centered in Iowa, Minnesota, Montana, and Nebraska, and some in Canada have been felt within North Dakota (http://earthquake.usgs.gov/earthquakes/states/-north_dakota/history.php). Northwestern North Dakota, specifically the area underlying the proposed pipeline, is however located in a seismicity zone where probabilistic ground motion maps for Peak

Ground Acceleration show effective peak accelerations (2 percent chance of exceedance in 50 years) (http://pubs.usgs.gov/of/2008/1128/pdf/OF08-1128_v1.1.pdf).

In addition to movement on faults, small quakes can also occur when subsurface layers of sedimentary rock collapse either in underground mines or where salt dissolution leaves underlying voids into which overlying rocks can collapse into. The latter could potentially occur in northwestern North Dakota; it is underlain by thick deposits of salt, at depths ranging from about 4,000 to 12,000 feet. If layers of salt were to dissolve quickly, overlying deposits could collapse and create earthquakes.

Mass Movements. Mass movement is the down slope movement of earth materials under the influence of gravity. Detachment and mass movement of earth materials occurs when the stress imposed on materials is greater than the strength of the material holding it in place.

The proposed Vantage Pipeline right-of-way is underlain by a mantle of glacial drift left by glaciers that advanced southward into North Dakota. The preglacial drainage in North Dakota flowed into Hudson Bay to the north. The preglacial terrain causing this northward flow sloped down to the northeast from the more elevated southwestern part of the State. As glaciers advanced along this slope, erosion and deposition caused by the glacial advance had the effect of subduing the preglacial topography by filling existing lows and planing off the highs (Sloan 1972).

Glacial drift is poorly consolidated and easily erodible and would be subject to erosion and mass movement on steeper slopes. However, most of the area underlying the proposed Vantage Pipeline right-of-way has slopes of less than 4 percent. The only major drainage, where down-cutting of the river could promote over-steepening of slopes is the Little Muddy River; however, that river is located to the east and south of the proposed pipeline route, and thus, should not impact erosion and/or mass movement within the pipeline right-of-way.

Flooding. Todhunter and Rundquist (2008) describe a unique flood hazard produced by the dramatic expansion of wetlands in Nelson County in eastern North Dakota, located in the North American Prairie Pothole Region of North Dakota. The Pothole Region is underlain by glacial drift similar to the area underlying the proposed pipeline, which is characterized by a multitude of shallow depressions that formed as the continental ice sheets advanced and retreated during the last glacial period (Murphy et al. 2002). The glacial drift has low-permeability glacial till and overlies early Tertiary rocks, mudstone, and shale bedrock throughout the area, which also generally has a low permeability. The shallow depression potholes are usually filled with standing water, creating numerous prairie wetlands (called potholes or sloughs) that may be temporary or permanent. Extended wet spells can significantly increase the number, size, and depth of prairie wetlands (LaBaugh et al. 1998; Johnson et al. 2004).

In addition, rapid snowmelt when underlying ground is still frozen, or because of the low permeability of underlying strata, could also lead to flooding. Wetland and snowmelt flooding produces flood impacts, however, such flooding is not ordinarily significant like flooding produced by more traditional regional, flash, or coastal flood processes.

A discussion of the impacts to climate posed by the construction and operation of the Vantage Pipeline is provided in Section 4.1.3 below.

3.5 HEALTH AND SAFETY

Transportation of liquid ethane by pipeline involves some risk to the public and the environment in the event of an accident or release. Ethane is a colorless, odorless, flammable gas with a vapor pressure of 540 psig at 70°F and boiling point of minus 128°F. Contact with the liquid may cause frostbite.

Vaporized ethane is slightly heavier than air and typically dissipates rapidly into air, but still could form pockets of oxygen deficient atmosphere in low-lying areas. In high vapor concentrations, it can act as a simple asphyxiant, possessing a slight inhalation hazard. If inhaled in high concentration, oxygen deficiency can result in serious injury or death.

Section 3.5.1 below discusses pipeline compliance and safety standards applicable to the transportation of ethane, including: inspections, release response, and reporting. Compliance with such standards help reduce health and safety risks posed by the transportation of ethane.

3.5.1 Pipeline Compliance and Safety Standards

The main causes of pipeline incidents in the United States are corrosion, excavation damage, pipe or weld failure, incorrect operations, or natural causes (e.g., floods). To avoid pipeline incidents, the federal government has established minimum pipeline safety standards under the U.S. Code of Federal Regulations (CFR), Title 49 “Transportation,” Parts 190–199 (http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?sid=73362a5c11608da8fa62ec9710cb9640&c=ecfr&tpl=/ecfrbrowse/Title49/49cfrv3_02.tpl). The Office of Pipeline Safety (OPS), Pipeline and Hazardous Materials Safety Administration (PHMSA), within the U. S. Department of Transportation (DOT), is the primary federal enforcement agency that regulates the safety of hazardous liquid and gas pipelines within the United States. The North Dakota Pipeline Authority (NDPA), within the Industrial Commission of North Dakota, is the jurisdictional state agency responsible for assisting operators with the development of pipeline facilities to support the production, transportation, and utilization of North Dakota energy-related commodities.

DOT is mandated, pursuant to 49 U.S.C. Chapter 601, to regulate the safety of pipelines. Within DOT, PHMSA administers the national pipeline regulatory program to ensure the safe transportation of hazardous liquids, including liquid hydrocarbons, by pipeline. PHMSA specifically develops safety regulations and other approaches to risk management that mandate safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set safety attainment levels which can be achieved through the use of various technologies. Of those, Parts 190, 194, 195, 198, and 199 are relevant to hazardous liquid pipelines. The following highlights key PHMSA regulations that apply to the Vantage Pipeline:

- Part 190 describes the procedures for carrying out regulatory duties, including inspection of pipelines and enforcement of the regulations.
- Part 194 contains requirements for spill response plans and emergency response plans intended to reduce the environmental impact of liquid hydrocarbons discharged from onshore pipelines.
- Part 195 prescribes the safety standards and reporting requirements for hazardous liquid pipelines, including detailed requirements on a broad spectrum of areas related to the safety and environmental protection of hazardous liquid pipelines.
- Part 199 requires operators of gas and hazardous liquid pipelines to establish programs for preventing alcohol misuse and to test employees for the presence of alcohol and prohibited drugs.

PHMSA policies also address pipeline safety standards near high consequence areas (HCAs). Agriculture is the predominant land use along the pipeline corridor, comprising about 99 percent of land crossed by the Vantage Project. The Vantage Pipeline HCAs include the town of Tioga, North Dakota (population 1127) and environmentally sensitive areas (wetlands) as defined in 49 CFR Part 195.6 located adjacent to the alignment.

The HCA regulation requires that hazardous liquid pipelines identify HCAs prior to operation and that a written integrity management program be in place within one year after the start of operation, including baseline assessments by the date of initial pipeline operation. Depending on the findings of the assessment, the operator must take preventive and mitigating measures to protect the HCA from the consequences of a pipeline failure. These measures include conducting a risk analysis of the pipeline segment to identify additional actions to enhance public safety or for environmental protection. The ethane transported by the Vantage Pipeline is also considered by PHMSA to be a hazardous material, and would therefore need to comply with all regulatory requirements applicable to such materials.

The Environmental Protection Agency requires facilities covered by Emergency Planning and Community Right-to-Know Act (EPCRA) to submit an Emergency and Hazardous Chemical Inventory Form to the Local Emergency Planning Committee (LEPC), the State Emergency Response Commission (SERC), and the local fire department annually. Facilities provide either a Tier I or Tier II form. North Dakota requires the Tier II form. Tier II reporting, which must be performed annually using the appropriate on-line North Dakota emergency and hazardous chemical inventory form(s) for all applicable pipeline chemicals. This information is distributed to the local emergency response services and fire departments. Tier II forms provide the following information for each substance transported through a pipeline:

- the chemical name or the common name as indicated on the MSDS;
- an estimate (in ranges) of the maximum amount of the chemical present at any time during the preceding calendar year and the average daily amount;
- a brief description of the hazards and manner of storage of the chemical;
- the location of the chemical at the facility; and
- an indication of whether the owner elects to withhold location information from disclosure to the public.

To ensure safe pipeline construction, operation, and maintenance, the Vantage Pipeline would be constructed and maintained to meet or exceed requirements and standards established by DOT, PHMSA, and North Dakota PA, as well as industry standards. Applicable industry standards would include those issued by the American Society of Mechanical Engineers, National Association for Corrosion Engineers and American Petroleum Institute. Details related to the Vantage Pipeline's specifications, and compliance with state and federal standards related to pipeline specifications are additionally provided in section 4.1.4. A discussion of the impacts to health and safety posed by the construction and operation of the Vantage Pipeline is provided in Section 4.1.4 below.

3.6 NOXIOUS WEEDS AND INVASIVE SPECIES

Noxious and invasive weeds are plant species that pose a significant land management problem to native and desirable species through over-competition and aggressive growth, causing a reduction in plant diversity and/or desirable vegetative cover. Noxious weeds are often aggressive and prone to occur when surface soils are disturbed by human activities. Once established, noxious weeds can spread and prevent the establishment of desirable and native species.

Noxious weeds are regulated at the federal level by Executive Order 13112 established on February 3, 1999 on invasive species requiring that federal agencies minimize the spread of invasive and noxious species through their actions. At the state level, North Dakota Law NDCC §4.1-47-02 requires every person to do all things necessary and proper to control the spread of noxious weeds.

The Noxious Weed Team coordinates the efforts of county and city weed boards and state and federal land managers to implement integrated weed management programs. Currently, there are weed boards in all of North Dakota’s 53 counties. Each county has the option to add additional species to the state’s noxious weed list for enforcement only in their jurisdiction. At this time Divide and Williams Counties have not added any additional weeds to the state list.

Occurrence of weeds along the pipeline corridor were noted during environmental surveys in the fall of 2010 and summer of 2011.. Weeds were evaluated based on both federal and state noxious weed lists. None of the federally listed noxious weed species were observed in the project area during field observation. Table 3.6-1 includes a complete list of declared noxious weeds for the state of North Dakota and indicates whether the species was observed during the surveys. Canada thistle (*Cirsium arvense*) was commonly found throughout the project area adjacent to wetlands, field roads, and idle cultivated fields. Musk thistle was also encountered in isolated locations. Other noxious weeds were not present.

Table 3.6-1. North Dakota Noxious Weeds and Occurrence Along Proposed Pipeline Corridor	
NOXIOUS WEED¹	OCCURRENCE²
Absinth wormwood (<i>Artemisia absinthium</i>)	No
Spotted knapweed (<i>Centaurea maculosa</i>)	No
Saltcedar (<i>Tamarix chinensis, T. parviflora, T. ramosissima</i>)	No
Russian knapweed (<i>Acroptilon repens</i>)	No
Purple loosestrife (<i>Lythrum salicaria</i>)	No
Musk thistle (<i>Carduus nutans</i>)	Yes
Leafy spurge (<i>Euphorbia esula</i>)	No
Diffuse knapweed (<i>Centaurea diffusa</i>)	No
Dalmatian toadflax (<i>Linaria genistifolia</i>)	No
Canada thistle (<i>Cirsium arvense</i>)	Yes
Yellow toadflax (<i>Linaria vulgaris</i>)	No

¹ ND Dept. of Agriculture noxious weed list, 2011 ² Weed species observed during fall of 2011

The Vantage Pipeline’s impacts on noxious weeds and invasive species are discussed in Section 4.1.5 below.

3.7 LAND USE

A baseline environmental survey served as the primary source for land use data. The collected data was supplemented with aerial photos provided by the U.S. Department of Agriculture Farm Service Agency (USDA/FSA 2009) and the Soil Survey Geographic (SSURGO) Database provided by the USDA Natural Resource Conservation Service (USDA/NRCS 2008). Land ownership was determined through correspondence with agencies including the USDA, U.S. Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), North Dakota Fish and Game Department (NDFG), the North Dakota State Land Department, the US Environmental Protection Agency (USEPA), the Williams County Recorder, and the Divide County Recorder.

Privately owned land occurs along 78.8 miles of the Vantage Pipeline route, with the remaining 1.0 miles owned by the North Dakota State Land Department. Therefore, the majority of the project’s 70-foot-wide right-of-way (40-foot-wide construction right-of-way and 30 foot-wide permanent right-of-way) would occur on privately owned lands. Federal lands located in Williams and Divide Counties include a National Wildlife Refuge, USFWS waterfowl production areas, and BLM land; however, the construction or permanent right-of-ways for the Vantage Pipeline route would not cross any federal, county, incorporated, or developed lands.

The types of land impacted during construction and operation of the pipeline are summarized in Table 3.7-1. Figure 3.7-1 below illustrates land ownership in the pipeline vicinity.

Table 3.7-1. Ownership of Lands Affected during Construction and Operation of the Pipeline				
OWNERSHIP	CROSSING LENGTH (miles)	PERCENT TOTAL LENGTH	AREA AFFECTED DURING PIPELINE CONSTRUCTION ¹	AREA AFFECTED DURING PIPELINE OPERATION ²
			(acres)	(acres)
Federal	0	0%	0	0
State	1.0	1.3%	5.0	3.8
County	0	0%	0	0
Private	78.8	98.7%	379.1	286.7
Totals	79.8	100.0	384.1	290.5

¹ Area affected during construction is based on 40-foot-wide construction right-of-way and additional temporary workspaces.

² Area affected during operation is based on 30-foot-wide permanent right-of-way.

Federal lands located in Williams and Divide Counties include a National Wildlife Refuge, USFWS waterfowl production areas, and BLM land. The Vantage Pipeline route would not cross any federal, county, or incorporated lands.

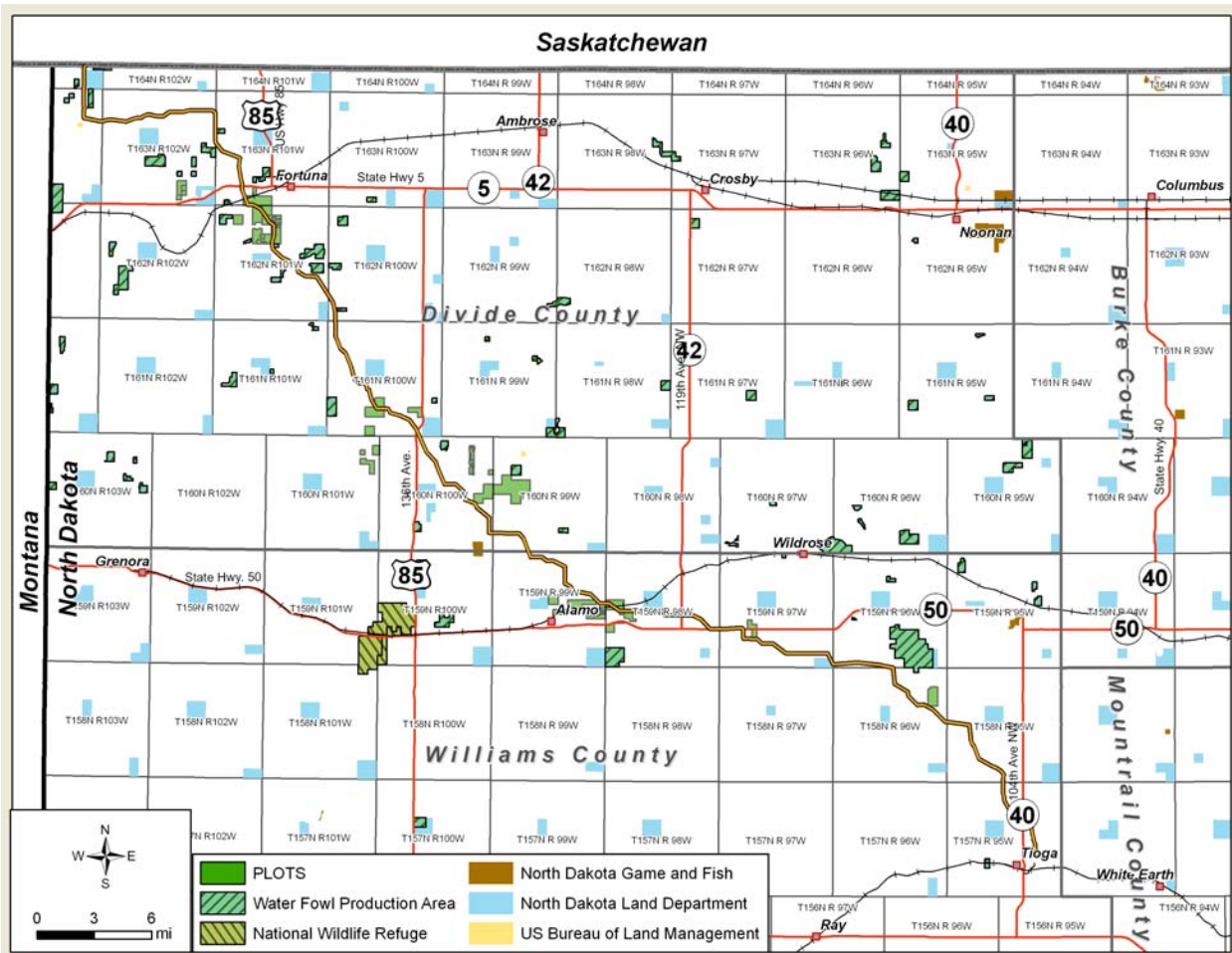


Figure 3.7-1. Land Ownership along the Vantage Pipeline Route

Grazing

Livestock grazing was not found to be a significant land use within the areas traversed by the Vantage Pipeline. Some parcels are fenced and grazing of horses, cattle and other livestock may occur.

Federal Farm and Ranch Lands

The Farm and Ranch Lands Protection Program keeps farm and ranch lands in production by purchasing development rights (USDA/FSA 2008). There are no tracts entered in the program within the proposed Vantage Pipeline corridor.

Sportsman Access

Private Land Open to Sportsmen (PLOTS) is an agreement between North Dakota Fish and Game Department (NDFG) and private or public landowners allowing public walk-in hunting access under the conditions outlined in the PLOTS rules and ethics (NDFG 2010). The proposed Vantage Pipeline route crosses approximately 4.9 miles of PLOTS tracts. The locations of private lands enrolled in the PLOTS program are illustrated on Figure 3.7-1.

Contaminated Waste Sites

There are no known hazardous or contaminated waste sites within the pipeline corridor (US EPA 2010).

A discussion of the impacts to land use posed by the construction and operation of the Vantage Pipeline is provided in Section 4.1.6 below.

3.8 NOISE

The common measure of noise in the United States is the A-weighted sound pressure level that measures noise in decibels (dBA). In the interest of protecting public health and welfare with an adequate margin of safety, the EPA has identified the noise level not to be exceeded during construction activities as 55 dBA. This noise level applies to outdoor areas where people spend widely varying amounts of time, such as residential areas and farms, and places where people spend limited amounts of time, such as school yards and playgrounds (USEPA, March 1974). Noise levels greater than 55 dBA may disturb local residents and recreationists and could displace area wildlife. The degree of disturbance depends on the receptor's distance from the source, noise intensity, and duration, as well as the sensitivity of the receptor. No noise standards have been established by the state of North Dakota or by Williams or Divide Counties.

The project area is sparsely populated and primarily rural/agricultural in nature. Noise-sensitive areas would include private residences. Existing noise sources in the project area are primarily natural, such as wind, but additional noise comes from agricultural operations, aircraft, traffic on county roads and state highways, and transportation (railroad and interstate highway) corridors. Existing noise levels within the project area are, for the most part, representative of rural conditions and are expected to be between 35 and 45 dBA (Harris 1991), except near roads where noise levels may be as high as 65 dBA. Noise levels from traffic along the interstate typically average greater than 70 dBA.

Median noise levels for the proposed project area likely range from 20 to 40 dBA in the morning and evening and from 50 to 60 dBA in the afternoon when wind speeds are typically greatest. These levels correspond to noise levels of a soft whisper (30 dBA), a library (40 dBA), a quiet office (50 dBA), a small town (40–50 dBA), and a normal conversation (60 dBA). Noise, however, may exceed 70 dBA in close proximity to specific pieces of equipment or operations during pipeline construction.

A discussion of the noise impacts posed by the construction and operation of the Vantage Pipeline is provided in Section 4.1.7 below.

3.9 PALEONTOLOGY

Bedrock geological units underlying the proposed Vantage Pipeline right-of-way include the Paleocene age formations of the Bullion Creek Formation, Cannonball Formation, and Sentinel Butte Formation. These formations are overlain by unconsolidated sediments of glacial origin. Both bedrock and sediments have the potential to produce scientifically significant fossils in North Dakota.

Geologic deposits underlying the proposed Vantage Pipeline right-of-way are summarized in Table 3.9-1 with regard to their name, age, types of fossils and interpreted BLM probable Fossil Yield Class (PFYC). PFYC Classes are defined as follows:

Class 2: Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.

Class 3: Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Also sedimentary units of unknown fossil potential.

Class 4: Class 4 geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant nonvertebrate fossils, but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.

Class 5: Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant nonvertebrate fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.

GEOLOGIC UNIT	AGE	KNOWN FOSSILS	PFYC
Quaternary deposits	Recent	None; too young	None
Quaternary deposits	Pleistocene and early Holocene	Ice-age mammals and fish	2 or 3
Sentinel Butte Formation	Paleocene	Plants, invertebrates, and vertebrates including amphibians, reptiles, crocodiles, champsosaurs and turtles, and mammals	3
Bullion Creek Formation	Paleocene	Significant leaf and pollen floras, many invertebrates, and a wide variety of vertebrates such as fish, salamanders, frogs, turtles, crocodiles, champsosaurs, lizards, and dozens of mammals	3 or 5
Cannonball Formation	Paleocene	Only Tertiary unit in which sharks, rays, and other marine vertebrates and invertebrate fossils are preserved <i>in situ</i>	3 or 5

In a review of Pleistocene and early Holocene mammals known from North Dakota glacial deposits, Kihm (1987) noted that only a meager number of finds had been reported since Upham (1895) described mammoth teeth and other Pleistocene bones found at the base of the Hearman Beach Ridge of Glacial Lake Agassiz in Cass County. Harrington and Ashworth (1986) suggested that North Dakota was part of an ecological refuge utilized by mammoths during the Wisconsin glacial advance suggesting that fossil finds should be more numerous. Mammoth remains have now been found in McKenzie County, Williams

County, and 11 other glaciated North Dakota counties (Hoganson, 2010). Isolated finds discovered during North Dakota's Geologic Survey's county geologic mapping program and other relatively recent finds have also been reported by private citizens since. Kihm's review includes additional horse (*Equus* sp.) and mammoth (*Mammuthus* sp.) finds that are fleshing out the story of Pleistocene mammals in North Dakota.

Over the last few years the massive giant-horned buffalo *Bison latifrons* (Hoganson, 2003) and *Megalonyx jeffersonii* (Hoganson and McDonald, 2007), the largest North American ground sloth, have also been recognized in North Dakota. *Megalonyx jeffersoni*, originally described by Thomas Jefferson (1799), is the first fossil mammal recognized in North America. The ice-age camel *Camelus* sp. is represented by a single metatarsal (a fused, elongated bone between the ankle joint and a pair of padded toes) found in Williams County (Hoganson, 2010).

A *Bison latifrons* skull with boney horn cores measuring about 7 ft (2m) tip-to-tip from Montrail County is now on display in the North Dakota Heritage Center in Bismark. Discovered in 1998, this fossil skull may be as much as 47,000 years old (Hoganson, 2003). It was found in river deposits mapped as Quaternary or Tertiary Undivided Sediment by Clayton (1980). Another nearby Montrail County locality in the same mapping unit, which has yielded horse (*Equus* sp.), mammoth (*Mammuthus priogenis*), and cervid (deer-family) material is the first glacial-deposit locality in North Dakota where the bones of Pleistocene mammals that lived together are found buried side by side.

Native fresh-water fish populations displaced by Pleistocene continental glaciation that repeatedly recolonized reopened habitats are commonly preserved in North Dakota sediments deposited during interglacial episodes, according to Newbrey and Ashworth (2004), who analyzed well-preserved late Pleistocene to early Holocene fossil fishes from the Missouri Coteau depositional sequence. Complete specimens of yellow perch (*Perca flavescens*), brassy minnow (*Hybognathus hankinsoni*), blacknose shiner (*Notropis heterolepis*), banded killifish (*Fundulus diaphanus*), and brook stickleback (*Culaea inconstans*) were included in their study. A benchmark entomologic study of beetle assemblages preserved over a 10,000 year period in associated Missouri Coteau deposits (Ashworth and Brophy, 1972) has also served as a basis for the analysis of prehistoric ecological environments in Quaternary North Dakota.

The Vantage Pipeline's impacts on paleontology are discussed in Section 4.1.8 below.

3.10 RECREATION

Resources available in Divide and Williams counties support dispersed, wildlife-related recreation. Many scattered tracts throughout the two counties are enrolled in the North Dakota Game and Fish Department PLOTS program described in section 3.7. These tracts provide hunting access to private land for pheasant, sharp-tailed grouse, and white-tailed deer.

Opportunities for waterfowl hunting and bird watching also exist at the Lake Zahl National Wildlife Refuge (Lake Zahl) located about seven miles southwest of the pipeline route at its nearest point. Lake Zahl is managed by the Crosby Wetland Management District, U.S. Fish and Wildlife Service (Crosby), which covers Divide, Burke and Williams Counties. The Crosby district also manages many scattered water fowl production areas (WPA) ranging in size from 12 acres to 2,270 acres, all of which may be hunted in season. Small ponds, lakes and impoundments scattered about within the two counties support recreational fishing.

No agency maintains recreation statistics specifically for Divide and Williams counties, so recreational use of local resources cannot be quantified from readily available sources of information. As measured in

2006 by a national sample survey, participation by North Dakota residents in wildlife-associated recreation was 17 percent for hunting, 21 percent for fishing, and 6 percent and 25 percent, respectively, for wildlife watching “away from the home” versus “around the home” (USFWS 2006). Hunting participation rates for residents of Divide and Williams counties may well be higher than the state average, assuming a traditional association of hunting with a rural lifestyle.

Residents from elsewhere in North Dakota and from other states are likely to hunt in Divide and Williams counties because of awareness among hunters of the area’s extensive grasslands, which support upland game, and because of the large acreage of federally managed wetlands that produce and attract water fowl. North Dakota hunting seasons typically begin in late September for water fowl, early October for pheasant, early November for white-tailed deer, and mid- November for sharp-tailed grouse.

The Vantage Pipeline’s impacts on recreation are discussed in Section 4.1.9 below.

The study area for potential socioeconomic effects of the Proposed Action and alternatives includes Williams and Divide counties in North Dakota. The proposed pipeline would pass near the communities of Tioga, Alamo, Wildrose, and Fortuna (Figure 3.11-1). Temporary housing resources and/or emergency response services in those communities and the more distant communities of Crosby and Noonan in Divide County and Epping, Ray, and Williston in Williams County are also considered. Socioeconomic conditions potentially affected by the Proposed Action and alternatives include employment and income, temporary housing resources, local and state government tax revenues, and potential demand for local government facilities and services.

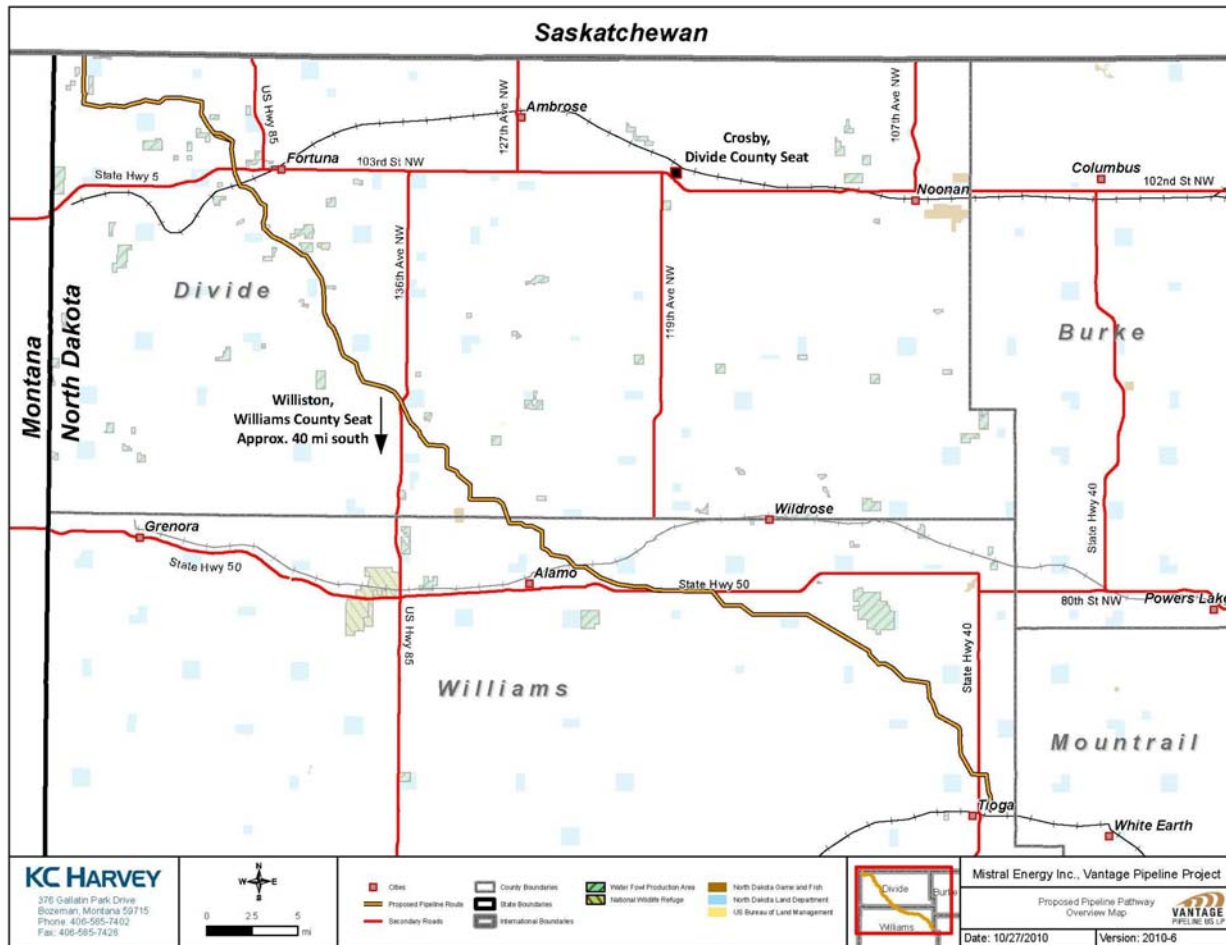


Figure 3.11-1. Socioeconomic Reference Map

Local Economy

Although adjacent to one another and having some elements in common, the economies of Divide County and Williams County are markedly different. Divide County’s economy is much smaller than that of Williams County (596 non-farm jobs compared to 13,055 in Williams County in 2009 (Table 3.11-1) and agriculture remains an important element of its economic base (503 farms totaling 708,000 acres and 678 operators) (USDA 2009). Farming added another 468 jobs in Divide County in 2008 (U.S. Department of Commerce, BEA, 2010). Divide County also has some oil and gas production (1.9 percent of state-wide oil production and 2.4 percent of state-wide natural gas production in 2009) (North Dakota Oil and Gas Division, 2010a and b). Total employment in Divide County has trended downward over the last decade, losing about 10 percent of locally based jobs.

Williams County has more land in farms and more employment in the agricultural sector than Divide County (857 farms totaling 1,445,000 acres, 1,151 operators) but farm employment totals approximately 5 percent of county-wide employment. Since 2005, Williams County has hosted a booming oil and gas industry. In 2009, the local mining sector (which is primarily oil and gas) had average annual employment of 3,069 jobs, or 23.5 percent of all non-farm employment in the county, 7 percent of state-wide oil production, and 22 percent of state-wide gas production. Driven by the increase in mining sector employment, total employment in the county has increased by more than 4,200 jobs since 2005.

Table 3.11-1. 2009 Non-Farm Covered Employment by Industrial Sector, Divide and Williams Counties

Industrial Sector	DIVIDE COUNTY		WILLIAMS COUNTY	
	Average Annual Employment	Share of Non-Farm Employment	Average Annual Employment	Share of Non-Farm Employment
Accommodation and Food Services	43	7.2%	953	7.3%
Administrative and Waste Services	9	1.5%	340	2.6%
Agriculture, Forestry, Fishing & Hunting	n/a	n/a	n/a	n/a
Arts, Entertainment, and Recreation	n/a	n/a	177	1.4%
Construction	12	2.0%	722	5.5%
Educational Services	n/a	n/a	n/a	n/a
Finance and Insurance	31	5.2%	348	2.7%
Health Care and Social Assistance	151	25.3%	1,546	11.8%
Information	17	2.9%	150	1.1%
Management of Companies & Enterprises	0	0.0%	n/a	n/a
Manufacturing	n/a	n/a	317	2.4%
Mining, including oil and gas	n/a	n/a	3,069	23.5%
Other Services, Ex. Public Admin	15	2.5%	344	2.6%
Professional and Technical Services	15	2.5%	325	2.5%
Public Administration	82	13.8%	444	3.4%
Real Estate and Rental and Leasing	3	0.5%	332	2.5%
Retail Trade	72	12.1%	1,407	10.8%
Transportation and Warehousing	17	2.9%	595	4.6%
Utilities	n/a	n/a	74	0.6%
Wholesale Trade	n/a	n/a	988	7.6%
Total Employment	596	100.0%	13,055	100.0%

Note: "n/a" as reported above totals 129 jobs in Divide County and 924 jobs in Williams County.

Source: Job Service of North Dakota, 2010

The strong economic growth in Williams County in recent years produced substantial work force immigration of temporary workers and provided economic opportunities that resulted in near record low unemployment in the region. In 2009, Divide County had average annual unemployment of 4.0 percent, reflecting 35 unemployed among the county's labor force of 867. By comparison, the unemployment rate for Williams County was 2.7 percent, which reflected 293 unemployed persons out of a labor force of 14,589 (U.S. Bureau of Labor Statistics, 2010).

Differences in the size, composition, and effects of recent trends on the local economies are also reflected in personal income data. Total personal income in 2008 was \$907 million in Williams County, compared to \$108 million in Divide County. Farm income accounted for about 6 percent of the total in Williams County, but nearly 45 percent of that in Divide County, the latter having increased by 140 percent from 2007 to 2008. The increase in farm income had a dramatic effect on per-capita income in Divide County, raising it by more than \$16,000, from \$37,805 in 2007 to \$54,120 in 2008. In Williams County, effects related to the oil and gas industry have been the driving forces affecting personal income: annual wages and salaries paid by the industry more than doubled between 2004 and 2008, to \$575 million, with a net outflow of \$113 million in earnings occurring in 2008. The latter amounts to more than 13 percent of the total county-wide wages and salaries paid.

Population

Prior to the recent economic expansion related to natural resource development, resident population in the region had been in long-term decline. In 2005, the estimated population of Williams County was 19,136, nearly 2,000 fewer residents than in 1990. The county's population has since increased, exceeding 20,400 in 2009, with most of the gains occurring in Williston. Williston, with a population of more than 13,000, is the largest community and largest trade and service center in the region. Tioga and Ray have also experienced recent population gains. It should be noted that population estimates for Williams County reflect resident population but not the substantial number of oil and gas industry employees who work in the county on temporary assignment. Table 3.11-2 summarizes population trends for the period 1990 to 2009 in Williams and Divide counties and their incorporated communities.

COUNTY/COMMUNITY	1990 POPULATION	2009 POPULATION	% CHANGE 1990 - 2009
Divide County	2,899	1,961	-31.9%
• Crosby (county seat)	1,312	932	-28.4%
• Fortuna	53	27	-49.1%
• Noonan	231	138	-39.7%
Rest of Divide County	1,255	844	-33.2%
Williams County	21,129	20,451	-2.6%
• Alamo	69	50	-27.5%
• Epping	51	78	52.9%
• Ray	603	552	-7.8%
• Tioga	1,278	1,127	-11.2%
• Wildrose	193	128	-33.3%
• Williston (county seat)	13,380	13,014	-2.1%
Rest of Williams County	5,246	5,278	-0.4%

Sources: US Census Bureau, 2000, 2002, 2010c, and 2010d.

In contrast to the recent population gains in Williams County, population in Divide County and its communities has continued to decline.

Temporary Housing Resources

Temporary housing resources are located in most communities near the proposed pipeline corridor. The inventory conducted for this assessment (Nov. 2010) identified a total of 778 hotel/motel rooms, 410 RV park pads and 32 guesthouse/lodge rooms in the two-county area. Several new motels were completed in the Williston area during the past several years, at least in part to meet demand associated with conventional oil and gas, more recently, the Bakken Shale resources (Loomer 2010). Table 3.11-3 displays temporary housing resources in Divide and Williams counties.

Table 3.11-3. Hotels/Motels, RV Parks, and Other Area Lodging

	HOTEL/MOTEL		RV PARKS		GUESTHOUSE/LODGES	
	Motels	Rooms*	Parks	Spaces*	Lodges	Rooms*
Divide County						
• Alkabo	--	--	1	5	--	--
• Crosby	1	40	1	5	1	3
• Fortuna	--	--	1	8	3	10
• Noonan	--	--	4	54	--	--
Williams County						
• Epping	--	--	2	56	--	--
• Ray	--	--	3	40	3	15
• Tioga	1	28	4	64	1	4
• Trenton	--	--	1	15	--	--
• Wildrose	--	--	1	--	--	--
• Williston	8	710	6	163	--	--
Totals	10	778	24	410	8	32

Source: North Dakota Tourism Division 2010, Williston Convention and Tourism Bureau 2010, Camp Scout 2010

Not included in the inventory is a recently opened 127-bed commercial hotel-style worker camp in the Williston area (Williston Herald 2010). More such facilities are being considered.

Law Enforcement, Fire Suppression and Emergency Medical Response Services

Law enforcement, fire suppression and emergency medical response services in Divide and Williams are located in a number of communities (Table 3.11-4). The Williams County and Divide County Sheriffs’ departments are primarily responsible for law enforcement in the unincorporated area of their respective counties. Williston and several other communities in the region maintain municipal police departments as well.

Near the proposed pipeline corridor, fire suppression and emergency medical response services are located in Tioga, Wildrose, Crosby, Fortuna and Noonan. There are three hospitals in the area; the Tioga Medical Center, Mercy Medical Center in Williston, and Saint Luke’s Hospital in Crosby.

Table 3.11-4. Public Safety Agency Overview: Divide and Williams Counties

FIRE AND AMBULANCE AGENCIES	LAW ENFORCEMENT AGENCIES
Divide County Agencies	
<ul style="list-style-type: none"> • Crosby and Rural Fire Department • Fortuna Rural Fire Protection District • Noonan Fire Department 	<ul style="list-style-type: none"> • Divide County Sheriff's Office • Crosby Police Department
Williams County Agencies	
<ul style="list-style-type: none"> • Alamo Rural Fire Protection District • Alamo Ambulance Service • Epping Rural Fire Protection District • Grenora Rural Fire Protection District • Ray Fire Protection District • Ray Ambulance District and Crash Rescue • Tioga Fire and Ambulance Department • Tioga Rural Fire Department • Wildrose Fire Protection District • Williston Fire Department • Williston Rural Fire Protection District-Ambulance • Williston Ambulance Service • Williston City Ambulance 	<ul style="list-style-type: none"> • Williams County Sheriff's Office • Tioga Police Department • Williston Police Department

Sources: North Dakota Office of the Attorney General, 2010; FireDepartmentDirectory.com, 2010; AmbulanceServices.net, 2010; The Agape Center, 2010.

Local Fiscal Resources

The proposed pipeline corridor would cross the jurisdictional boundaries and service areas of Divide and Williams counties, four public school districts, and numerous special service districts. The proposed corridor also passes near the towns of Tioga, Alamo, and Fortuna.

Local governments, service districts, and school districts in North Dakota rely on a combination of locally generated taxes and fees, grants, and intergovernmental transfers from the state and federal government to fund their administrative functions including staff, capital facilities, equipment, and programs. The revenue-generating capacity of each jurisdiction is a function of many variables, including the value of land, natural resource and real estate development located within its boundaries, its population, level of retail trade (for towns and counties), and the mandated and optional tax levies imposed. Property and sales/use taxes are the two public-sector revenue streams most likely affected by the pipeline. Expenditures are a function of the types and levels of services provided.

Environmental Justice

Executive Order (EO) 12898, “Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations” was published in the Federal Register (59 FR 7629) on February 11, 1994. EO 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level).

In 2009 minority residents comprised an estimated 2.9 percent of the Divide County population and 9.6 percent of the Williams County population, as compared to 10.9 percent for North Dakota (U.S. Census Bureau, 2010c, 2010d). Individuals with per-capita income below the poverty level (2008 estimates)

include 11.6 percent of the Divide County population and 9.9 percent of the Williams County population, compared to the 11.5 percent state-wide (U.S. Census Bureau, SAIPE, 2009). Based on these estimates, neither Divide nor Williams County have concentrations of minorities or persons in poverty significantly higher than the state-wide averages.

At a more localized level, there are higher concentrations of minority populations (23.7 percent) in the census tract in Williams County encompassing an area north and west of Williston and in the community of Springbrook. The poverty data for smaller geographic areas is dated (1999), but communities near the pipeline corridor with poverty labels above the state-wide poverty levels (11.9 percent) included Wildrose in Williams County (13.5 percent or 18 people; about 5 miles from the proposed corridor), and Fortuna in Divide County (54 percent or 27 people in poverty; 2 miles from the pipeline corridor). Other communities with higher than state-wide poverty levels included Crosby, Noonan, Epping, and Williston, but all of those communities are at some distance from the proposed corridor.

3.12 SOILS

The Vantage Pipeline corridor is located in the northern Great Plains Spring Wheat Region Land Resource Region (LRR). This region covers a total area of 142,225 square miles and includes areas of North Dakota (48 percent), Montana (23 percent), South Dakota (23 percent) and Minnesota (6 percent). This area has been smoothed by continental glaciation and is characterized by fertile soils and a smooth topography. Soils in this region are dominantly Mollisols, with Ustolla and Aquolls as the dominant suborders. These soils favor agricultural uses, limited by short growing seasons, high winds, and periodic droughts.

The U.S. Department of Agriculture defines the dominant Major Land Resource Areas along the pipeline corridor as central dark-brown glaciated plains, accounting for 76.1 miles of the pipeline corridor, and northern dark glaciated plains, accounting for 3.7 miles of soils crossed by the pipeline. Both central and northern dark-brown glaciated plains soils are dominated by mollisols which generally have a frigid soil temperature regime, an ustic or aquic soil moisture regime, a mixed or smectitic mineralogy, and are very deep and clayey or loamy (USDA, 2006). Central glaciated plains soils are well drained to poorly drained, while northern glaciated plains soils drain moderately well to well.

Soils along the Vantage Pipeline are mostly characterized as agricultural soils that developed on glacial till plains and moraines in a climate characterized by cold winters, warm summers, and low to moderate precipitation. Approximately 80 percent of the land use is cropland with the remaining 20 percent used as rangeland composed of mixed-grass prairie used for livestock grazing and wildlife habitat. The topographical features are mostly gently undulating hills with occasional wetlands found in depressional areas. Annual precipitation averages about 12 inches per year although this amount may vary substantially from year to year.

3.12.1 Identification of Soil Conditions

Soil conditions and characteristics of interest were initially acquired from the Soil Survey Geographic (SSURGO) database, and verified with an on-site field survey. Soil characteristics of interest and their occurrence along the Vantage Pipeline are discussed in this section.

Soils data was compiled from the SSURGO database, a database of digitized soil survey maps created by Natural Resources Conservation Service (NRCS) and National Cartography and Geospatial Center (NCGC). The SSURGO database was compiled using national field mapping standards for the purpose of natural resource planning and management, and remains the most detailed level of soil mapping available from the NRCS (NRCS, 2008). Soil characteristics of interest to the Vantage Pipeline provided by the

SSURGO database include prime farmland, farmland of statewide/ local importance, hydric soils, compact prone soils, soil erodibility, texture, and thickness.

Soil Associations

The following information regarding the dominant project soil associations and soil types found in the project area is based on NRCS soil survey data and field observations made in October 2010.

The proposed Vantage Pipeline route crosses a total of 39 soil associations. The following dominant associations (associations that make up more than 5 percent of total soils crossed by the proposed pipeline route) make up approximately 67 percent of soils in the project area.

- Williams-Zahl loams and Zahl-Williams loams are the most common soil associations bisected by the proposed Vantage Pipeline route. These soils are similar to the Williams Bowbell loams with the exception of some being found in depressions containing very poorly drained soils. In addition, Zahl soils found on knolls and ridges have a prominent “high lime” layer that occurs at plow depth. This light-colored, limy material often is exposed and mixed with dark-colored surface soil by cultivation.
- Williams-Bowbells loams are also among the most common soils encountered along the proposed Vantage Pipeline route. They are found on undulating to rolling topography with knolls, ridges, and an occasional drainage-way. Slopes are generally 0 to 3 percent without any root-restrictive layers to a depth of at least 60 inches. These well-drained soils have moderate amounts of surface organic matter (4 percent) and the restrictive layer is moderately low. Available water to a depth of 60 inches is high. The depth of calcium carbonate generally ranges from about 7 to 14 inches.

Other soil associations of particular interest include Arnegard loam and Vallers loam.

- Arnegard loam consists of very deep, well-drained soils on level to moderately steep landscapes that formed from a combination of alluvium, calcareous sedimentary beds or glacial till. It is one of the best soils in North Dakota. The majority of prime farmland soils crossed by the proposed Vantage Pipeline route are Arnegard loam.
- Vallers loam, saline is deep, poorly drained, moderately saline, highly calcareous and typically associated with drainage ways on till plains. Permeability is moderately slow with cropping and revegetation limited due to severe wind erosion potential.

Dominant soil associations, in approximate order of their presence, are shown in Table 3.12-1.

Table 3.12-1. Dominant Soil Associations Found in the Project Area		
SOIL ASSOCIATION	LENGTH (MI)	PERCENTAGE OF TOTAL PIPELINE LENGTH
Williams-Zahl loams	19.2	24.0%
Zahl-Williams loams	18.3	22.9%
Williams-Bowbells loams	16.1	20.2
Totals	53.6	67.1%

Prime Farmland Soils

As defined by the NRCS, prime farmland is “land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is also available for these uses.” Indicators of prime farmland include adequate moisture supply, permeability, acceptable acidity and alkalinity levels, acceptable salt and sodium content, and few rocks (NRCS, USDA 2009). These characteristics were considered when classifying soils as prime farmland, farmland of statewide importance, prime farmland if drained, and prime farmland if irrigated. The proposed Vantage Pipeline Route crosses 32.4 miles of prime farmland or farmland of statewide and local importance. Farmland classification along the proposed route is provided in Table 3.12-2.

FARM CLASSIFICATION	LENGTH (MI)	PERCENTAGE OF TOTAL PIPELINE LENGTH
Prime farmland	0.7	0.9%
Farmland of statewide importance	31.7	39.7%
Not prime farmland	45.0	56.4%
Prime farmland if drained	0.8	1.0%
Prime farmland if irrigated	1.6	2.0%
Totals	79.8	100.0%

Potential impacts to soils caused by the construction and operation of the Vantage Pipeline are discussed in Section 4.1.11 below.

3.13 THREATENED, ENDANGERED, CANDIDATE, AND SENSITIVE ANIMAL AND PLANT SPECIES

Information presented in this section reflects information received through informal discussions with the U.S. Fish and Wildlife Service (USFWS - Office of Ecological Services, Bismarck, North Dakota), North Dakota Game and Fish Department (NDGF - Bismarck, North Dakota office), and other data sources available at the time this document was prepared.

The USFWS is responsible for enforcing the Endangered Species Act (ESA). The DoS, as the lead federal agency, is responsible for determining whether the proposal could affect threatened or endangered species and/or their designated Critical Habitat, and for consulting with the USFWS. The DoS, or the applicant as a non-federal party, is required to consult with the USFWS to determine whether any federally listed or proposed Endangered or Threatened species or their designated Critical Habitat occur in the vicinity of the proposed project. If, upon review of existing data, the DoS determines that these species or habitat may be affected by the proposed project, the DoS is required to prepare a Biological Assessment (BA) to identify the nature and extent of adverse impact and to recommend mitigation measures that would avoid the habitat and/or species or that would reduce potential impact on acceptable levels. If, however, the DoS determines that no federally listed or proposed Endangered or Threatened species or their designated Critical Habitat would be affected by the proposed project, no further action is necessary. The following sections discuss Threatened, Endangered, Candidate, and sensitive species, as well as designated Critical Habitat, known to occur in proximity to the Vantage Pipeline corridor.

In addition, the USFWS also has authority for enforcing the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. No eagles or migratory birds, including their parts, nests or eggs, may be taken without a permit. Potential impacts and mitigation to eagles and migratory birds identified through consultation with USFWS are also discussed in the sections below.

3.13.1 Threatened and Endangered Species

Through informal consultations, the USFWS identified all Threatened and/or Endangered species and designated Critical Habitat known to occur in Williams and Divide Counties of North Dakota. Those species and habitat identified by the USFWS are presented in Table 3.13-1. Each identified species and habitat is discussed more fully below. The documentation provided by the USFWS is included in Appendix B.

Table 3.13-1. Threatened and Endangered Species of Williams and Divide Counties	
DIVIDE COUNTY	WILLIAMS COUNTY
<p>Endangered Species Whooping crane (<i>Grus Americana</i>) Gray wolf (<i>Canis lupus</i>)</p>	<p>Endangered Species Interior least tern (<i>Sterna antillarum</i>) Whooping crane (<i>Grus Americana</i>) Pallid sturgeon (<i>Scaphirhynchus albus</i>) Grey wolf (<i>Canis lupus</i>)</p>
<p>Threatened Species Piping plover (<i>Charadrius melodus</i>)</p>	<p>Threatened Species Piping Plover (<i>Charadrius melodus</i>)</p>
<p>Designated Critical Habitat Piping Plover –Alkali Lakes and Wetlands</p>	<p>Designated Critical Habitat Piping Plover – Lake Sakakawea</p>

Mammals

Grey Wolf (*Canis lupus*): The grey wolf is an occasional visitor in North Dakota, and is most frequently observed in the Turtle Mountain area located approximately 150 miles east of the Vantage Pipeline route. Wolves outside the Turtle Mountains of northeastern North Dakota would most likely be transitory individuals from Minnesota or Manitoba. According to Licht and Huffman (1996), since 1980 there have only been confirmed sightings of wolves in counties to the east and southeast of the pipeline corridor. They indicated that the most likely area for wolf pack and long-term occupancy would be the habitat afforded by the Turtle Mountains, because of the presence of more desirable prey species (i.e. moose, elk, and white-tailed deer) and the forested, mountainous habitat where they feel more secure from human interference. Although the prairies of North Dakota historically supported wolves, Licht and Huffman (1996), and the North Dakota Game and Fish Department’s Comprehensive Wildlife Conservation Strategy indicated that no known gray wolf production has been documented in North Dakota in recent years. Most wolves observed in North Dakota during recent years were believed to be young males that migrate from packs in Manitoba and Minnesota.

Fish

Pallid Sturgeon (*Scaphirhynchus albus*): The pallid sturgeon is known to occur in the Missouri and Yellowstone Rivers. Only a few known cases of natural reproduction of the pallid sturgeon have been documented in the Lower Missouri during the past 50 years. Today, pallid sturgeons are scarce in the upper Missouri River above Ft. Peck Reservoir, scarce in the Missouri and lower Yellowstone Rivers between Ft. Peck Dam and Lake Sakakawea, and very scarce in the other Missouri River reservoir reaches. Both the Missouri and Yellowstone Rivers are greater than 10 miles from the pipeline corridor at the closest point.

Birds

Interior Least Tern (*Sterna antillarum*): The Interior Least Tern nests on exposed sandbars and gravel beds of the Missouri and Yellowstone Rivers. Typically this species nest in large river channels in the

northern Great Plains. The Little Muddy River is a tributary of the Missouri River and runoff from the project area would potentially discharge to the Missouri River

Whooping Crane (*Grus Americana*): The Aransas-Wood Buffalo Population (264 birds) of whooping cranes occurs in North Dakota counties during the spring and fall migration between breeding and wintering areas. Figure 3.13-1 identifies a 90-mile migration corridor in North Dakota where whooping cranes migrate annually in the spring and fall.

Whooping cranes begin their migration from the Wood Buffalo Park nesting area in mid-September and migrate to the north-central Saskatchewan staging area (a traditional staging area), where they remain for two to four weeks before proceeding south to the Aransas National Wildlife Refuge wintering area near Corpus Christi, Texas. The fall movement between the Saskatchewan fall staging area and the wintering area generally takes less than two weeks with stops along the migration corridor in North Dakota for brief periods. The only major traditional spring staging area occurs in mid to late March along the Platte River near North Platte and Kearney, Nebraska. The spring migration movement to the north lasts longer than the fall migration, due to spring storms and variations in retreating snow and ice conditions (Johns, 1992; Austin and Richert, 2001).

Whooping cranes migrate in sub-adult, bonded pairs, and family groups of three to four. During migration they use shallow, open-water wetlands and water-covered river sandbars for roosting during the day and night. During migration they feed on waste grain and barley in nearby agricultural croplands, as well as on frogs, crayfish, and plant tubers. Migration habitat characteristics include various sizes of wetlands in close proximity to areas producing grain. Although no traditional staging or use areas have been identified within close proximity to the pipeline corridor, potential whooping crane habitat—wetlands in association with agricultural grain crops—is interspersed throughout the pipeline route. No traditional roosting sites for whooping cranes have been identified in North Dakota, although hundreds of observations have been recorded (Stephen, 1979; Johnson and Temple, 1980; and Austin and Richert, 2001). Fence and power line collisions were noted to be the greatest source of mortality for migrating cranes (3rd Revision International Recovery Plan for the Whooping Crane, 2005).

Piping Plover (*Charadrius melodus*): The piping plover nests on midstream sandbars of the Missouri and Yellowstone Rivers and along shores of saline wetlands. More nests are located in North Dakota than in any other state. In North Dakota, Piping Plover begin arriving at their breeding grounds in early to mid-April and typically depart by the 1st of September.

Designated Critical Habitat for piping plovers is located in several Divide County locations, and at Lake Sakakawea in Williams County (Figure 3.13-1). This habitat includes known nesting sites. The proposed Vantage Pipeline route would be within one mile of Radar Waterfowl Production Area designated Critical Habitat area located in Divide County.

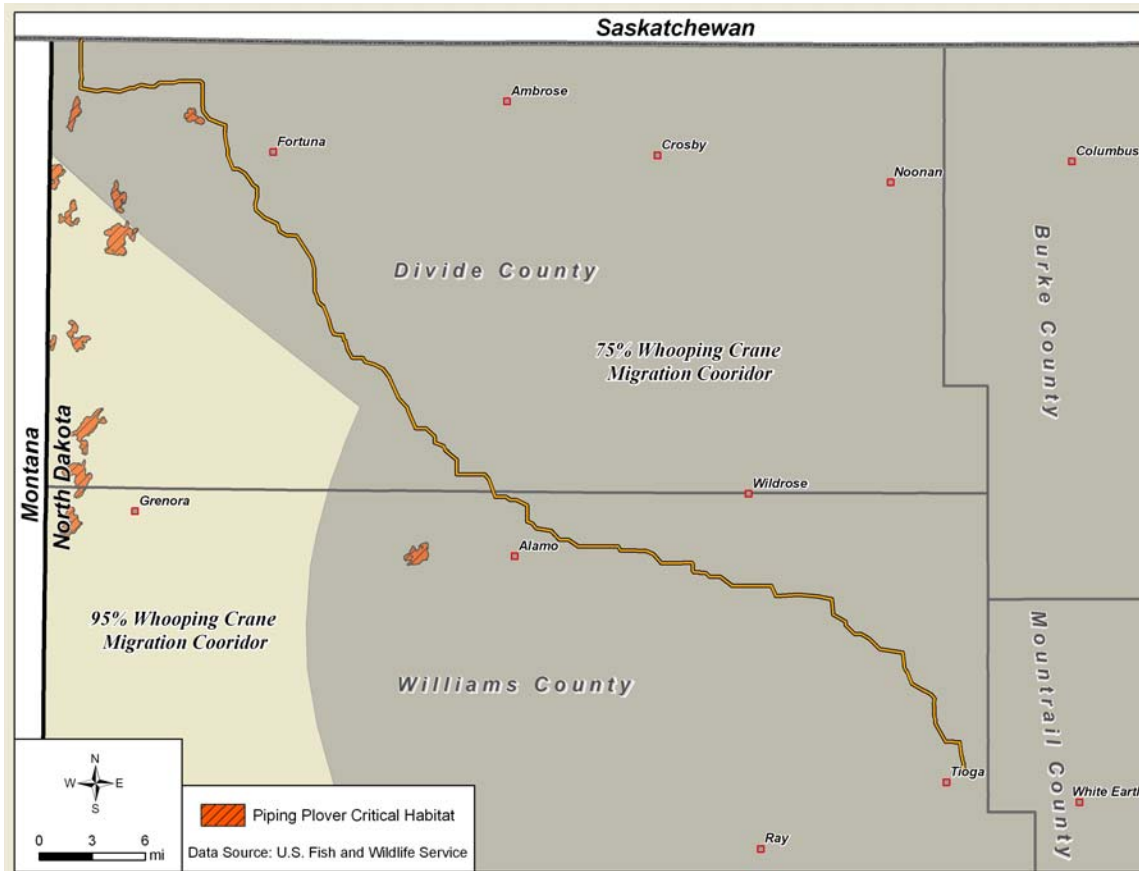


Figure 3.13-1. Whooping Crane Migration Corridor and Designated Critical Habitat for Piping Plovers in Divide and Williams Counties, North Dakota

Plants

At this time, there are no federally listed threatened and endangered plant species listed for Divide or Williams Counties, North Dakota.

3.13.2 Other Species of Concern

In addition to threatened and endangered species, the species of concern identified in Table 3.13-2 are listed in the North Dakota Comprehensive Wildlife Conservation Strategy, 2005 (North Dakota Game and Fish Department) and are identified by the USFWS as species “in greatest need of conservation” in Williams and Divide County, North Dakota:

Table 3.13-2. Level I Species for North Dakota Species of Concern in North Dakota

COMMON NAME	SCIENTIFIC NAME
Horned Grebe	<i>Podiceps auritus</i>
American White Pelican	<i>Pelecanus erythrorhynchos</i>
American Bittern	<i>Botaurus lentiginosus</i>
Swainson's Hawk	<i>Buteo swainsoni</i>
Ferruginous Hawk	<i>Buteo regalis</i>
Yellow Rail	<i>Coturnicops noveboracensis</i>
Willet	<i>Catoptrophorus semipalmatus</i>
Upland Sandpiper	<i>Bartramia longicauda</i>
Long-billed Curlew	<i>Numenius americanus</i>
Marbled Godwit	<i>Limosa fedoa</i>
Wilson's Phalarope	<i>Phalaropus tricolor</i>
Franklin's Gull	<i>Larus pipixcan</i>
Black Tern	<i>Chlidonias niger</i>
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
Sprague's Pipit	<i>Anthus spragueii</i>
Grasshopper Sparrow	<i>Ammodramus savannarum</i>
Baird's Sparrow	<i>Ammodramus bairdii</i>
Nelson's Sharp-tailed Sparrow	<i>Ammodramus nelsonii</i>
Lark Bunting	<i>Calamospiza melanocorys</i>
Chestnut-collared Longspur	<i>Calcarius ornatus</i>
Canadian Toad	<i>Bufo hemiophrys</i>
Plains Spadefoot	<i>Spea bombifrons</i>
Smooth Green Snake	<i>Liochlorophis vernalis</i>
Western Hognose Snake	<i>Heterodon nasicus</i>
Black-tailed Prairie Dog	<i>Cynomys ludovicianus</i>
Sturgeon Chub	<i>Machybopsis gelida</i>
Sicklefin Chub	<i>Machybopsis meeki</i>
Pearl Dace	<i>Margariscus margarita</i>
Blue Sucker	<i>Cycleptus elongatus</i>

Source: North Dakota Comprehensive Wildlife Conservation Strategy, 2005

Sprague's Pipit (*Anthus spragueii*): In 2010, the Sprague's Pipit was determined to be a candidate species under the ESA. No legal requirements exist to protect candidate species under the ESA; however, it is within the spirit of the ESA to consider these species as having significant value worth protecting. Habitat for Sprague's Pipit includes grassland habitats for wintering and large prairie areas for nesting, both of which are present in the Vantage Pipeline wildlife study area (USFWS, 2010).

3.13.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act prohibits anyone without a permit from taking bald or golden eagles, including their parts, nests, or eggs.

Bald Eagle (*Haliaeetus leucocephalus*): Bodies of water located in close proximity to groves of tall trees in the Vantage Pipeline wildlife study area provide potential nesting habitat for Bald Eagles. Wetland and aquatic habitats within one to two miles of mature tree stands (e.g., pines, spruce, firs, cottonwoods, poplars, oak, and birch) provide foraging areas with fish, waterfowl, and shorebird food resources for adults and broods.

Golden Eagle (*Aquila chrysaetos*): The Golden Eagle is a common nesting species of the native prairie and agricultural cropland habitats in the area of the Vantage Pipeline corridor. Their nesting and brood-rearing period lasts from March to August.

3.13.4 Migratory Bird Treaty Act

The Migratory Bird Treaty Act prohibits the taking, killing, possession, and transportation (among other actions) of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. Commonly known migratory birds of the over 299 migratory birds known to occur in North Dakota are presented in Table 3.13.-4.

Table 3.13-4. Common Species Protected by the Migratory Bird Treaty Act in North Dakota	
COMMON NAME (<i>Scientific Name</i>)	
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	Ruby-throated Hummingbird (<i>Archilochus colubris</i>)
Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)	Blue Jay (<i>Cyanocitta cristata</i>)
Bufflehead (<i>Bucephala albeola</i>)	Killdeer (<i>Charadrius vociferus</i>)
Canvasback (<i>Aythya valisineria</i>)	Western Meadowlark (<i>Sturnella neglecta</i>)
Northern Cardinal (<i>Cardinalis cardinalis</i>)	Northern Mockingbird (<i>Mimus polyglottos</i>)
Gray Catbird (<i>Dumetella carolinensis</i>)	Common Nighthawk (<i>Chordeiles minor</i>)
Black-capped Chickadee (<i>Poecile atricapillus</i>)	Sprague's Pipit (<i>Anthus spragueii</i>)
Sandhill Crane (<i>Grus canadensis</i>)	Piping Plover (<i>Charadrius melodus</i>)
Whooping Crane (<i>Grus americana</i>)	Common Raven (<i>Corvus corax</i>)
American Crow (<i>Corvus brachyrhynchos</i>)	Baird's Sandpiper (<i>Calidris bairdii</i>)
Mourning Dove (<i>Zenaida macroura</i>)	Baird's Sparrow (<i>Ammodramus bairdii</i>)
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Swamp Sparrow (<i>Melospiza georgiana</i>)
Golden Eagle (<i>Aquila chrysaetos</i>)	Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)
Great Crested Flycatcher (<i>Myiarchus crinitus</i>)	Western Tanager (<i>Piranga ludoviciana</i>)
American Goldfinch (<i>Carduelis tristis</i>)	Blue-winged Teal (<i>Anas discors</i>)
Canada Goose (<i>Branta canadensis</i>)	Turkey Vulture (<i>Cathartes aura</i>)
Common Grackle (<i>Quiscalus quiscula</i>)	Cedar Waxwing (<i>Bombycilla cedrorum</i>)
Red-tailed Hawk (<i>Buteo jamaicensis</i>)	Downy Woodpecker (<i>Picoides pubescens</i>)

Source: USFWS Website

3.14 TRANSPORTATION

The North Dakota Department of Transportation (NDDOT) classifies North Dakota's state highways into five categories: Interstate System, Interregional System, State Corridor, District Corridor, and District Collector. Of the five categories of state highways, the following three are present in Williams and Divide counties (NDDOT, 2010):

State Corridors support the movement of agricultural commodities, freight, and manufactured products within the state. They also provide connections between lower and higher-level roadways. Traffic on these highways is primarily medium-distance intrastate traffic. Daytime travel speeds average 60-65 miles per hour (mph), with moderately high volumes of traffic consistent year-round. State Corridors are typically safe, two-lane facilities that have segments or locations with partially controlled access, either paved or aggregate shoulders, limited passing zones, and legal weight limits. Bridges and overhead structures provide for the unrestricted movement of legal loads, and the ride is generally good. Maintaining a moderately high degree of reliability and mobility on these highways is critical.

District Corridors primarily support short to medium-distance intrastate traffic. Daytime travel speeds average 55-65 mph. Moderate volumes of traffic are relatively consistent year-round, with occasional increases in seasonal traffic volumes and truck movements. District Corridors are safe, two-lane highways with a good ride quality, and access control is not usually purchased. These highways have narrow paved or gravel shoulders, segments with restricted passing zones, and 7-ton or 8-ton seasonal load limits. Bridge structures provide for the unrestricted movement of legal loads. Maintaining a moderate degree of reliability and mobility on these highways is desirable.

District Collectors are generally shorter routes providing connections to the higher-level systems. Traffic is primarily short-distance, local, or farm-to-market. Daytime travel speeds average 50-55 mph with low volumes of traffic year-round. However, small increases in truck movements may occur during spring planting and fall harvest periods. District Collectors are safe, two-lane facilities with access control usually not purchased, and offer a fair ride quality. These highways generally have no shoulders, and have restricted passing zones. Seasonal 6-ton or 7-ton load limits are normal although some segments may have year-round restrictions. Bridge structures provide for the movement of typical legal loads, but some structures have load, height, and width restrictions. Maintaining reliability and mobility on these highways is a lower priority.

3.14.1 Transportation Corridors Crossed by the Vantage Pipeline

The Vantage Pipeline would cross a total of 88 unimproved trails, neighborhood roads, and county roads, state highways, and two railroads. The transportation corridor crossings are summarized in Table 3.14-1. Figure 3.14-1 illustrates the location of transportation corridors, including state corridors, district corridors, and district collectors, in the vicinity of the Vantage Pipeline.

Table 3.14-1. Road/Railroad Crossings along the Vantage Pipeline Route	
ROAD TYPE	NUMBER OF CROSSINGS
Unimproved Trail	32
Gravel Road	62
Paved Road	6
Railroad ¹	2
Total	102

¹The southernmost railroad line, formerly a BNSF line, has been abandoned.

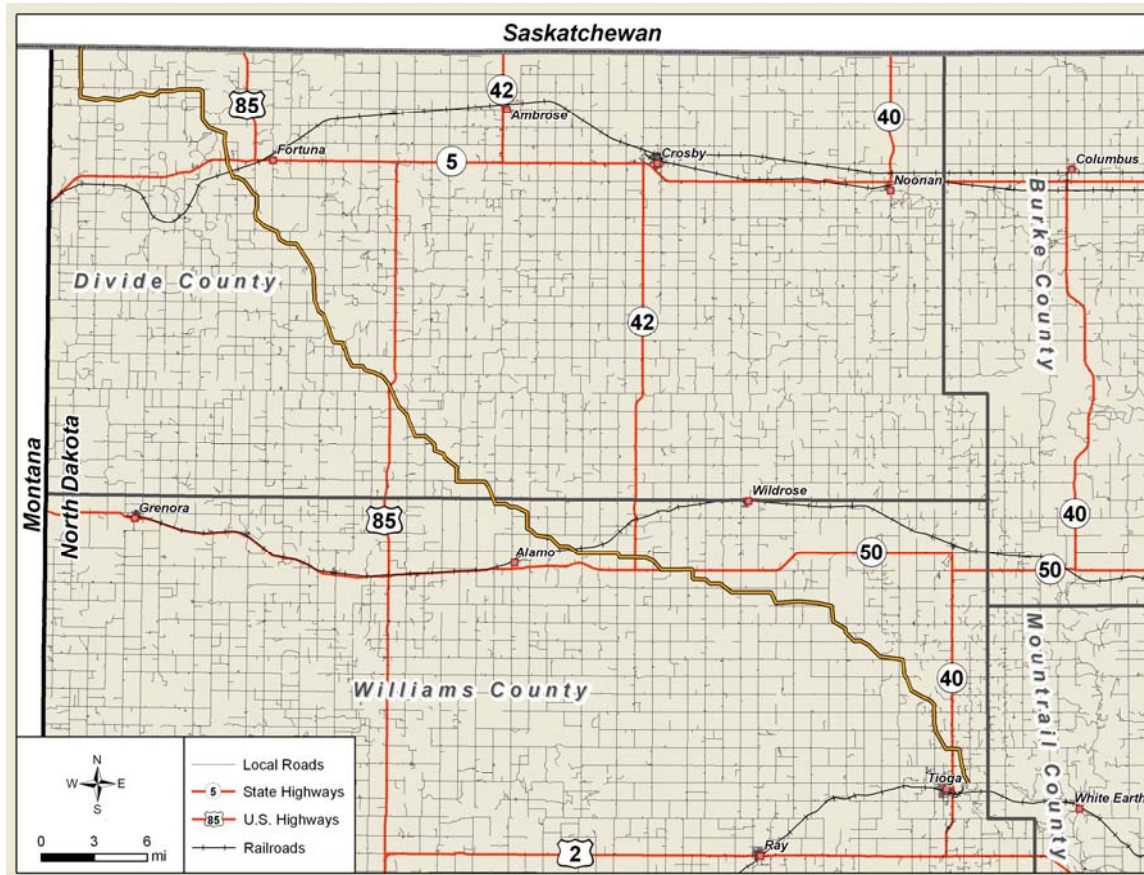


Figure 3.14-1. Transportation Corridors Crossed by the Vantage Pipeline

3.14.1.2 Highway Access and Weight Restrictions

The following state highways were identified within the vicinity of the Vantage Pipeline:

State Corridors. US Highway 85 is located just east of the proposed pipeline route. It runs north/south from the Canadian border, jogs east/west along highway 5, crosses the proposed route at milepost 47.4, and continues south to merge with Highway 2.

District Corridors. State Highway 50 and State Highway 5 run east/west, crossing the pipeline at milepost 23.6 and 65.2, respectively.

District Collectors. State Highway 42, located east of the pipeline route, runs north/south from the Canadian border, jogs east along State Highway 40, east of highway 42, runs south from the Canadian border to Noonan, ND, jogs east along Highway 5, and continues south from Columbus, ND to Highway 50. At Highway 50, Highway 40 jogs west for a short distance before continuing south to Tioga. Highway 40 (also 104th Ave NW) crosses the Vantage Pipeline at milepost 2.44. Portions of Highway 40 along Highway 5 and Highway 50 are classified as District Corridors.

Weight restrictions to gross vehicle weight for highways providing access to the Vantage Pipeline are identified in Table 3.14-2.

HIGHWAY	MAXIMUM GROSS WEIGHT (LBS)
US Highway 85	105,500
Highway 50	105,500
Highway 5	105,500
Highway 42 ¹	80,000
Highway 40	105,500

Source: (NDDOT 2010)

¹ Authorization required for vehicle/load movement exceeding 80,000 lbs G.V.W. when traveling on state highways designated for 80,000 lbs.

3.14.1.3 Other Access

County Roads. In addition to highway crossings, 62 gravel road crossings and 32 trail crossings provide access to the pipeline right-of-way during construction.

Railroads. The Vantage Pipeline intersects two railroad tracks: the abandoned Burlington Northern Santa Fe (BNSF) at milepost 30.4; and the Dakota, Missouri Valley & Western (DMVW) at milepost 64.5.

The portion of BNSF that crosses the proposed pipeline route has been abandoned since 2002 and tracks have been removed. The 60.5-mile line originally ran from Powers Lake to Grenora (Upper Great Plains Transportation Institute, 2007).

The Flaxton-Montana Line (also known as the Western Subdivision) of the DMVW runs 10.3 miles west from Flaxton to Crosby, then 29.9 miles west to the Montana border and west to Whitetail, MT. The existing line is shown in Figure 3.14-1. The maximum travel speed along this route is 10 mph with a maximum carload of 134 tons. In 2004 1,257 carloads of grain were generated; from 2001-2004 an average of 1,647 carloads were generated annually.

The impacts to transportation, including impacts to state highways and other transportation corridors, caused by the construction and operation of the Vantage Pipeline are discussed in Section 4.1.13 below.

3.15 VEGETATION

A baseline environmental survey served as the primary source for the identification of vegetation within the APE. The collected data was supplemented with aerial photos provided by the U.S. Department of Agriculture Farm Service Agency (USDA/FSA 2009) and the Soil Survey Geographic (SSURGO) Database provided by the USDA Natural Resource Conservation Service (USDA/NRCS 2008). The baseline environmental survey classified vegetation along the pipeline route by the three major categories as defined by the Multi-Resolution Land Characteristics Consortium (MRLC 2001):

- Herbaceous Planted/Cultivated: Areas characterized by herbaceous vegetation that has been planted or is intensively managed for the production of food, feed, or fiber; or is maintained in developed settings for specific purposes. Herbaceous vegetation accounts for approximately 80 percent of the cover.
- Herbaceous Upland Natural/Seminatural Vegetation: Upland areas characterized by natural or semi-natural herbaceous vegetation; herbaceous vegetation accounts for approximately 20 percent of the cover.
- Wetlands: Areas where the soil or substrate is periodically saturated with or covered with water as defined by Cowardin et al. (Cowardin 1979).

Vegetation Crossed by the Pipeline Route

All three major categories of vegetation were identified within the APE. Herbaceous Planted/Cultivated vegetation comprises approximately 80 percent of the pipeline corridor. Specifically, 47.3 miles of cultivated crops and 16.5 miles of pasture/hay are crossed by the Vantage Pipeline. Herbaceous Upland Natural/Seminatural Vegetation comprises 20 percent of the corridor, and would be crossed by the Vantage Pipeline for 15.8 miles. While present, the Vantage Pipeline would cross only a minimal amount of wetlands vegetation, equating to approximately 0.3 miles. The types of vegetation observed, and their frequency, are identified in Table 3.7-1.

Table 3.7-1. Land Cover Classification along the Vantage Pipeline Route			
GENERAL AND SUBCLASS DESIGNATION	GENERAL DESCRIPTION	DISTANCE ALONG PIPELINE	
		[mi.]	[%]
Herbaceous Planted/Cultivated			
Cultivated Crops	<i>Row Crops</i> - Areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, and cotton. <i>Small Grains</i> - Areas used for the production of graminoid crops such as wheat, barley, oats, and rice.	47.3	59%
Pasture/Hay	Grasses/legumes planted for livestock grazing or the production of seed or hay crops	16.5	21%
Herbaceous Upland Natural/Seminatural Vegetation			
Herbaceous Upland Natural/Seminatural Vegetation	Dominated by graminoid or herbaceous vegetation, generally > 80% total vegetation, not subject to intensive management such as tilling, but can be used for grazing	15.8	20%
Wetlands			
Palustrine Emergent Wetland	Includes wetlands dominated by persistent emergent vascular plants, emergent mosses or lichens; plants generally remain standing until the next growing season	0.2	<1%
Palustrine Unconsolidated Bottom	Includes shallow open water communities with water depths of less than 6.6 feet. Floating-leaved and submergent vegetation is dominant	<0.1	<1%
Total		79.8	100%

The impacts vegetation caused by the construction and operation of the Vantage Pipeline are discussed in Section 4.1.14 below.

3.16 VISUAL RESOURCES

Landscapes in Williams County are characterized by rolling to hilly plains. In Divide County, the landscape is generally a hummocky plain punctuated by numerous prairie potholes. Even on open grasslands the views of low-lying features may be blocked by the modest changes in elevation characteristic of this terrain.

Private land use in Divide and Williams counties is typically farming on large tracts of 40 acres or more. The city of Tioga and other small farming communities in northern Williams County and western Divide County are arrayed along the east-west railroad corridors and primary road network. State school lands

found in virtually every “township” (36-square-mile units of the original public survey of western lands) are native or restored grasslands leased to private owners for grazing. Housing outside of the cities and towns is scattered among the large agricultural parcels. Older housing of this type is associated with original farms and, given consolidation of ownership over time, may now be occupied only seasonally or not at all.

Exploration and development of petroleum and natural gas resources is an established industry in North Dakota and in Divide and Williams counties, which are part of the geologically defined Williston Basin. Land uses related to the industry are scattered throughout both counties; they include the gas processing plant near Tioga and numerous producing well sites, pipeline valve sites, and surface signage used to mark the location of underground pipelines.

No roads in Divide and Williams counties bear a “scenic” designation (NDPRD). Traffic is generally light and related to local land uses or to commercial transport. The North Dakota Department of Transportation reports average daily traffic counts (ADT) of around 2,100 vehicles per day on North Dakota State Highway (SH) 40 near the City of Tioga, 160 ADT on SH 50 between Tioga and Alamo, 475 ADT on U.S. Highway 85 north of its intersection with State Highway 50, and 235 ADT on SH 5 west of Fortuna (NDDOT 2009). The same source indicates that about one-fourth of ADT is trucks in Divide and Williams counties.

Impacts to the above-identified visual resources caused by the construction and operation of the Vantage Pipeline are discussed in Section 4.1.15 below.

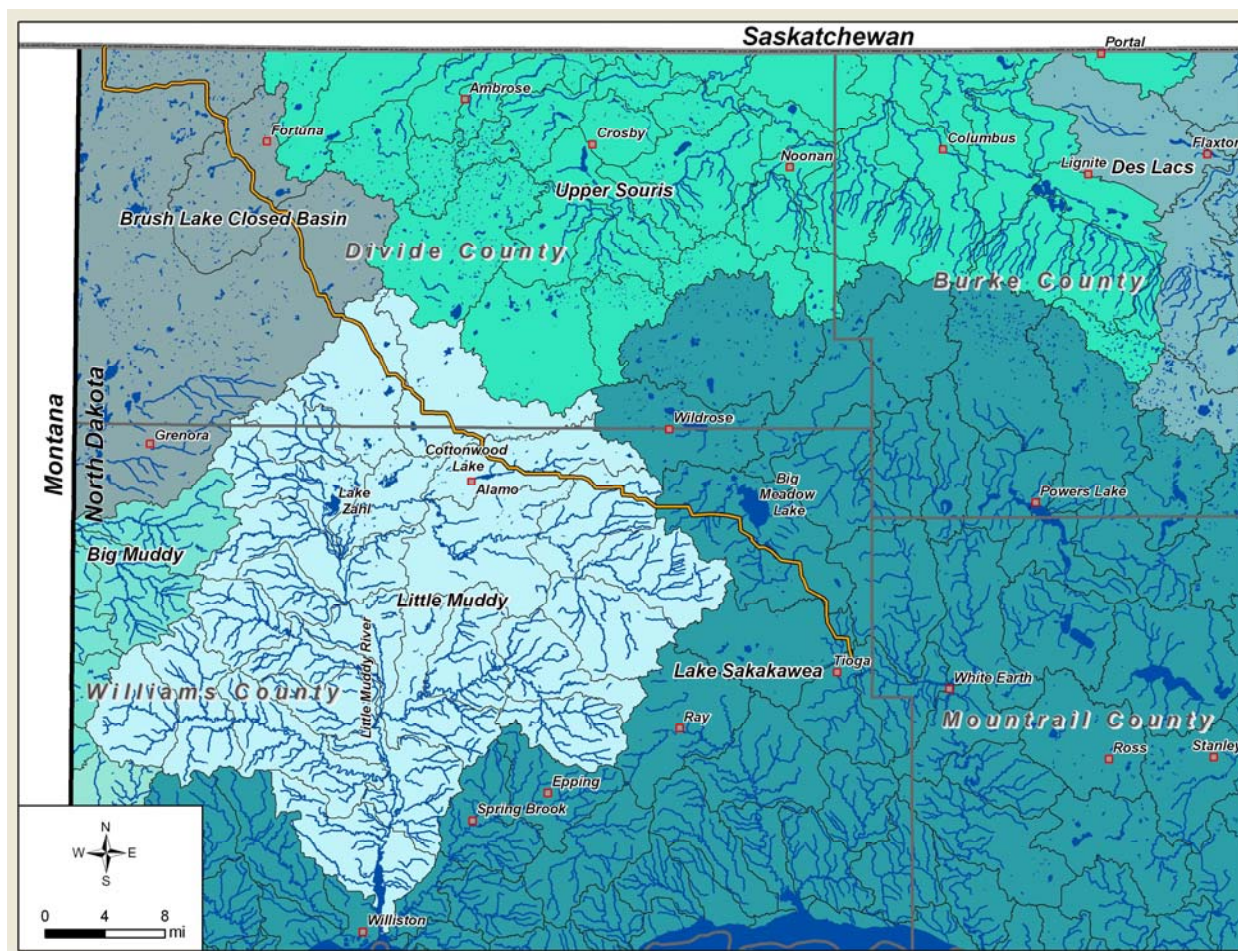
3.17 WATER QUALITY

The Area of Potential Effect (APE) refers to the geographic area that includes all water resources that could be potentially affected by the Proposed Action. For surface water resources the APE would be defined within a drainage or watershed. The APE for groundwater would include any aquifers that could potentially be affected by the Proposed Action.

A baseline survey was completed in which wetlands, groundwater wells, and surface waters within a 500-foot-wide corridor of the pipeline alignment were identified. The baseline survey data was combined with water resource data gathered through public GIS databases provided by the U.S. Environmental Protection Agency, the USDA/NRCS National Cartography & Geospatial Center, the North Dakota Health Department, the US Geological Survey (USGS), and the North Dakota State Water Commission (NDSWC).

Additionally, glacial drift aquifer data was collected from the North Dakota State Water Commission GIS data hub (NDWSC, 2010). Glacial drift aquifer data was digitized from a 1986 USGS map showing glacial drift aquifers in North Dakota and estimated potential yields. The data has been modified by the USGS in cooperation with the NDSWC and the North Dakota Geological Survey. Hydrologic unit GIS data was acquired through the NRCS National Cartography & Geospatial Center, and is periodically updated by USDA Service Center Agencies.

Surface water within the pipeline corridor can be characterized by a few depressional potholes and wetlands, with very few defined surface water drainages. Groundwater is the primary water source for rural residents in the project area. The surface water and groundwater specifically identified within the APE are discussed below, as well as water quality, use and protection.



3.17.1 Surface Waters

Figure 3.17-1 illustrates the locations of the five watersheds or hydraulic sub-basins in the vicinity of the pipeline route, including the Lake Sakakawea, Little Muddy, Big Muddy, Brush Lake Closed Basin, and Upper Souris (USDA/NRCS 1999). Of the five watersheds identified, the Vantage Pipeline route is located within the Lake Sakakawea, Little Muddy, and the Brush Lake Closed Basin watershed.

Figure 3.17-1. Hydrologic Sub-basins in the Vicinity of the Vantage Pipeline

Specifically, 20.4 miles of the southern route is located along the western margin of the Lake Sakakawea Sub-basin. The alignment crosses one surface water drainage that flows to the White Earth River, and several drainages that flow to Big Meadow Lake. Several lakes, including Cottonwood Lake (non-reporting) and Zahl Lake (reporting), are located further south of the pipeline route. To the north, the pipeline route traverses along the headwaters of the Little Muddy River Basin watershed (29.1 miles). Within this watershed, the pipeline alignment crosses one ephemeral drainage that is a tributary to the Little Muddy River. To the north the pipeline route then enters the Brush Lake Closed Basin watershed for a distance of 30.3 miles.

The streams and lakes identified within the watersheds are listed in Table 3.17-1. Flowing water was not observed at any of the drainage crossings during the Fall 2010 field surveys, but runoff was observed in some locations during the spring 2011 surveys. In addition to the surface waters identified in Table 3.17-

1, wetlands and prairie potholes were also identified adjacent to the pipeline route, as well as palustrine emergent wetlands and palustrine unconsolidated bottom wetlands with standing water. For an assessment of identified wetlands, please refer to section 3.18.

WATERBODY	MAJOR HYDROLOGIC BASIN	APPROXIMATE DISTANCE AND DIRECTION FROM PIPELINE ROUTE
Big Meadow Lake	Missouri River – Lake Sakakawea Sub-basin	0.6 miles NE
Cottonwood Lake	Missouri River – Little Muddy Sub-basin	0.4 miles W
Lake Zahl	Missouri River – Little Muddy Sub-basin	8.0 miles SW
Little Muddy River	Missouri River – Little Muddy Sub-basin	11.4 miles SW
White Earth River	Missouri River – Lake Sakakawea Sub-basin	6.4 miles E

3.17.2 Groundwater

Groundwater is a primary source for public water systems, private drinking-water wells, irrigation, and livestock along the Vantage Pipeline route. Major aquifer in the vicinity of the Vantage Pipeline route include the regional Lower Tertiary bedrock aquifer; and unconsolidated deposits (glacial drift, surficial aquifers) including the Skjermo Lake, Smoky Butte Yellowstone River Channel, West Wildrose, and an unnamed aquifer (NDSWC 2010).

The principal bedrock aquifer underlying the Vantage Pipeline is the Lower Tertiary aquifer (USGS 2003) which in North Dakota consists of sandstone beds of the Paleocene age. Lower tertiary aquifers are not highly permeable due to interbedded shale, mudstone, siltstone, lignite, and coal, but are large, making them an important water supply source. In the Williston basin, lower Tertiary rocks are typically less than 1,000 feet thick. Permeable areas include openings between sand grains, bedding planes, joints and clinker zones. Well yields in the lower Tertiary aquifer of North Dakota range from 1 to 100 gallons per minute, and are typically drilled 300 to 900 feet deep (Whitehead 1996).

The pipeline route also crosses the Skjermo Lake aquifer at its northernmost end. The Skjermo Lake aquifer is approximately one million acres in area, with the water table ranging from above ground level to 100 feet below ground level, with the thickness of the saturated sand and gravel ranging from 38 to 106 feet (Armstrong 1967).

The Yellowstone River Channel runs from southeast to northwest occupying an area of approximately 4.3 million acres. The Vantage Pipeline route would cross the northern portion of the aquifer near the Williams/Divide County border. The saturated sand and gravel thickness of the aquifer in this area is estimated to be 12-20 feet (Armstrong 1967).

The Little Muddy aquifer occupies approximately 2.6 million acres and extends northeast of the Little Muddy River just north of the Yellowstone River Channel. The aquifer consists of mixed sand and gravel and ranges in thickness from 0 to 116 feet.

The pipeline also crosses the West Wildrose aquifer in the northern portion of Williams County, occupies approximately 4.3 million acres, and consists of sand and gravel. The groundwater table in this area, lies at a depth ranging from 88 to 125 feet with thickness of saturated soil ranging from 15 to 46 feet (Armstrong 1967).

Little is known of the unnamed aquifer including extent and its general hydrogeologic properties. It is found in unconsolidated glacial Quaternary Age deposits with materials comprised of glacial outwash and alluvium. Sand and gravel make up the fine grains with a high porosity. Depths below ground surface can be as shallow as 100 feet to as deep as 1,000 feet and the aquifer ranges from highly confined to semi-confined depending on the surrounding formations, as these are unconsolidated glacially derived materials. Figure 3.17-2 illustrates the locations of these major aquifers in the vicinity of the Vantage Pipeline route.

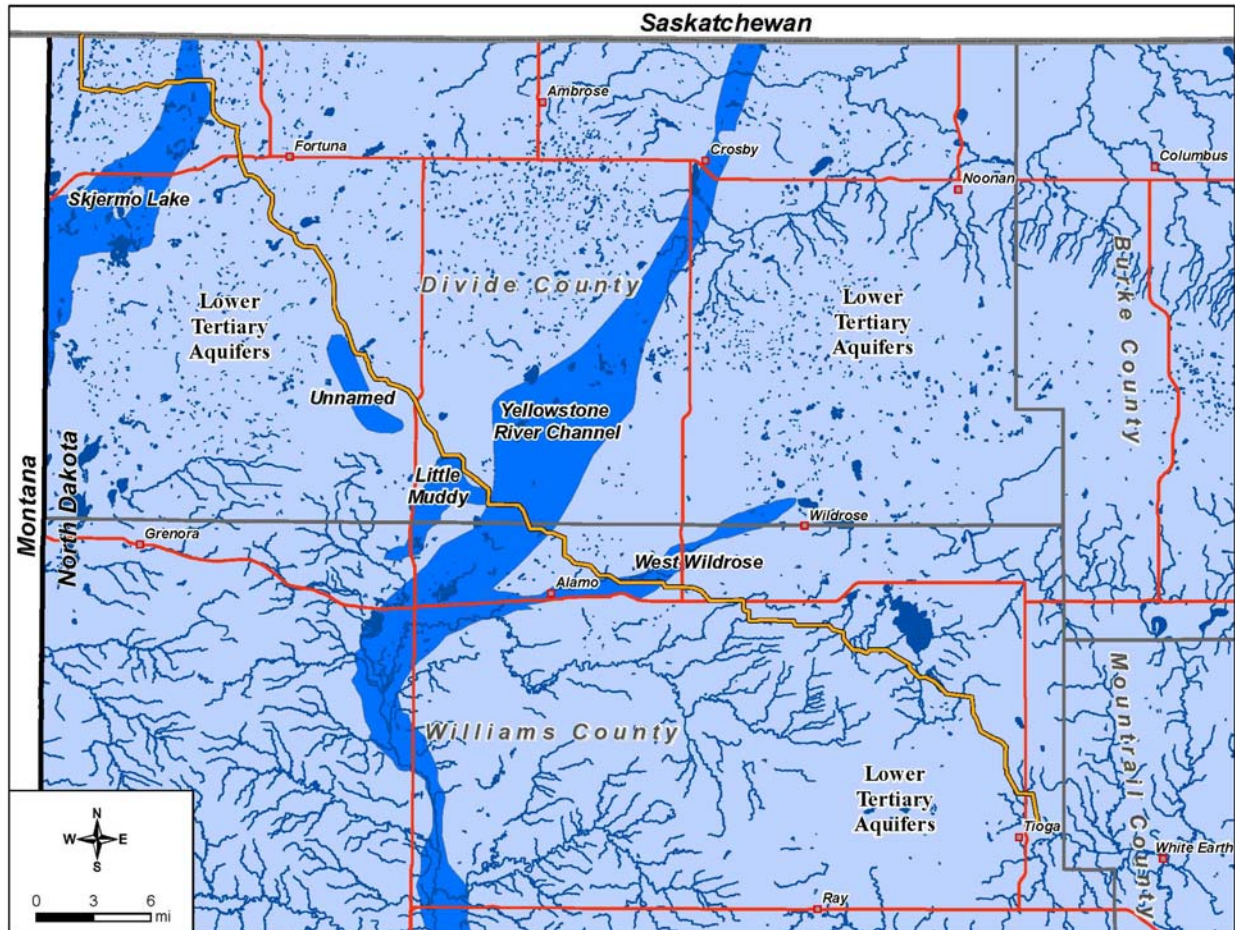


Figure 3.17-2. Principal and Major Glacial Drift Aquifers in Northwestern North Dakota

Sole Source Aquifers

According to the U.S Environmental Protection Agency (EPA) Region 8 Sole Source Aquifer (SSA) Program, there are no designated sole source aquifers in North Dakota or in the eastern two-thirds of Montana. The nearest federal designated sole source aquifers in Region 8 are found in western Montana, Idaho, southern Wyoming and Utah. In addition, there are no North Dakota Department of Health (NDH) Source Water Protection Program designated SSA boundaries in the project area.

3.17.3 Water Quality

Ground water quality in North Dakota's glacial drift aquifers typically ranges from 200 mg/L of Total Dissolved Solids (TDS) to several thousands of mg/L. The National Secondary Drinking Water

Regulations (NSDWR or secondary standards) suggest a drinking water standard of less than 500 mg/L TDS. The secondary standard for TDS is the concentration where hardness, mineral deposits, colored water, staining, and salty taste may result for concentrations above the maximum concentration level (MCL). The groundwater quality of select subsurface aquifers crossed by the Vantage Pipeline route is summarized in Table 3.17-2 below. Water quality of the Yellowstone River Channel aquifer was not reported by Armstrong due to the lateral and vertical variability in water quality. All of the TDS levels indicated in the table are at or exceed the secondary MCL for TDS.

AQUIFER	TOTAL DISSOLVED SOLIDS (MG/L)
Skjermo Lake	907
West Wildrose	500
Little Muddy	1,030 to 2,050

Source: Armstrong 1967

Further, Section 303(d) of the Clean Water Act (CWA) requires each state to list waterbodies which are considered water-quality limited and require load allocations, waste load allocations, and Total Maximum Daily Loads (TMDLs). Listed waterbodies (Section 303(d) list) are considered water-quality limited when it is known that their water quality does not meet applicable standards or is not expected to meet applicable standards. The North Dakota Department of Health has recently updated the Section 303(d) list and has identified the following listed waters in the vicinity of the Vantage Pipeline. Figure 3.17-3 illustrates the locations of the 303(d) Waterbodies located near the Vantage Pipeline Route, and Table 3.17-3 summarizes the 303(d) listings in the area.

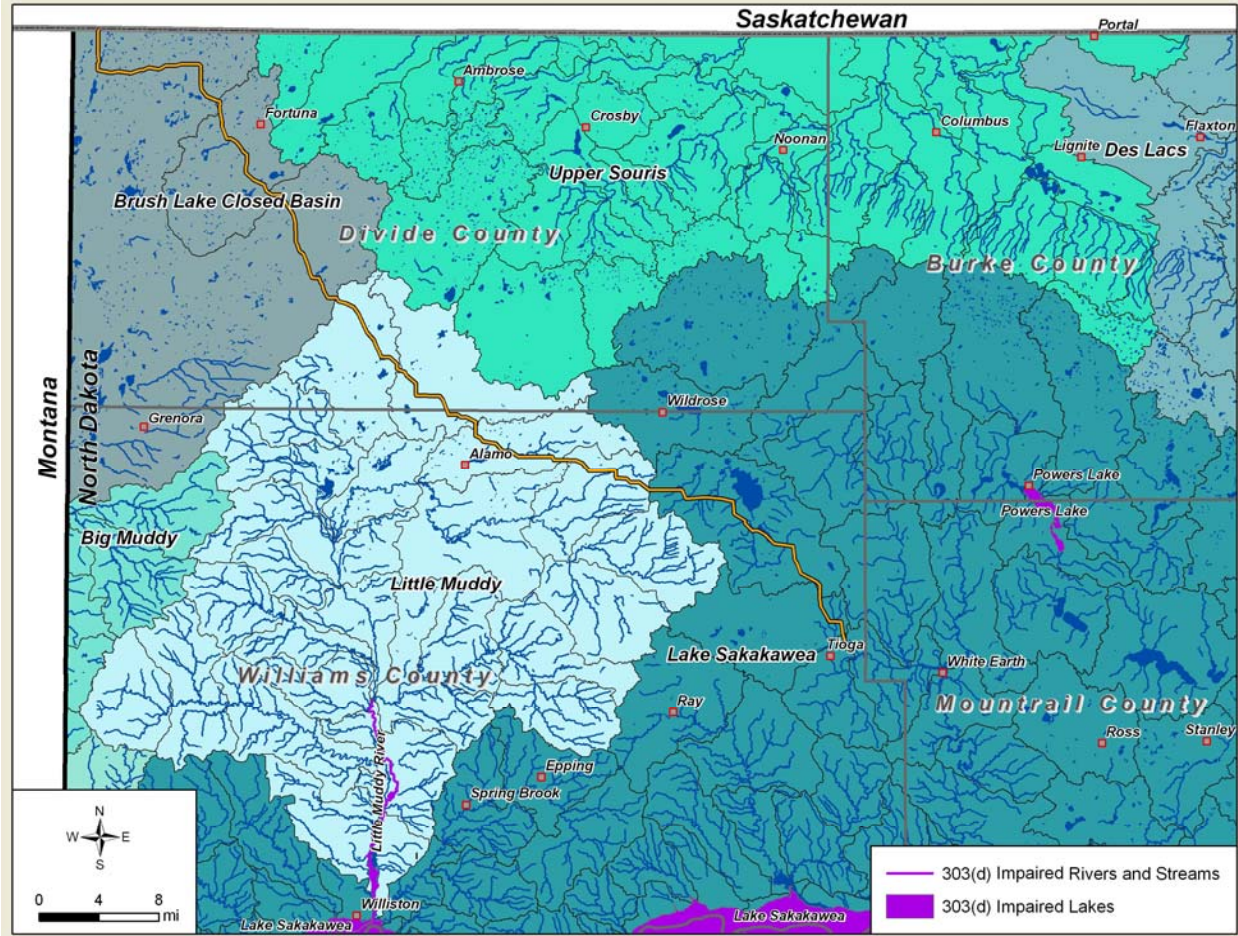


Figure 3.17-3. North Dakota 303(d) Waterbodies located near the Vantage Pipeline Route

WATERBODY	DESIGNATED USE	USE SUPPORT	IMPAIRMENT
Powers Lake	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation
Lake Sakakawea	Fish Consumption	Not Supporting	Methylmercury
Little Muddy River from its confluence with East Fork Little Muddy River, downstream to Lake Sakakawea. Located in Central Williams County. (24 Miles)	Recreation	Fully Supporting but Threatened	Fecal Coliform

Source: North Dakota Department of Health, 2010

The Vantage Pipeline would not cross any of the Section 303(d) listed waters identified in Table 3.17-3. The pipeline route would traverse the Little Muddy hydrologic unit upgradient of the listed section of the Little Muddy River.

The North Dakota Department of Health has found that nonpoint source (NPS) pollution such as siltation/sedimentation and stream habitat loss or degradation is the primary cause of aquatic life use impairment (NDDH, 2010). Other pollution such as trace element contamination, flow alteration, and oxygen depletion has contributed to impairment. In North Dakota the primary sources of pollutants affecting aquatic life use are cropland erosion and runoff, animal feeding operations and poor grazing management (NDDH, 2010).

3.17.4 Water Use

Groundwater use in the APE includes public supply systems, private wells, livestock, and irrigation (USDA, 2006). The EPA has defined a public water system as providing water for at least 15 service connections or at least 25 people for 60 or more days a year (Edward T. Schafer, Murray G. Sagsveen 1999). Groundwater dependant public water systems in Divide and Williams County include the Ray and Tioga Water System, Grenora, Wildrose, Noonan, Crosby, and Fortuna (NDDH/DWQ 2003). No public water supply wells are located within one mile of the proposed pipeline route. The nearest municipal wells, owned by the City of Tioga, are located approximately 1.4 miles southwest of the southern end of the pipeline route (NDSWC 2007). The Ray and Tioga City Public Water System supplies water to the Hess Tioga Gas plant and to a population of approximately 2,363 people (Schafer, Sagsveen 1999) residing in Tioga, Ray and Stanley, ND.

Twelve domestic water supply wells are located within 1 mile of the pipeline route, which draw water from the glacial drift aquifers identified in Section 3.17.2 above. Well locations are illustrated in Figure 3.17-4 below. Other wells within one mile of the pipeline include: test holes, observation wells, surface water sample sites, irrigation wells, stock wells, and wells of unknown purpose (NDSWC 2007).

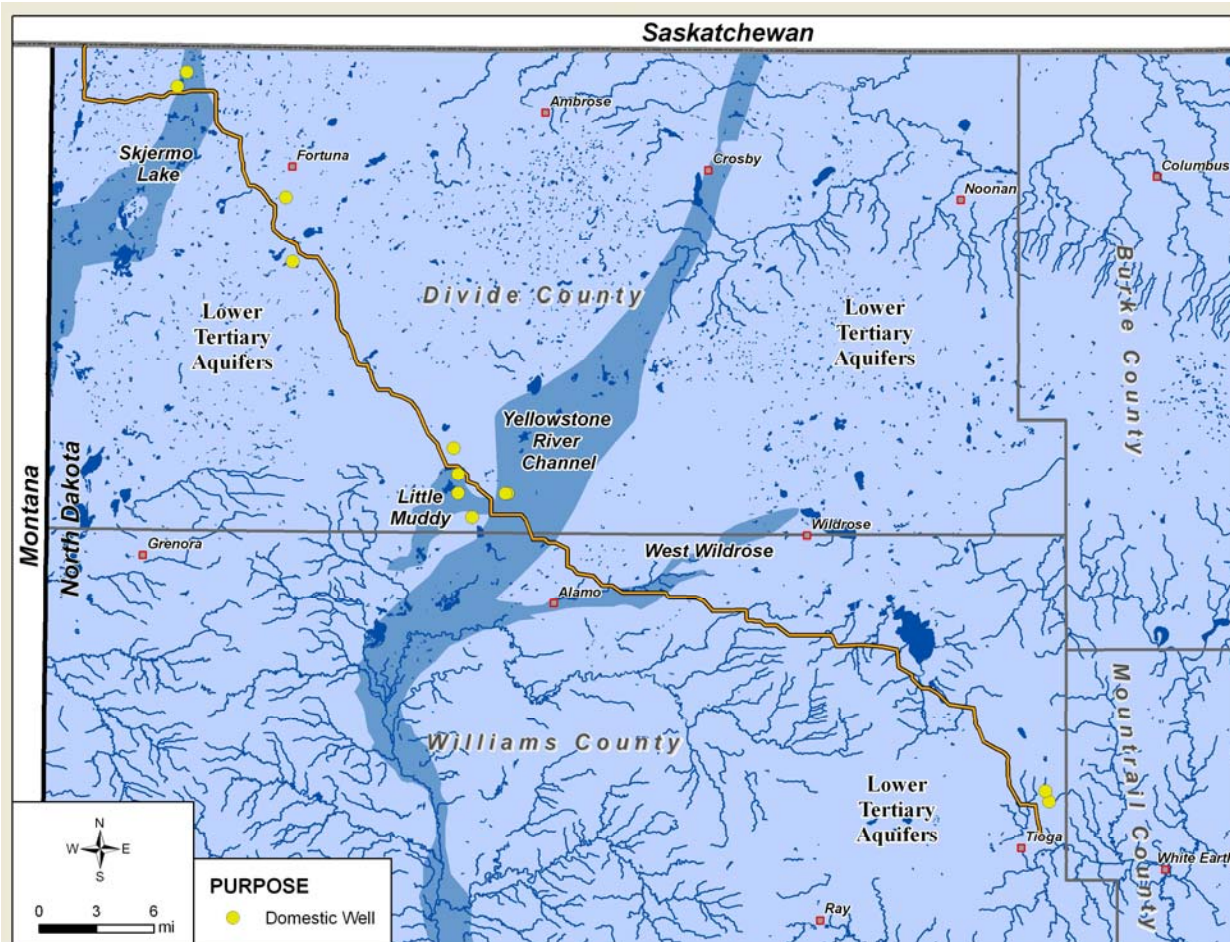


Figure 3.17-4. Domestic Wells Within 1 Mile of the Vantage Pipeline

Well Head Protection Areas

There are no federal or state designated wellhead protection areas (WHPAs) in the State of North Dakota. The legislation states that the WHPA boundaries are defined as the municipal or facility property boundary until the municipal or property owner designates such otherwise.

3.17.5 Emergency Watershed Protection Program

The Emergency Watershed Protection Program protects watersheds by purchasing floodplain easements and preventing destruction due to naturally or on naturally occurring impairments (USDA/NRCS 2010b). There are no Emergency Watershed Protection Program areas in the Vantage Pipeline corridor.

Potential impacts to water caused by the construction and operation of the Vantage Pipeline are discussed in Section 4.1.16 below.

3.18 WETLANDS AND RIPARIAN ZONES

Wetlands are defined in federal Executive Order 11990 as “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal

circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”

According to Corps of Engineers Wetlands Delineation Manual (USACE 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (USACE 2010), one positive indicator (except in certain situations) from each of three elements must be present in order to make a positive wetland determination, which are as follows:

- Greater than 50 percent dominance of hydrophytic plant species.
- Presence of hydric soil.
- The area is either permanently or periodically inundated, or soil is saturated to the surface during the growing season of the dominant vegetation.

Vantage conducted a conservative and approximate inventory of wetland boundaries along the 80-mile long, 500-foot-wide Vantage Pipeline corridor based upon visible hydrology and vegetation indicators. Preliminary correspondence with the U.S. Army Corps of Engineers indicated that formal wetland delineations were not necessary for pipeline route planning. Rather, a conservative and approximate wetland boundary would be appropriate for impact avoidance and minimization efforts. Full wetland delineations were therefore not completed during the preliminary field surveys, nor were soils samples collected.

The wetland investigation resulted in the identification and mapping of wetlands within and nearby the initial proposed pipeline route. This total included the various route alternatives that were considered. A total of 201 of the wetlands are located within the final 500-foot Vantage Pipeline corridor. Table 3.18-1 summarizes the identified wetlands within the corridor by wetland type. Each wetland type, and the number of occurrences, are discussed in more detail below.

CLASSIFICATION		WETLANDS OBSERVED	
Circular 39 ²	Cowardin ³	Number	Area (acres)
1	PEMA	25	5.18
1/2	PAMA/B	1	0.50
2	PEMB	101	40.90
2/3	PEMB/C	40	28.10
2/5	PEMB/PUBx	1	0.12
3	PEMC	20	13.22
3/4	PEMC/F	8	8.38
4	PEMF	2	2.10
4/5	PEMF/ PUB	1	0.21
5	PUB	1	3.59
6	PSS1B	1	0.08
Totals		201	102.36

¹ Includes only wetland area within the 500-foot pipeline corridor. Actual wetland boundaries may extend past the project limits and may be larger than indicated.

² *Wetlands of the United States, Circular 39.* (Shaw and Fredine, United States Fish and Wildlife Service, 1956)

³ *Classification of Wetlands and Deepwater Habitats of the United States.* (Cowardin et al., December 1979)

Wetlands are classified into six types:

Type 1—Palustrine Emergent A (PEMA) Seasonally Flooded Basins. A total of 25 Type 1 wetlands, encompassing approximately 5.18 acres, were identified in the project area. Additional Type 1 wetlands were also identified as occurring with Type 2 wetlands. Type 1 seasonally flooded basins are shallow depressions that may have standing water for a small portion of the growing season, but are usually dry for a portion to a majority of the growing season. This type of wetland is very common throughout the prairie pothole region. Many of the seasonally flooded basins observed in the project area were cultivated with a variety of crops, although those basins that were fallow developed a dominance of wetland vegetation. Dominant vegetation in the seasonally flooded basins included water smartweed (*Polygonum amphibium*), which grows only in wetland areas; reed canary grass (*Phalaris arundinacea*), foxtail barley (*Hordeum jubatum*), curly dock (*Rumex crispus*), field mint (*Mentha arvensis*), and barnyard grass (*Echinochloa crus-gali*), all of which usually occur only in wetlands; and field sowthistle (*Sonchus arvensis*), which may occur in either wetlands or upland areas.

No primary indicators of wetland hydrology were observed in the identified seasonally flooded basins. However, several secondary indicators were observed including surface soil cracks, sparsely vegetated concave surface, saturation visible on aerial imagery, geomorphic position, and vegetation type.

Type 2—Palustrine Emergent B (PEMB) Fresh Wet Meadows. A total of 101 Type 2 wetlands, encompassing approximately 40.90 acres, were identified in the project area. Additional Type 2 wetlands were also identified as occurring with Type 1, Type 3, and Type 5 wetlands. Type 2 fresh wet meadows are depressions that may contain standing water for a short duration early in the growing season, but typically are saturated within 12 inches of the surface and lack surface water for most of the growing season. Fresh wet meadows are usually dominated by grasses, sedges, and forbs with little woody species present. Many of these wetlands observed in the project area were cultivated, but crops showed evidence of stress due to long duration of saturation. Dominant vegetation in the fresh wet meadows included: water smartweed, reed canary grass, various species of sedges (*Carex spp.*) and rushes (*Juncus spp.*), and field sow thistle.

Primary indicators of wetland hydrology as defined by the Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Great Plains Region were observed in few of the fresh wet meadows where the wetlands were saturated to the surface, but saturation would most likely have been observed if subsurface soils were investigated. Secondary indicators observed in the fresh wet meadows included sparsely vegetated concave surface, saturation visible on aerial imagery, geomorphic position, and vegetation type.

Type 3—Palustrine Emergent C (PEMC) Shallow Marshes. A total of 20 Type 3 wetlands, encompassing approximately 13.22 acres, were identified in the project area. Additional Type 3 wetlands were also identified as occurring with Type 2 and Type 4 wetlands. Type 3 shallow marshes have soils that are saturated and are usually inundated with up to 6 inches of standing water throughout the growing season. Most of the shallow marshes observed within the project area were adjacent to areas of deeper water, although several of the shallow marshes were deep, inundated depressions. Dominant vegetation in the shallow marshes included broad-leaved cattail (*Typha latifolia*) and softstem bulrush (*Scirpus validus*), both species that grow only in wetland areas. Water smartweed was found in areas with drawn down hydrology.

Surface water was the primary indicator of hydrology that was observed in the shallow marsh wetlands. The shallow marshes in the project area varied in the amount of standing water. Several wetlands did not have visible standing water, but were saturated to the surface, had a thin muck surface, and contained vegetation typical of a shallow marsh. These wetlands were likely drawn down as the growing season progressed and were still considered shallow marshes.

Type 4—Palustrine Emergent F (PEMF) Deep Marshes. A total of 2 Type 4 wetlands, encompassing approximately 2.10 acres, were identified in the project area. Additional Type 4 wetlands were also identified as occurring with Type 3 wetlands. Type 4 deep marshes are typically inundated with between 6 inches and 3 or more feet of standing water throughout the growing season. They are dominated by emergent vegetation, but may also be composed of floating-leaved and submerged vegetation. Both of the deep marshes observed in the project area were open water with a Type 2 or Type 3 fringe. Broad-leaved cattail and lake sedge (*Carex lacustris*) were dominant in the deep marsh habitats.

Surface water was the primary indicator of hydrology that was observed in the deep marsh wetlands. Deep marshes rarely draw down to expose the aquatic bed and standing water should be expected throughout the growing season.

Type 5—Palustrine Unconsolidated Bottom (PUBx) Shallow Open Water. One Type 5 wetland encompassing approximately 3.59 acres was identified within the project area. Additional Type 5 wetlands were identified as occurring with Type 2 wetlands. Type 5 shallow open water communities have water depths of less than 6.6 feet. Waterbodies with a depth greater than 6.5 feet are deep water habitat and are not considered wetlands. Shallow open water communities differ from deep marshes in that floating-leaved and submergent vegetation is dominant, rather than emergent vegetation, as in a deep marsh. Typical dominant species in shallow open water habitats include duckweed (*Lemna spp.*), pondweed (*Potamogeton spp.*), and various species of water lilies (*Nymphaea sp.* and *Nuphar sp.*). Both of the shallow open water communities observed within the project area showed evidence of excavation.

Surface water was the primary indicator of hydrology that was observed in the shallow open water wetlands. Shallow open water communities persist throughout growing season.

Type 6—Palustrine Scrub-Shrub Broad-leaved Deciduous (PSS1B) Shrub-carrs. One Type 6 shrub-carr community was identified within the study corridor, encompassing approximately 0.08 acres. Shrub-carrs are plant communities composed of tall, deciduous shrubs growing on saturated to seasonally flooded soils. They are typically dominated by willows or dogwood overlaying a ground layer of ferns, sedges, grasses, and forbs of sedge meadow and fresh (wet) meadow communities. The diversity of species composing the ground layer is dependent on degree of shrub canopy cover, degree of disturbance, and water source. The observed Shrub-carr wetland was dominated by willows and shrubs.

Primary indicators of wetland hydrology as defined by the Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Great Plains Region were not directly observed in the Type 6 shrub swamp basin, but saturation would most likely have been observed if subsurface soils were investigated. Secondary indicators observed in the shrub swamp included sparsely vegetated concave surface, saturation visible on aerial imagery, geomorphic position, and vegetation type.

Wetland complexes, which are comprised of more than one wetland plant community type, were frequently observed throughout the project area. Because wetland plant communities are dependent upon hydrology present, it is natural that the wetland plant community habitat is not contiguous throughout the entire basin. Shallow marsh/fresh wet meadow complexes were most frequently encountered, with several deep marsh/shallow marsh and shallow open water/fresh wet meadow complexes observed as well. These complexes are comprised of vegetation that is characteristic of each habitat and are indicative of a transition between two wetland types.

Potential impacts to wetlands caused by the construction and operation of the Vantage Pipeline are discussed in Section 4.1.17 below.

3.19 WILDLIFE AND FISHERIES

Information presented in this section reflects information received through informal discussion with the USFWS, the North Dakota Game and Fish Department (NDGF), and other data sources available at the time this document was prepared. This information is intended to be updated throughout the pre-construction process based upon ongoing surveys and continued consultation with state and federal agencies. Wildlife surveys were completed in July of 2011 with the exception of the piping plover survey which will be included in the pre-construction survey. Wildlife surveys would identify use sites and habitats of concern within one-half mile of the proposed Vantage Pipeline alignment. Any identified habitats of concern would be monitored during the construction process. Information resulting from this process would be used to finalize the wildlife and fishery components for Environmental Reclamation and Mitigation Plans.

The following sections discuss occurrences of, and impacts to, terrestrial and aquatic wildlife caused by the construction and operation of the Vantage Pipeline. Threatened, endangered, candidate, and sensitive animal and plant species are discussed in Section 3.13. Table 3.13-2 describes those birds, mammals, amphibians, and reptiles of high priority for management in North Dakota. Each priority species is also addressed in detail in the North Dakota Comprehensive Wildlife Conservation Strategy (Hagen, Isaacson, and Dyke, 2005).

3.19.1 Terrestrial Wildlife

Wildlife Resources in Williams and Divide Counties in North Dakota occur within areas generally characterized as upland grasslands, croplands, and prairie pothole wetlands. Wildlife habitats along the Vantage Pipeline include herbaceous upland natural/semi-natural vegetation, herbaceous planted/cultivated, and wetlands. The upland areas include areas used for agricultural production, fallow fields, and grassland. Descriptions of vegetative communities along the Vantage Pipeline route are presented in Section 3.15 and 3.18. Efforts were made in routing the pipeline to minimize impacts on and crossings of native grassland and prairie wetland habitats, by ensuring that the pipeline right-of-way would predominantly cross cultivated agricultural lands.

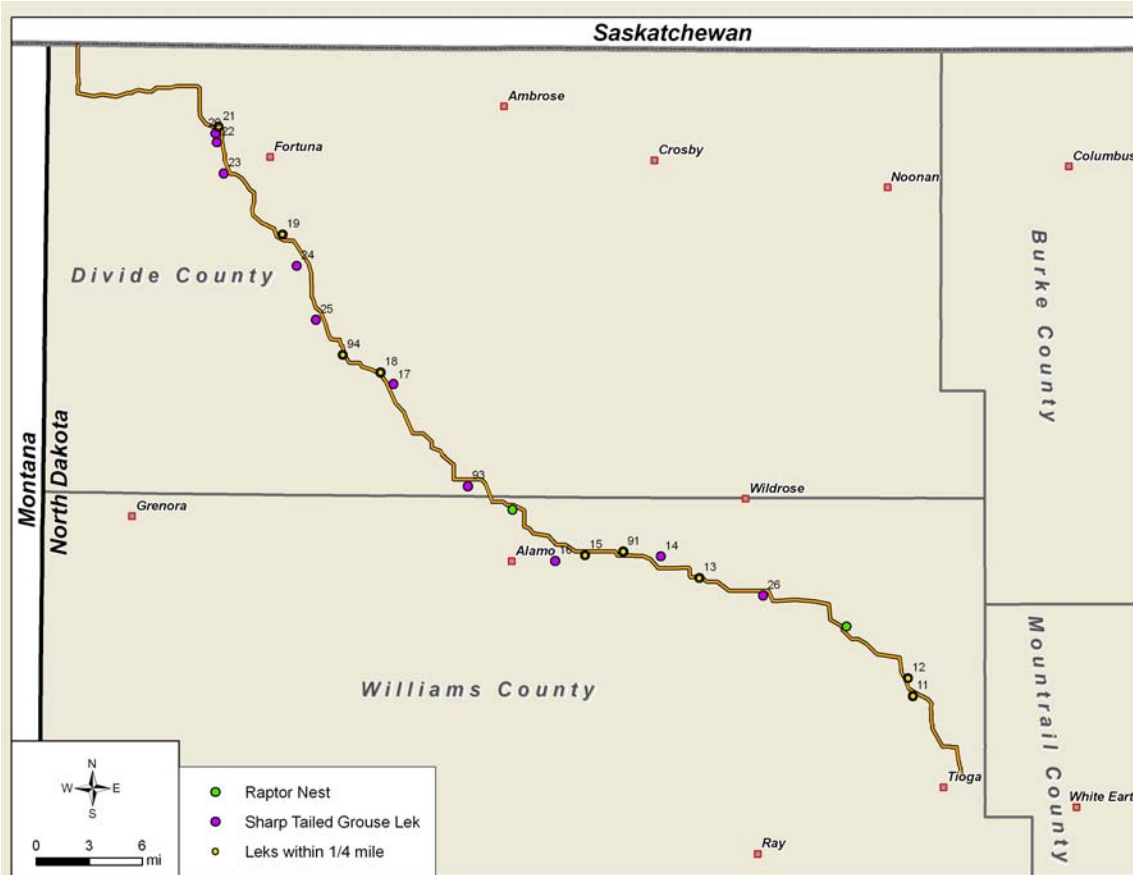
Approximately 80 percent of the total length of the pipeline route, or 63.8 miles, crosses upland areas classified as agricultural and pasture/hay. Agricultural croplands generally consist of row crops, small grains, lentil peas, and sunflowers. Livestock grazing occurs on native and introduced pastures in spring through fall. Croplands provide a seasonal food source for mammals, upland birds, and waterfowl. Common wildlife species that utilize the agricultural areas for feeding and occasional cover include white-tailed deer, ring-necked pheasant, sharp-tailed grouse, and raccoon.

Locally produced and migrating populations of ducks, geese, and sandhill cranes frequent the agricultural fields for feeding on crop aftermath in the spring and fall. A few bird species such as starlings, crows, mourning doves, eastern meadowlark, and sparrows may also be found in the agricultural fields. Hunting for ducks, geese, ring-necked pheasant, sharp-tailed grouse, and white-tailed deer occurs each fall on many of the agricultural croplands and associated wetlands and shelterbelts in the region. Because habitat in these areas is only seasonally available due to hunting, farming, and other agricultural activities, wildlife are not expected to be present throughout the year. Upland game birds and several species of passerine birds are expected to be more prevalent due to nesting and winter cover that exists along road right-of-ways, shelterbelts, and fence lines of agricultural and grassland areas that are not annually farmed.

The remaining 20 percent of the total length of alignment, or approximately 16.0 miles are classified as grassland, rangeland, and fields, many of which are enrolled in the Conservation Reserve Program (CRP).

Wildlife habitat in these grassy areas and areas with woody shrubs support wildlife species that often use the open areas and nearby agricultural areas. These species include white-tailed deer, raccoon, squirrel, striped skunk, eastern cottontail rabbit, white-tailed jackrabbit, and sharp-tailed grouse. Predatory species such as coyote, fox, and a variety of hawks hunt the grasslands for the abundant small rodents, birds, and reptiles.

An aerial survey of the study corridor was completed in April/May of 2011. The area was surveyed for sharp-tailed grouse and possible nesting habitat present within ½ mile of the pipeline alignment and 19 sharp-tailed grouse leks were identified. Lek sizes ranged from 1 to 19 males. The area within the pipeline



corridor is heavily fragmented with cropland and dirt summer fallowed fields. All of the leks located were found in CRP grasses or native rolling pastures, and where larger tracts of grassland/pasture habitat were intact. One sharp-tailed grouse lek was identified within the construction disturbance area, approximately 15 feet from the pipeline centerline. Figure 3.19-1 illustrates the sharp tailed grouse leks identified during the survey.

Figure 3.19-1. Sharp-tailed Grouse Leks within 1 Mile of the Study Corridor

The majority of prairie pothole wetlands interspersed throughout the upland areas are classified as palustrine emergent wetlands. Prairie pothole wetlands, and surrounding upland grasslands, provide habitat for waterfowl and waterbird nesting, brood-rearing, and aquatic feeding activity in spring and fall. Wetland areas account for only 1.05 acres within the permanent pipeline right-of-way; however, adjacent wetland areas—within the 500 ft. pipeline corridor, as discussed in Section 3.18—are frequent along the entire length of the alignment. The emergent vegetation within and along wetland margins provide

additional habitat for terrestrial wildlife, such as songbirds, colonial nesting water birds, white-tailed deer, fox, and a variety of small mammals.

3.19.2 Aquatic Wildlife

The submerged and emergent vegetation associated with seasonally flooded and permanently flooded wetland soils provide habitat for a variety of semi-aquatic wildlife including muskrat, beaver, mink, waterfowl, wading birds, and numerous species of reptiles and amphibians. The Vantage Pipeline route does not cross any perennial waterbodies. Several ephemeral drainages with emergent wetlands are crossed by the alignment in the locations presented on Figure 3.17.-1. Threatened and endangered fish species are discussed in Section 3.13.

3.19.3 Waterfowl Production Area

Waterfowl production areas are located within close proximity of the proposed Vantage Pipeline route and are illustrated on Figure 3.7-1.

3.19.4 USFWS Grassland Easements

The Grassland Easement program is an agreement between the USFWS and landowners not to cultivate their land in order to preserve grassland and to allow grassland nesting species an undisturbed nesting season. A grassland easement parcel cannot be mowed, hayed, or seeded until after July 15th of each year. The majority of grassland easements within the vicinity of the pipeline corridor were avoided during pipeline routing. In areas where grassland easements could not be avoided, the pipeline would be routed to cross the area of least disturbance where the corners of the grassland easements meet. Vantage would work closely with the USFWS to determine whether a horizontal boring or a compatibility determination followed by trenching would be most appropriate to avoid any impacts to grassland areas. Grassland easement crossings that could not be avoided during pipeline routing are illustrated in Figure 3.19-2.

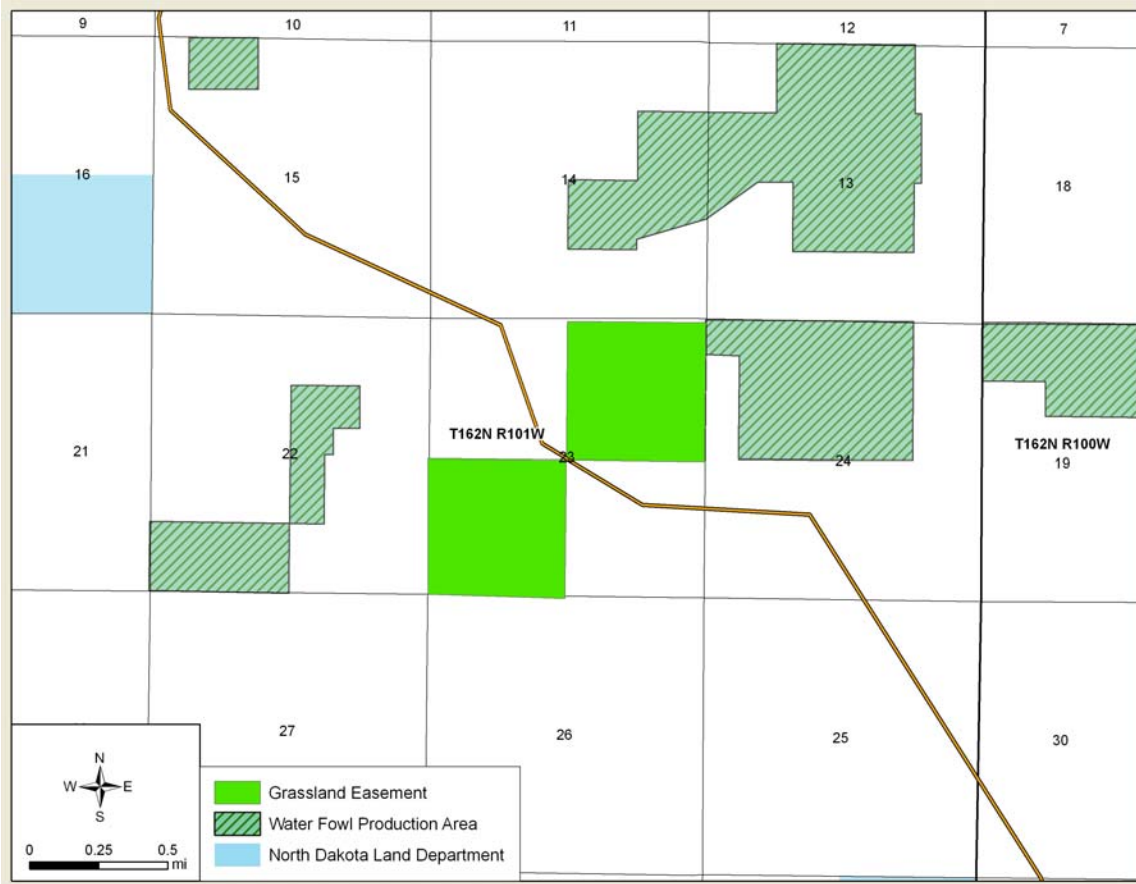


Figure 3.19-2. Grassland Easement Crossing

Potential impacts to wildlife and fisheries caused by the construction and operation of the Vantage Pipeline are discussed in Section 4.1.18 below.

4. ENVIRONMENTAL EFFECTS

This section provides an analysis of the potential environmental impacts that would result from implementation of the Proposed Action (construction of the Vantage Pipeline and facilities) and No Action (denial of a Presidential Permit to the construct the project). Measures that would avoid or reduce identified impacts caused by the construction and operation of the Proposed Action are included in Section 2. The following impact assessment takes those identified measures into consideration. Additional opportunities to mitigate impacts beyond the measures proposed in Section 2 are also presented in this section under the “Mitigation Summary” for each resource.

4.1 DIRECT AND INDIRECT EFFECTS

4.1.1 CLIMATE AND AIR QUALITY

Alternative I – No Action

Under the No Action Alternative, the Vantage Pipeline would not be built. Project-related impacts to air quality would not occur.

Alternative II – Proposed Action

Air quality would be impacted by construction and operation of the Proposed Action. For instance, emissions from the operation of heavy construction equipment, operation of on-road vehicles, and fugitive dust during construction would occur. Upon pipeline operation, and as explained/identified below, air emissions would also result from the Pipeline’s use and maintenance. All such emissions would be required to comply with any applicable federal, state, and/or local air quality laws and/or permitting requirements.

During both construction and operation, the project would be required to comply with federal, state, and local air quality permitting requirements that are driven by the CAA and its amendments. The CAA authorizes the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants (HAPs). The NDDEQ has indicated that neither permitting nor air quality modeling would be required for pipeline construction or operation.

Construction Impacts on Air Quality

Air emissions as a result of pipeline construction would typically be intermittent and short-term due to the fact that emissions from construction equipment and light vehicles, as well as fugitive dust resulting from surface disturbance, would not be centralized in a single location along the pipeline right-of way, but rather, would proceed quickly along the route as the pipeline is constructed.

Construction equipment and other mobile sources would be powered by diesel or gasoline fuels. Intermittent and short-term emissions from these sources would include emissions of CO, SO₂, NO_x, PM₁₀/PM_{2.5}, VOCs, and GHGs. Air emissions from off-road vehicles and construction equipment and on-road vehicles carrying personnel and equipment at the construction site are shown in Table 4.1.1-1. Air emissions of PM₁₀ and PM_{2.5} from wind erosion of disturbed areas and from construction activities have been estimated and are given in Table 4.1.1-2.

Table 4.1.1-1. On-Road and Off-Road Vehicle Air Emissions (tons)		
SOURCE TYPE	POLLUTANT	EMISSION RATE (TPY)
On-Road Vehicles	CO	1.12
	SO ₂	
		0.007
	NOx	1.55
	PM ₁₀ /PM _{2.5}	0.049 / 0.039
	CO _{2e}	388
Off-Road Vehicles and Equipment	CO	3.5
	SO ₂	
		0.03
	NOx	8.28
	PM ₁₀ /PM _{2.5}	0.78 / 0.75
	CO _{2e}	1,617

Notes:

1. On-road criteria pollutant emissions and CO_{2e} emissions calculated based on emission factors from EPA MOBILE6C and Transport Canada.
2. Off-road criteria pollutant and CO₂ emissions calculated based on emission factors from EPA Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition.

Table 4.1.1-2. Fugitive Dust Emissions from Construction (tpd)		
SOURCE TYPE	POLLUTANT	EMISSION RATE (tons per day)
Construction Activities	PM ₁₀	0.045
	PM _{2.5}	0.025
Wind Erosion of Disturbed Areas	PM ₁₀	7.16
	PM _{2.5}	1.07

Emissions calculated using emission factors from EPA's Compilation of Air Pollutant Emission Factors (AP-42).

Additional emissions may result from small (22,000 btu/hr) propane heaters used to warm personnel during the construction phase of the project. Impacts to air quality from these heaters, however, would be insignificant since they would be infrequently used during the summer/fall months when pipeline construction is scheduled to take place.

Emissions from fugitive dust and construction activities would be controlled to the extent required by state and local agencies. Any emissions from gasoline and diesel engines would be required to comply with federal EPA mobile source regulations (40 CFR Part 85). The project would also incorporate sufficient measures to ensure that appropriate levels of air quality are maintained during construction, and that emissions from construction-related activities do not significantly affect local or regional air quality.

Operational Impacts on Air Quality

Sources of air emissions during pipeline operation would include light vehicle travel during maintenance activities, small heaters to provide personal warmth to personnel during maintenance activities, and ethane emissions from pipeline valves and flanges along the route. No compressor engines are proposed in the U.S.

Emissions from pipeline maintenance would be primarily from on-highway mobile source travel to various locations along the pipeline route. In addition to the on highway mobile source travel there would be emissions from aircraft used for aerial surveillance of the pipeline. Aerial surveillance of the pipeline is expected to occur 1-2 times per month. Internal combustion engine emissions would consist of emissions of CO, SO₂, NO_x, PM₁₀/PM_{2.5}, and VOCs. Periodic use of access roads during operations would result in infrequent and minor impacts associated with fugitive dust, but would be localized and temporary. GHGs, which include CO₂, CH₄, and N₂O, would also be produced from infrequent on-road mobile source travel, but would be subject to federal emissions standards.

Ordinarily, additional air quality impacts could be caused by emissions released from blowdown events under routine operations or upset conditions, or due to small leaks (fugitive emissions) from pipeline and system components such as equipment packing, seals, valves, flanges, pneumatic devices, and connectors. In a traditional natural gas pipeline, such blowdown events or upset conditions may emit VOCs and GHG or CH₄. However, because the Proposed Action transports only ethane gas, no VOC or CH₄ emissions would occur, and thus, no criteria pollutants or GHGs would be released if a pipeline rupture were to occur.

An assessment of the criteria air pollutants and GHGs emitted during operation of the pipeline was completed and is provided in Table 4.1.11-3.

SOURCE	CO (tons/yr)	NO _x (tons/yr)	SO ₂ (tons/yr)	CH ₄ (tons/yr)	N ₂ O (tons/yr)	CO ₂ (tons/yr)	CO ₂ e (tons/yr)
On-road vehicles	0.76	0.06	0.0004	0.04	0.002	-	25
Maintenance of Equipment	-	-	-	-	-	-	6
Aerial Surveillance	0.00	0.04	-	0.01	0.001	7.43	8
Totals	0.76	0.10	0.0004	0.05	0.003	7.43	39

Notes:

1. On-road criteria pollutant emissions and CO₂ emissions calculated based on emission factors from MOBILE6C and Transport Canada.
2. Aerial emission factors sourced from International Civil Aviation Organization on Aviation Environmental Protection and Environment Canada.
3. Fugitive emission factors from EPA Protocol for Equipment Leak Emission Estimates.

The reporting threshold for GHG in the US is 25,000 metric tons per year. The emissions from construction and annual operation of the Vantage pipeline is significantly less than the reporting threshold, and thus, insignificant.

Mitigation Summary

No additional mitigation with regard to air quality is proposed.

4.1.2 CULTURAL RESOURCES

Alternative I – No Action

No project-related impacts would occur under the No Action Alternative. Prehistoric sites are generally established in a stable environment and would remain undisturbed. Historic sites would continue to deteriorate due to natural and non-project related forces.

Alternative II – Proposed Action

There would be no direct impacts to identified prehistoric or historic cultural resources caused by the construction and/or operation of the Proposed Action. Vantage rerouted segments of the pipeline route to avoid 33 sites identified during the cultural resource inventory. Further, 37 of the sites are within the 300-foot survey corridor, but are at least 45 feet from the temporary construction corridor, and thus, can be properly avoided. While five sites are outside the temporary construction corridor, but still within the 45-foot buffer, Vantage would either “neck down” or adjust the temporary workspace to ensure the appropriate buffer is maintained and these sites are avoided. To avoid impacting the two identified railroad sites, Vantage would bore beneath the railroad grade.

In addition, to avoid secondary impacts associated with artifact collecting and vandalism from/to any of the identified sites, Vantage would limit all activities by workers to the defined temporary construction corridor. This would provide a 45-foot buffer to the identified sites and would minimize the visibility of all but the standing structures and buildings. The buildings are deteriorated to the point that they cannot be reconstructed. The construction of the pipeline and the associated facilities would not constitute an adverse visual impact to the sites.

Since isolated finds are not eligible for listing on the National Register of Historic Places, no further mitigation would be required were construction and/or operation of the Vantage Pipeline to impact these finds.

If unanticipated cultural resources were encountered during construction, procedures to be implemented by Vantage to avoid impacts to such resources are identified in the EPP. Procedures for the unexpected discovery of human remains and/or funerary objects are also identified in the EPP.

Since consultation with Tribes has not yet occurred, it is unknown whether any affected Tribe may attach religious and/or cultural significance to any historic properties that may be affected by the Vantage Pipeline. The DoS will consult with affected Tribes to ascertain if such Traditional Cultural Properties are present and determine their NRHP eligibility. If present, the DoS would work with the other federal agencies, the Tribes, the North Dakota SHPO and Vantage to either avoid or mitigate any adverse effects to any identified sites.

Mitigation Summary

- If additional ground-disturbing impacts not previously taken into consideration during Class I or Class III investigations are identified/necessary, the impacted area(s) would be investigated using the same methods employed during initial investigations explained in Section 3.3 above.
- Vantage would continue to avoid sites to the extent possible. If Vantage were unable to avoid an NRHP-eligible site, the DoS would work with the appropriate parties to identify and implement a plan to mitigate any adverse effects.
- If unanticipated cultural resources were encountered, and/or unexpected human remains and/or funerary objects were discovered during construction, Vantage would employ the procedures outlined in the EPP.

4.1.3 GEOLOGY AND MINERALS

Alternative I – No Action

Under the No Action Alternative the lands surface would not be modified by the Proposed Action and would continue to be affected by natural erosional processes. Mineral resources would be unaffected.

Alternative II – Proposed Action

The Proposed Action is likely to impact only the shallow subsurface geologic environment during construction due to trenching, pipe installation, and backfilling. During operation, impacts to subsurface geologic resources may also occur to the extent erosion caused by maintenance access vehicles is created. Any impacted geologic resources would include debris, such as sands and gravel and surface salts. Coal in the Tertiary rocks, oil and gas, and salts in the deeper subsurface would be unaffected during construction and operation.

Impacts could additionally occur to the geologic environment as a result of the Proposed Action if construction were to steepen slopes or otherwise increase runoff of the surrounding landscape, thereby causing erosion to geologic resources. Additional impacts may occur if construction activities were to cause undercutting, which could initiate slumping, landslides or other mass movements of surrounding geologic resources. The project design and construction measures that would be implemented by Vantage as described in Chapter 2 would help to ensure such impacts are insignificant and/or avoided.

Impacts could also occur to the geologic environment, as well as project facilities, as a result of natural geologic hazards, including landslides, mass movements, and earthquakes. While possible, impacts are unlikely to occur from such geologic hazards since there is low relief across, and low seismicity within, the APE.

Mitigation Summary

No additional mitigation is proposed.

4.1.4 HEALTH AND SAFETY

Alternative I – No Action

Under the No Action Alternative, the Vantage Pipeline would not be built. Project-related impacts with regard to health and safety would not occur.

Alternative II – Proposed Action

The transportation of ethane by pipeline involves some risk to the public in the event of an accident and subsequent release of ethane. The greatest hazards are fire or explosion following a major pipeline rupture. Ethane is colorless, odorless, tasteless, and easily ignited by heat, sparks, or flames. Ethane is flammable and forms explosive mixtures with air at concentrations between 3.0 percent and 12.5 percent.

Vantage would incorporate all applicable federal, state, and industry standards into the design of the Pipeline in order to avoid ruptures. Vantage would further incorporate: safety requirements in the design, complete detailed construction inspection, and would implement detailed operational monitoring to reduce potential risk for potential release of ethane. As required by PHMSA, Vantage would also develop an emergency response plan detailing the actions to be taken in an emergency response in order to

minimize health and safety risks in the event a rupture were to occur. Finally, Vantage Pipeline employees would undergo safety training and access to above-ground facilities would be maintained to prevent unauthorized access.

4.1.4.1 Inspections

PHMSA regulates, inspects, and enforces both intrastate and interstate liquid pipeline safety requirements in North Dakota. Through certification by PHMSA, the state of North Dakota regulates, inspects, and enforces intrastate gas pipeline safety requirements. This work is performed by the Testing and Safety Division of the NDPA. Applicable North Dakota state regulations can be found at: <http://www.psc.state.nd.us/jurisdiction/gas-laws.html>.

Pipeline design must comply with pertinent industry standards, including:

- American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI) Code B31.4, “Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols.” This standard addresses requirements for materials of construction, welds, inspection, and testing for cross-country hazardous liquid pipelines. It requires a mainline block valve on the upstream side of major river crossings and public water supply reservoirs, and either a block valve or a check valve on the downstream side.
- American Petroleum Institute (API) 570 Piping Inspection Code: In-service Inspection, Rating, Repair, and Alteration of Piping Systems. This code was developed for the petroleum refining and chemical processing industries but may be used for any piping system.
- API RP 1102, Recommended Practices for Liquid Petroleum Pipelines Crossing Railroads and Highways. This recommended practice is a requirement of ASME/ANSI B31.4.
- API RP 1109, Recommended Practice for Marking Liquid Petroleum Pipeline Facilities.
- NACERP 01-69, Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

Prior to being placed into operation, all pipeline sections would be pressure tested with water to at least 125 percent of the Pipeline’s maximum allowable operating pressure to ensure the integrity and operational safety of the pipeline. After the welds have passed inspection, a corrosion-resistant protective coating would be applied to the outside of the pipe.

4.1.4.2 Release Response and Reporting

The root cause of pipeline releases is usually from excavation damage, corrosion, or natural forces (e.g., soil settlement or washouts). Although pipeline leak-detection technology could identify a leak and shut down flow quickly, actual response is often delayed due to the remoteness of the release location.

When a release of ethane occurs, the resulting environmental impact(s) depend on a number of factors, including weather conditions. Windy conditions results in dissipation of the volatile ethane to the atmosphere. Conversely, calm days could potentially result in isolated pockets of ethane gas near the ground surface due to its characteristic specific gravity.

Based on modeling work by Hanna and Drivas (1993), the majority of volatile organic compounds, including ethane from pipeline releases, would evaporate almost completely within a few hours. In addition, the vapors are usually dissipated below risk levels within a short distance of the source.

If a pipeline release were to occur, emergency response contractors or health and safety personnel would follow their emergency response plans, including wearing the proper personal protective equipment and performance of air monitoring of the ethane vapors. Restricted public access to areas exceeding specified risk levels while also ensuring that authorized personnel within the restricted areas are equipped with and using appropriate personal protective equipment.

Any impacts on air quality related to releases would be localized and short-term resulting in little or no impact to ecological and physical resources. An estimate of the volume of the release and air emissions would be reported to PHMSA using standard forms, in accordance with 49 CFR Section 195.50. PHMSA maintains a database of pipeline incident reports available online at:

<<http://primis.phmsa.dot.gov/comm/reports/psi>>.

In addition, in accordance with North Dakota law, hazardous materials exceeding reportable quantities must be reported to the North Dakota Emergency Services through the Division of State Radio by calling 800-472-2121. The initial notification requires follow-up reporting using the Hazardous Materials Spill report Form. Once a release has been mitigated, the owner or operator must provide a spill or release report describing the details of the incident. These procedures would also be implemented by Vantage to reduce the potential for any health and/or safety risks.

To minimize the threat of leaks, the proposed Vantage Pipeline would be monitored and controlled 24 hours per day, 365 days per year, from a central control facility (CCF) located in Joffre, Alberta using a state-of-the-art SCADA system. A leak detection system (LDS) would continuously monitor the pipeline. In the event any anomaly is detected, block valves would automatically shut to isolate that portion of the pipeline. These automated block valves would be located approximately every 15 miles along the pipeline. A cathodic protection system, including anode beds, rectifiers and associated facilities would be installed for the Pipeline, pump stations, and the Empress Terminal.

A computer-based LDS would also be installed for the Vantage Pipeline. This system would report through the SCADA system to the CCF and would provide the CCF operator with enhanced capabilities related to the early detection and location of leaks. Response to a leak indication would be coordinated from the CCF, with resources being supplied from the nearest pipeline maintenance location.

Regular preventative maintenance programs, such as aerial patrols, internal inspections and cathodic protection monitoring, along with pipeline markers at roads and pipeline watercourse crossings, would also be incorporated into the design and operation of the pipeline.

4.1.4.3 Abandonment

The pipeline is expected to operate for 50 or more years. Decommissioning and abandonment activities would comply with all applicable federal and provincial regulatory requirements in force at the time.

Mitigation Summary

Vantage would adhere to all notification and cleanup requirements identified under North Dakota law. No additional mitigation is proposed.

4.1.5 NOXIOUS WEEDS AND INVASIVE SPECIES

Alternative I – No Action

Under the No Action Alternative, the Vantage Pipeline would not be built. Project-related impacts related to noxious weeds and invasive species would not occur, and infestations would continue at present levels.

Alternative II – Proposed Action

Construction activities would result in surface disturbance that would contribute to the spread of noxious weeds and other undesirable species. Upon disturbance, weed species would be fast-growing and could displace native species and inhibit the establishment of native grass, forb, and shrubs. The occurrence of noxious weeds would likely increase in disturbed areas along the right-of-way where construction tracking occurs. After construction is completed, disturbed areas would be restored and operation and maintenance traffic would typically be limited to the locations of the surface facilities. Cropland would be returned to production and weeds would be managed during crop production. Upland areas would be restored with desirable vegetation. Over the long term, it is expected that noxious weeds resulting from construction may be more prevalent in upland areas where less intensive weed management practices are used. It is expected that such noxious weeds could further spread due to activities such as livestock grazing and seed dispersion by livestock. Those weeds that are considered by the State of North Dakota to be noxious, which could potentially grow in the right-of-way after disturbance, are identified in Table 3.6-1. In order to mitigate the spread of any noxious weeds, Vantage would implement the Best Management Practices (BMPs), and weed control practices, identified in the EPP.

Mitigation Summary

- Vantage would require contractors to clean equipment to be used during construction prior to mobilizing equipment to the project.
- Vantage would conduct a pre-construction weed survey to identify pre-existing weed conditions.
- Vantage would consult with the North Dakota Weed Control Association boards in Divide and Williams counties. Data obtained during this survey and consultation would be used to develop weed management plans.
- Vantage would implement BMPs and weed control practices identified in the EPP.

4.1.6 LAND USE

Alternative I – No Action

Under the No Action alternative, the Vantage Pipeline would not be built and no project-related impacts to uplands, wetlands, or agricultural lands would occur.

Alternative II – Proposed Action

Both temporary and permanent impacts to land use would occur as a result of the Proposed Action. Approximately 435 acres of cultivated land used for production of row crops and small grains would be temporarily disturbed and removed from production during construction. Construction activities, including trenching, pipe installation, backfilling, and areas required for access, would temporarily disturb

the cropland within both the construction and permanent right-of-way. Agricultural production would resume within the majority of the cropland during the growing season following completion of the pipeline construction.

Vantage would restore agricultural land to preconstruction conditions as soon as practicable following construction. Landowners would be compensated for crop losses and other damages resulting from the pipeline construction. During construction, Vantage would maintain landowner access to the fields, storage areas, and other agricultural facilities in order to reduce impacts on planting and harvesting. Any drainages systems such as roadway ditches crossed by the pipeline and disturbed during construction would be maintained to the extent practicable. Repair of drainage systems would be completed in accordance with Vantage’s mitigation plans.

The Vantage Pipeline would cross approximately 68 fences and 7 windbreaks. The pipeline right-of-way would need to be kept clear of trees, which means windbreaks would not be revegetated within the permanent pipeline right-of-way. Vantage would take appropriate measures to protect livestock during construction. Vantage would coordinate with landowners to provide passage for livestock and would provide temporary fencing and gates where required to protect livestock from construction-related hazards. Following construction, fences and gates would be rebuilt to original condition or better.

The pipeline route would cross approximately 23.3 miles of CRP tracts. The CRP program is coordinated by the NRCS Farm Service Agency (FSA), and is a voluntary reserve program through which landowners of eligible farmland establish a long-term (10 to 15-year) agreement to preserve vegetative land cover. Land cover preservation controls water runoff and sediment from directly entering groundwater, nearby lakes, rivers ponds and streams while contributing to wildlife habitat (USDA/FSA, 2010). Vantage would restore all CRP lands in accordance with FSA requirements.

Permanent impacts to land use would occur in the locations of the four block valves identified in Table 4.1.6-1 and Figure 4.1.6-1. Specifically, approximately 0.27 acres would be removed from crop production permanently to accommodate the block valve locations and access roads. The block valve locations would be fenced and the permanent access road would be necessary to allow inspections and maintenance. Access to the block valve locations would typically follow the 30-foot-wide permanent right-of-way. Four of the block valve locations are within upland areas that would not be restored to upland following completion of the construction activities. The block valve locations would be fenced and would include an access road to allow inspections and maintenance. An area of approximately 0.32 acres would be required for the block valve locations and access roads (see Table 4.1.6-2). These locations would result in a permanent impact to upland habitat. The combined area of permanent impact would equal approximately 0.58 acres.

Further, any trees and/or shrubs along the permanent right-of-way that were cleared during construction would not be replanted since the right-of-way would need to be free of such vegetation to allow for pipeline inspection and maintenance.

BLOCK VALVE NUMBER	MILEPOST	LAND COVER	AREA (acres)
BV-2	19.8	Cultivated cropland	0.08
BV-3	37.5	Cultivated cropland	0.06
BV-5	59.8	Cultivated cropland	0.07
BV-6	65.2	Cultivated cropland	0.06
Total area*			0.27

BLOCK VALVE NUMBER	MILEPOST	LAND COVER	AREA (acres)
BV-0	0.0	Grassland	0.05
BV-1	7.8	Grassland	0.11
BV-4	52.7	Grassland	0.11
BV-7	71.9	Pasture	0.05
Total area*			0.32

*note that areas listed in tables do not sum total impact area (0.58 acres) due to rounding

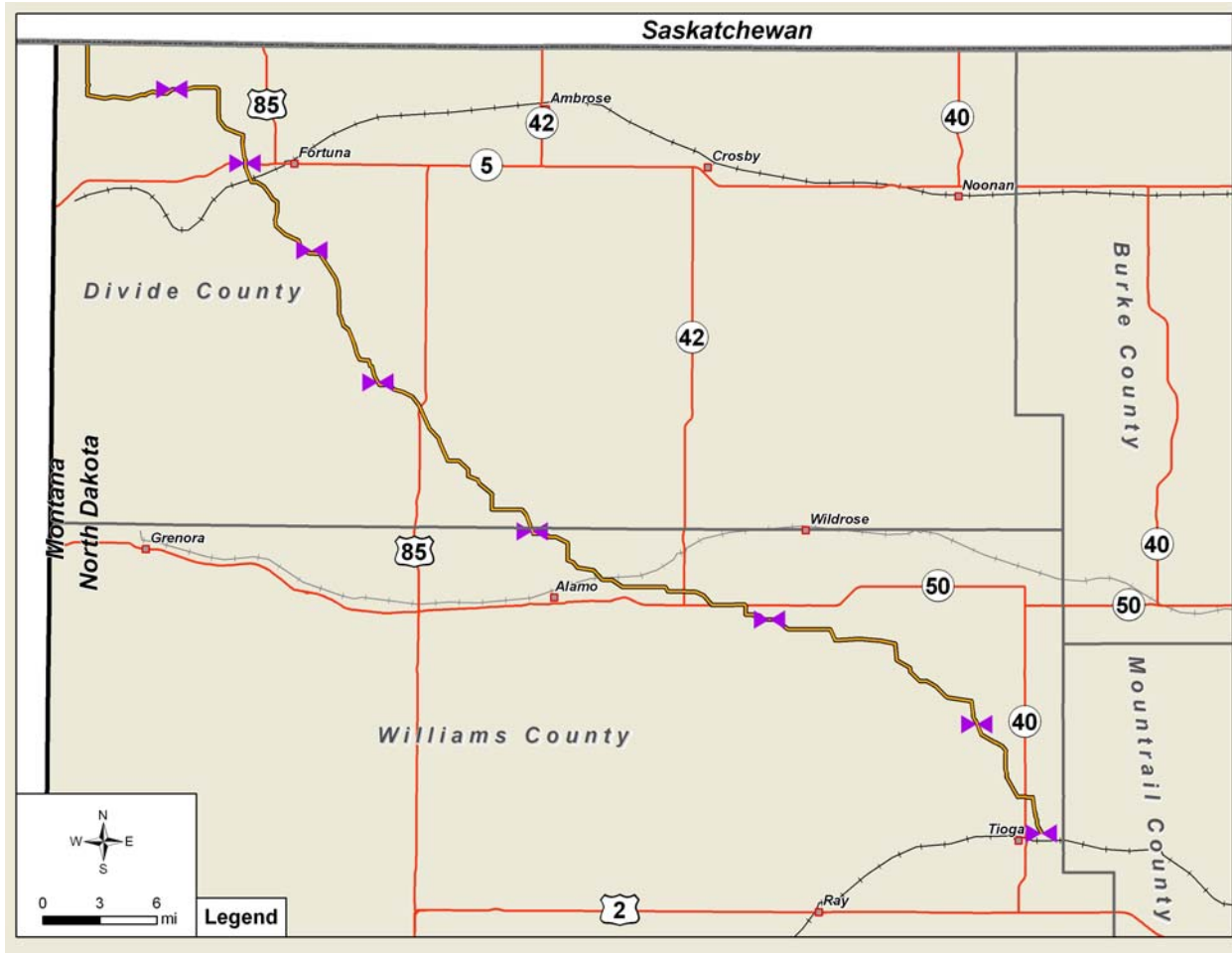


Figure 4.1.6-1. Vantage Pipeline Block Valve Locations

4.1.7 NOISE

Alternative I – No Action

Under the No Action Alternative, the Vantage Pipeline would not be built. Project-related impacts to area noise levels would not occur. Existing noise generated by traffic and agricultural activities would continue at present levels.

Alternative II – Proposed Action

Noise levels would temporarily increase near the project area during pipeline construction activities. Residences within 500 feet of the Vantage Pipeline right-of-way would experience short-term inconvenience from construction equipment noise, however, such noise would be intermittent, depending on the construction schedule, and would also vary depending on the size and types of equipment used for soil stripping, trenching, pipe installation, backfilling and soil spreading. The increased construction noise would also result in short-term impacts to big game and other wildlife using the area. Table 4.1.7-1 shows typical noise levels for construction equipment that would be associated with construction of the Vantage Pipeline project.

Table 4.1.7-1. Construction Noise from Typical Pipeline Construction Equipment Activities¹

Equipment	Reference dBA at 50 feet	Number of devices	Usage (%) ^b	ESTIMATED NOISE LEVEL (dBA) AT THE SPECIFIED DISTANCE FROM THE SOURCE (FEET)					
				50	100	250	500	1,000	2,500
3-Ton truck	84	1	40	80	74	66	60	54	46
Dump truck	84	1	40	80	74	66	60	54	46
Concrete truck	85	1	40	81	75	67	61	55	47
Fuel truck	84	1	40	80	74	66	60	54	46
Backhoe	80	1	40	76	70	62	56	50	42
Trenching machine	85	1	40	81	75	67	61	55	47
Crane	85	1	16	77	71	63	57	51	43
Front end loader	80	1	40	76	70	62	56	50	42
Bulldozer	85	1	40	81	75	67	61	55	47
Sideboom	85	1	16	77	71	63	57	51	43
Boring machine	85	1	20	78	72	64	58	52	44
Padding machine	85	1	40	81	75	67	61	55	47
Farm tractor	84	1	40	870	74	66	60	54	46
Mulching machine	86	1	40	82	76	68	62	56	48
Air compressor	80	1	40	76	70	62	56	50	42
Generator/ light plant	82	1	50	79	73	65	59	53	45
Water pump	77	1	50	74	68	60	54	48	40
Water truck	84	1	40	80	74	66	60	54	46
Welding machine	73	1	40	69	63	55	49	43	35
Welding truck	55	1	40	51	45	37	31	25	17
X-ray truck	55	1	40	51	45	37	31	25	17
Total worst-case result ²				92	86	78	72	66	58

¹ Derived by adding the individual equipment noise levels logarithmically using the following formula: $L_{eqtotal} = 10\log(\sum(10^{L_{eq}/10}))$.

² DOT, 2006.

In order to mitigate noise impacts to residences and wildlife during construction, Vantage would limit construction activities primarily to daylight hours. Short-term direct and indirect impacts to ambient noise levels during construction would therefore be low to moderate.

Further, noise impacts are not anticipated to be significant during operation of the pipeline since the project does not include any pump stations that use engines or other noise sources. Noise, however, may result from any maintenance or repair activities that would require use of construction equipment. Any noise impacts arising from maintenance or repair activities would not likely be significant. **Mitigation Summary**

Vantage would limit construction activities to daylight hours and would also not include any pump stations, or other facilities capable of impacting noise levels, within North Dakota. No additional mitigation is proposed.

4.1.8 PALEONTOLOGY

Alternative I – No Action

Under the No Action Alternative the surface would not be disturbed by the Proposed Action and no significant fossils resources would be impacted except by natural erosional processes. The potential discovery of previously unknown fossils resources, however, would not occur.

Alternative II – Proposed Action

Impacts could occur to the paleontological environment if surface disturbance associated with the Proposed Action results in the exposure and destruction of significant fossil resources, along with associated loss of geologic information. Conversely, the Proposed Action could also result in new and significant fossil resources being discovered, properly recovered and cataloged into the collection of a museum repository, making these resources available for study.

The surface underlying the Proposed Action is covered by a varying thickness of Quaternary deposit, chiefly glacial drift. These deposits range in age from Pleistocene to Holocene (recent). Pleistocene deposits could potentially preserve ice-age fossils of scientific significance. However, recent Holocene deposits are likely too young to contain fossils. While it seems unlikely that any surface disturbance activities during construction of the Proposed Action could cause impacts to deposits capable of containing fossils, impacts could occur if excavation were to penetrate underlying bedrock of Pleistocene deposits, including the Sentinel Butte, Bullion Creek, or Cannonball Formation, which do contain sensitive paleontological resources.

Mitigation Measures

The magnitude of impacts associated with the destruction of potential fossil resources can be reduced by the implementation of paleontological resource mitigation measures described in Chapter 2 and reiterated below:

- **Worker Instruction.** Construction personnel would be instructed about the types of fossils they could encounter and the steps to take if they uncover fossils during construction. Instruction should stress the nonrenewable nature of paleontological resources, that collection or excavation of vertebrate or scientifically significant invertebrate or plant fossil materials from federal land without a federal permit is illegal, and that fossils are part North Dakota's prehistoric heritage and should be preserved for study.
- **Discovery Contingency.** Should fossil resources be uncovered during surface disturbance associated with the Proposed Action, authorized personnel should immediately notify the BLM and work should cease immediately in the area of the discovery until the fossil remains can be

evaluated for scientific significance by a qualified paleontologist. If fossil remains of significance are identified, additional mitigation may be required. Additional mitigation could include collection, identification, and curation of the fossil remains and potentially monitoring of ongoing surface disturbance in the area of discovery.

- Field Survey/Trench Spoils inspection. A preconstruction field survey should be conducted for the proposed pipeline. A field survey would involve a visual examination of the formation in areas of exposure and would determine the need for additional mitigation. For expediency, the field survey should be conducted in coordination with a trench spoils inspection after trench excavation.

4.1.9 RECREATION

Pipeline construction and operations would potentially affect dispersed, wildlife-associated recreation directly if construction activity near lands open to hunting coincides with hunting seasons and thereby discourages hunting, directly if hunting access to PLOTS lands is withdrawn to allow for construction, and indirectly if disturbed habitat loses its ability to produce or attract game populations in the long run.

Alternative I – No Action

Under the No Action Alternative, the Vantage Pipeline would not be built, so there would be no effect on recreation in Divide and Williams counties.

Alternative II – Proposed Action

Under the Proposed Action, roughly 99 percent of the pipeline route would cross private land, as described in Table 2.1-3. Of 45 PLOTS tracts in close proximity, the pipeline route under the Proposed Action intersects 14 tracts. The total length of pipeline that would be built through the intersected tracts is about 5 miles. About 1 mile of the pipeline crosses a State rangeland section. The pipeline route avoids federal refuge, WPA lands and fishable water bodies. Since the pipeline route avoids these recreation resources, pipeline construction would not directly impact wildlife associated recreation such as water fowl hunting, bird watching or recreational fishing.

Vantage proposes to begin construction of the project in summer 2012, work along the pipeline corridor for approximately four to six months, and put the pipeline in service in the latter part of 2012. If construction is completed by October of 2012, pipeline construction activity would not disturb upland game and deer hunting on intersected PLOTS tracts although the disturbed surface of the tract would remain essentially bare and would likely be unsuitable and unattractive for hunting, pending its restoration and revegetation.

The pipeline construction process described in Section 2.1.2 would temporarily disturb an estimated total of 42.4 acres of surface on PLOTS tracts, based on a total pipeline length of about 5 miles through the 12 intersected tracts and assuming a 70-foot path of disturbance. The impact to PLOTS tract individually and as a whole is indicated by the disturbance area relative to the total area of the tract.

Given the calculated disturbance area for each tract, the maximum disturbance would be five percent of the surface area of any one of the 12 potentially affected PLOTS tracts and less than one percent of the total area of intersected tracts. There would be no impact to the remaining 40 or so PLOTS tracts in close proximity to the pipeline route or to the many other PLOTS tracts in Divide and Williams counties. Relative to the total hunting resource represented by PLOTS tracts in Divide and Williams counties, the potential impact to upland game and deer hunting from the surface disturbance caused by pipeline

construction would be small. The potential impact to upland game and deer hunting on State land would be similar and also quite small (1.0 miles of pipeline disturbance to a 640 acre tract).

Mitigation Summary

- Disturbed areas would be revegetated in accordance with site-specific landowner requests as described in Section 2.1.2 and the EPP. Generally, this would require Vantage to return the pipeline construction route to a pre-disturbance type of vegetation.
- Grasslands would be re-seeded, and farmlands could be farmed over the pipeline route. Indirect impacts to hunting in the long run would be avoided if restoration and revegetation of disturbed areas are carried out as described and are successful. Revegetation is discussed in Section 4.1.14 and the adaptation of wildlife to revegetated areas is discussed in Section 4.1.18.

4.1.10 SOCIOECONOMICS

Alternative I – No Action

Implementation of the No Action Alternative would result in a continuation of existing socioeconomic conditions and trends within the study area. The housing and public service and facility demands described for the Proposed Action would not occur and the associated economic and fiscal benefits would be foregone.

Alternative II – Proposed Action

Employment and Income Impacts

Construction. As noted in Section 2.1, construction of the domestic segment of the Proposed Action is scheduled to begin during summer of 2012 and last about six months. A temporary workforce averaging 60 to 75 workers would be employed to complete the U.S. segment of the proposed pipeline. Construction would involve activities including landowner negotiations, surveying, clearing, grading, access development, trenching, welding, testing, placement and cover, and reclamation. These activities would occur sequentially as construction progresses along the right-of-way. The current plan of development (POD) calls for construction to proceed generally in a northwesterly direction from a point near Tioga to a point near the North Dakota/Montana border in Divide County, where the pipeline would cross into Canada.

Purchases by Vantage, its construction contractors and workers employed on the project would support other jobs in the regional economy. Most of these jobs would be in local trade, services, transportation, and construction industries. Economic data for Divide and Williams counties, accounting for the duration of construction and outflow of earnings associated with non-local workers, indicates that each direct industrial construction job would support an average of 0.8 to 1.2 additional jobs elsewhere in the economy. Thus, the total short-term employment impact during construction is estimated at 108 to 143 jobs (full-time equivalent, or FTE). The short-term employment effects would be small but beneficial to local labor markets during 2012.

The employment stimulus would be geographically dispersed, with some impacts in the hospitality and fuel/convenience retail industries concentrated nearer the right-of-way corridor, while effects in the health care, automotive service, and other industries would be focused in Williston and other regional trade and service centers.

Further, local households and business establishments would realize temporary gains in personal income tied to the wages and salaries of workers directly and indirectly associated with the Proposed Action. The direct payroll is estimated at \$2.4 to \$2.8 million in 2012, with an additional \$0.7 to \$0.9 million in income associated with jobs indirectly support by the Proposed Action.

The economic benefits accruing to the regional economy during construction would be temporary and limited in relation to the current personal income in the region.

Operations. Pipeline operations are highly automated, incorporating state-of-the-art technology to insure proper functioning and safe operations. This technology would allow operation of the portion of the proposed pipeline located within the U.S. with two or three additional staff, augmented periodically by employees of pipeline service companies contracted by Vantage to support operations. The permanent staff would be based in the Tioga area. Ongoing O&M expenditures by Vantage, along with the consumer expenditures by project staff, would support a comparable number of jobs, on an FTE basis, elsewhere in the regional economy. The total long-term employment impact in the region, including the incremental indirect and induced positions, would likely be equivalent to 6 to 8 jobs over the operating life of the project. These jobs would likely be filled by current residents. The small employment increment would have a small beneficial effect on local labor markets. Based on prevailing wages in the region, the total annual wage and salaries associated with the long-term jobs would be approximately \$350,000 to \$450,000.

Other Economic Benefits. Landowners who lease lands to Vantage would also realize additional income in the form of lease/right-of-way easement payments. For affected local farmers and ranchers, the lease payments would provide an income stream that is independent of commodity markets, feed, fuel, and fertilizer prices or weather conditions.

Perhaps the most important economic benefit of the Proposed Action would be that it would increase the amount of economically recoverable gas reserves in the fields providing feedstock to the pipeline by increasing the market price of the gas product. By extracting the ethane the producer would realize about a 20-30 percent increase in value over leaving it in the natural gas, which would increase the economic benefit of extracting the oil and gas in the Williston Basin.

Population

Construction. One-way commutes of an hour or more are not uncommon for workers in the construction and oil and gas industries. Because of this, a substantial pool of skilled workers exists in the region and would likely fill many of the direct construction jobs associated with the project. Construction of the proposed pipeline through portions of northwestern North Dakota would result in limited-scale incremental population effects. These effects would be temporary and result from the influx of non-local construction workers to work on the pipeline. Fewer than 50 non-local workers would be expected due to the scale of the overall project and availability of local skilled workers.

The experience of other pipeline construction projects has shown that most non-local construction workers would be single status, that is, unaccompanied by other family members, while working on the project. Consequently no increases in enrollment in area schools would be anticipated. That characteristic reflects the temporary nature of the construction phase of the project and continual relocation of the work force along the linear right-of-way. The primary nexus of the population effects would shift over time, affecting different communities for a few weeks or months as construction moves along the right-of-way.

Operations. Due to the small number of jobs associated with project operations and likely availability of local labor to fill those jobs, project operations would result in negligible long-term effects on regional population.

Housing

Construction. Given the short-term nature of the construction phase of the Proposed Action and the continually shifting location of the pipeline construction site, housing effects would be limited to demand for temporary units such as hotels, motels, guest houses, and RV and campground spaces. Average construction worker housing demand could be for as much as 50 units, assuming 10 to 15 locally-hired workers, but is more likely to be around 40 units to account for some sharing of hotel/motel rooms and RVs. As demonstrated in Chapter 3.11, there are many hotel/motel and guesthouse rooms and RV/campground spaces (at least 1,220) located in communities within commuting distance of the pipeline corridor. However, competition for temporary housing units is likely, particularly in Williams County given the level of oil and gas development associated with the Bakken and Three Forks formations.

Use of temporary housing resources by construction workers may displace some tourism and recreation visitors during summer months and hunting season. These effects would be short-term, lasting for portions of the six-month construction season. Conversely, hotel/motel, guest house, and campground proprietors would likely experience increased revenues during the construction season as construction workers occupied rooms typically unoccupied during weekdays and off seasons. It is possible that some construction workers may stay in RVs on lands along the pipeline corridor, at the discretion of landowners and in compliance with local land use ordinances.

Operations. Due to the small number of jobs associated with project operations and the likely availability of local labor to fill those jobs, operations of the project would result in negligible long-term effects on housing conditions in the region.

Public Facilities and Services

Construction. Construction of the Proposed Action would potentially generate demand for a relatively limited range of local government facilities and services. Non-local construction workers would occupy existing temporary housing resources already served by public utilities such as water, wastewater, and solid waste collection. Thus, the provision of utilities to these existing establishments is already accounted for in the capacities and utilization of those systems. Construction workers would likely be in the area in single-status; therefore they would not increase enrollments in area schools or create demand for family-based services such as child care and social services.

Given the traffic and construction activity and the influx of a relatively small number of construction workers, the Proposed Action could create some incremental demand for law enforcement, fire suppression, and emergency medical response and treatment. Law-enforcement services could be required for traffic management, accident response and for demands associated with the temporary, largely single-status, male workforce. Fire suppression, emergency medical response, and urgent and emergency medical services could be required if industrial or transportation-related accidents occur. Given that most construction workers are likely to be non-local and not have established relationships with physicians, they are likely to seek urgent care or hospital emergency room facilities for treatment of non-emergency injuries or illnesses.

All of these demands would be short-term and minor, given the size of the construction workforce and short-term nature of the construction project. The law enforcement, fire suppression and emergency medical response and treatment services listed in Section 3.11 would likely not be strained in providing

services to the Proposed Action-related construction workforce, although response times to certain areas of the pipeline corridor could be lengthy.

Operations. Due to the small number of jobs associated with project operations and likely availability of local labor to fill those jobs, project operations would result in negligible long-term demand for local government facilities and services

Fiscal Impacts

Effects on public-sector expenditures are expected to be limited due to the scale and duration of short-term and long-term effects associated with the project. State and local outlays on highway, road, and bridge maintenance and potential outlays for law enforcement, fire suppression, and emergency medical response related to project-related traffic, primarily during construction, are the functions that would most likely be affected. Offsetting the limited effects on expenditures would be a series of one-time and recurrent revenues.

Construction. Under North Dakota's tax code, construction of the Proposed Action would generate substantial one-time revenues from the state's 5.0 percent sales and use tax levy on taxable purchases of construction material and supplies. Additional revenue would accrue from taxable expenditures by contractors and workers directly and indirectly employed by the project. Such revenues would total approximately \$1.38 million during construction assuming combined direct and indirect taxable expenditures at 50 percent of the total project construction costs.

Some communities along the construction corridor would realize temporary revenues from local option taxes on lodging, meals, and beverages in restaurants and bars and other convenience retail purchases as the construction workforce passes through the area. Due to the availability of temporary lodging, Williston could realize gains as well, as some workers might choose to stay in the community and commute, assuming availability of temporary housing resources. These gains would be short-term and beneficial. Although relatively small in magnitude for any given community, the gains in relative terms could still be important.

Operations. Following project completion, Divide and Williams counties, local school districts, townships, and other local taxing jurisdictions would realize ad valorem/property tax revenues assessed on the pipeline. Such taxes would be initially based on a taxable value equal to \$2,750,000, or 5 percent of the value of construction. Thereafter, assessments would reflect depreciated replacement cost, income-production capacity, and estimated market value from sales. Approximately 46 percent of the project value would be located in Williams County, the remainder in Divide County.

Annual property tax revenues accruing to the two counties would total more than \$337,000 in the first year of full assessment (Table 4.1.11-1). Annual taxes would decline to about \$118,000 in year 15, based on estimated depreciated value. Over the first 15 years of operations, total ad valorem/property tax revenues, based on current tax rates, would exceed \$3.4 million, approximately half of which would accrue to taxing entities in each county. Within each county, approximately one-fifth of the revenue would accrue to the respective general funds, and the remainder to special service and other districts.

	WILLIAMS COUNTY		DIVIDE COUNTY		TOTAL
Taxable Value – Year 1 (\$)	\$1,269,900		\$1,480,100		\$2,750,000
Distribution of Taxable Value (%)	46%		54%		100%
	General Fund	Service Districts & Other	General Fund	Service Districts & Other	
Mill Levy (2008)	.01933	.11286	.2300	.09143	NA
Taxes: Year 1	\$24,547	\$143,321	\$34,042	\$135,326	\$337,236
Taxes: Year 15	\$8,591	\$50,161	\$11,915	\$47,365	\$118,032
Taxes: Years 1-15	\$249,148	\$1,454,682	\$345,534	\$1,373,576	\$3,422,940

Collectively, it is unlikely that school districts in the area would see any increase in enrollment or expenditures due to the long-term direct and indirect population effects associated with the pipeline.

The four school districts having enrollment boundaries crossed by the pipeline would receive increases in taxable values from the pipeline. Taxable values associated with the pipeline would range from an estimated \$454,000 in Nesson School District #2 to \$987,000 in Divide County School #1 (Table 4.1.11-2). Based on current tax rates, property taxes of nearly \$300,000 to support public education would be levied on the project in the first year of operation, declining to approximately \$103,000 in year 15. Over the first 15 years of operations, an estimated \$3.0 million in property taxes would be levied on the pipeline to support education, with totals ranging from \$484,000 by the Nesson SD #2 to \$1.03 million for Grenora SD #99.

	DIVIDE SD #1	TIOGA SD #15	GRENORA SD #99	NESSON SD #2	TOTAL
Taxable Value– Year 1 (\$)	\$ 987,000	\$ 486,500	\$ 822,500	\$ 454,000	\$ 2,750,000
Taxable Value	35.9%	17.7%	29.9%	16.5%	100%
Mill Levy	0.09574	0.10675	0.12324	0.10505	NA
Taxes: Year 1	\$ 94,502	\$ 51,932	\$ 101,364	\$ 47,687	\$ 295,485
Taxes: Year 15	\$ 33,076	\$ 18,176	\$ 35,477	\$ 16,691	\$ 103,420
Taxes: Years 1-15	\$ 959,200	\$ 527,105	\$ 1,028,845	\$ 484,033	\$ 2,999,183

Counties and local school districts may also realize some indirect effects in ad valorem tax base due to the project, for example, due to effects on residential or agricultural values. However, such effects would not be expected to be significant.

Communities in the area would realize long-term revenues from local option taxes on local taxable purchases, such as meals in restaurants and retail purchases, but such revenue would not be significant. Long-term effects on budgeted expenditures for public services would be negligible.

In summary, the short-term and long-term fiscal effects of the project would be beneficial, although relatively modest in magnitude.

Environmental Justice

The analyses conducted for this EA (presented in Section 4) did not identify any high and adverse human health or environmental effects of the Proposed Action. Section 4.1.4 (Health and Safety) states that ethane releases can be hazardous, but vapors are usually dissipated below risk levels within a short distance of the source and would evaporate almost completely within a few hours. Consequently, health and safety effects from accidental ethane releases would not be anticipated to affect the communities of Wildrose or Fortuna. Moreover, any inadvertent or unanticipated environmental or health and safety impacts would not be anticipated to disproportionately affect minority populations or persons living in poverty. Therefore, no environmental justice impacts would be associated with the Proposed Action.

Mitigation Summary

No adverse impacts to socioeconomic conditions or environmental justice within the project area are anticipated; therefore no mitigation measures are required.

4.1.11 SOILS

Alternative I – No Action

Under the No Action alternative, the Vantage Pipeline would not be built and no project-related impacts to soils or prime farmlands would occur.

Alternative II – Proposed Action

The three main potential impacts to soil quality that may result from construction of the Proposed Action are soil mixing, compaction, and erosion. Each of these impacts are discussed below, as well as various mitigation techniques.

Soil Mixing

Pipeline construction operations that contribute most to soil impacts include: grading, trenching, backfilling, right-of-way traffic, and clean-up activities. The most common impact associated with these pipeline construction activities is the mixing of organic and nutrient-rich topsoil with less fertile mineral subsoil. This practice detrimentally affects the soils' physical makeup and overall capability. The loss of organic matter and nutrients from the root zone can affect plant growth in varying degrees, depending on the type of vegetation. Mixing texture classes is also detrimental to plant growth.

In order to mitigate the potential for mixing soils, Vantage would use various soil-handling mitigation options included in the EPP. For instance, Vantage would segregate salvaged topsoil and subsoil into separate stockpiles. During trench backfilling, subsoil material would be placed and graded prior to topsoil spreading. Mitigation options to address various conditions that may be encountered during construction for wet soils, thin soils, stony soils, unstable trenching conditions, uneven soil boundaries, and shallow bedrock would be available to prevent mixing in these instances.

Soil analysis is usually the only sure way of revealing the net change in soil chemical properties mixed during backfill operations. Examples of soil chemistry changes that may occur as a result of backfill operations include the presence and persistence of elevated sodium as measured by sodium absorption ratio (SAR) in the topsoil. Elevated SAR results increase soil dispersion causing limitations in plant growth and crop yields. Long-term impacts due to increased SAR would result due to soil mixing.

Vantage would mitigate potential for increasing topsoil SAR by following the soil-handling mitigation options described above.

Soil Compaction

Soil compaction usually is dependent on a combination of soil moisture content, texture, and organic matter content. Compaction is detrimental to soil structure properties, and results in poor plant root penetration, difficulties in cultivation, and restricted water movement. Most importantly, compaction affects soil aeration by decreasing soil porosity and lowering oxygen levels which may lead to restricted plant growth, decreases in nutrient uptake, and a decrease in absorption of water by plants. In addition, soil compaction may cause ponding of water and increased erosion potential due to lowered soil infiltration rates. Working soil under wet conditions can also alter soil structure. When combined with mixing, the associated compaction impacts to soil are usually more severe.

Vantage would mitigate long-term impacts caused by soil compaction by implementing mitigation measures described in the EPP, including ripping or discing, traffic management, and avoidance of construction activities when moisture conditions are prone to compaction.

Soil Erosion

Pipeline construction may result in increased soil loss from wind or water erosion. Erodibility increases during construction when the soil is temporarily in a non-vegetated state. In addition, increased soil loss may occur when topsoil is placed in stockpiles and has greater exposure to wind and water erosion. Wind erosion is a function of wind velocity, soil characteristics, and surface soil condition. Soil-handling procedures, which require vegetation removal, increase the potential for wind erosion, particularly in high-wind areas where surface soils have fine textures. Erosion impacts caused by water can also occur, which results in the loss of finer, more fertile soil particles which are first to wash away.

Vantage would implement mitigation options described in the EPP to minimize potential for soil and water erosion. Vantage would also mitigate long-term impacts related to soil erosion by restoring vegetation throughout the right-of-way.

Mitigation Summary

- To mitigate the potential for mixing soils, Vantage would use various soil-handling mitigation options included in the EPP.
- Vantage would mitigate long-term impacts caused by soil compaction by implementing mitigation measures described in the EPP.
- Vantage would implement mitigation options described in the EPP to minimize potential for soil and water erosion.
- During construction, Vantage would use the BMPs outlined in the construction stormwater management plan that would be prepared for the project.

4.1.12 THREATENED, ENDANGERED, CANDIDATE, AND SENSITIVE ANIMAL AND PLANT SPECIES

Alternative I – No Action

Under the No Action alternative, the Vantage Pipeline would not be built and no project-related impacts to threatened, endangered, candidate, or sensitive species would occur.

Alternative II – Proposed Action

Information presented in this section reflects information received through informal consultation with the U.S. Fish and Wildlife Service (USFWS), the North Dakota Game and Fish Department (NDGF), and other data sources available at the time this document was prepared.

Vantage has completed informal consultation with the USFWS Ecological Services Office in Bismarck, ND and the Wildlife section personnel of the NDGF's Bismarck office to identify the potential presence of Threatened and Endangered species in the vicinity of the proposed Vantage Pipeline project (see Section 3.13). The USFWS identified four federally-listed Endangered species known to occur within the vicinity of the pipeline corridor. The USFWS also identified one federally-listed Threatened species known to occur in the vicinity of the pipeline corridor, as well as two designated Critical Habitat areas for the piping plover. (Section 3.13.1). One Candidate species—the Sprague's pipit—was additionally identified by the USFWS as possibly being present in the project area. Potential impacts to migratory birds and bald and golden eagles were also identified by the USFWS. Correspondence with USFWS regarding impacted species and/or mitigation is included in Appendix B.

A preliminary risk assessment, including potential impacts and mitigation, is provided in the following sections. A final risk assessment, as well as a baseline monitoring plan (pre through post construction phases) would be completed following the completion of ongoing field monitoring. The results of the baseline studies would be used to develop mitigation plans to avoid and minimize impacts on the potentially affected species. To prevent long-term loss of disturbed habitat form and function, wildlife habitat needs would be incorporated in reclamation and habitat restoration planning.

4.1.12.1 Threatened and Endangered Species

Mammals

The Grey Wolf (*Canis lupus*) is the only federally listed mammal that would potentially be affected by construction of the Vantage Pipeline. The USFWS indicated that the wolf has been observed mainly in the Turtle Mountain area located approximately 150 miles northeast of the project area. It is possible that grey wolves from this population could enter or cross the area affected by the Vantage Pipeline during construction and operation. The likelihood of seeing a wolf along the pipeline route would be regarded as a rare occurrence. The project area does not consist of suitable habitat that would likely support long-term occupancy by a wolf pack because of the lack of desirable prey species and cover. If a wolf was observed it would most likely be a transitory individual and would not remain in the area very long. However, if a wolf is observed by wildlife survey personnel during surveys or company personnel during the pre-construction through reclamation period of work on the pipeline, it would be immediately reported to the U.S. Fish and Wildlife Service, Ecological Services office in Bismarck, and a determination would be made for appropriate actions to avoid conflict while it is in the area. This occurrence would not be considered a significant impact because grey wolves are unlikely to become established in the project area.

Birds

Interior Least Terns (*Sterna antillarum*) nest on sandbars on the Missouri and Yellowstone Rivers. The Little Muddy River is a tributary of the Missouri River and runoff from the project area would potentially discharge to the Missouri River. During construction, Vantage would utilize Best Management Practices (BMPs) in accordance with an approved stormwater management plan to control erosion and sediment discharge into the Little Muddy River. The drainages crossed by the pipeline are not perennial streams and runoff to the Little Muddy River should only occur during snowmelt or major storm events. The Missouri and Yellowstone Rivers are not in close proximity to the proposed pipeline route, and therefore, no risk of impact to the interior least tern is anticipated.

Whooping Cranes (*Grus americana*) migrate through North Dakota each spring and fall. They breed in the wetlands of the Wood Buffalo National Park in Alberta, Canada and over winter on the Texas coast. The Vantage Pipeline alignment is located within the corridor used by 75 percent of the migrating birds (Figure 3.13-1). During migration, the cranes make numerous stopovers along the migration route to feed and roost. Due to the occurrence of suitable roosting and feeding habitat in the project area, whooping cranes may stop in the project area during migration and may spend several days in one location within the project area.

Adverse effects to the whooping crane and its habitat associated with pipeline construction and operation would be minimized by project site monitoring and construction scheduling (shut-downs) for areas where whooping crane sightings are within 1 mile of the pipeline corridor. Implementation of approved reclamation and habitat restoration prescriptions following construction would result only in temporary loss of native and agricultural habitats form and function, between the time of pipeline construction and successful habitat reclamation.

Known Piping Plover (*Charadrius melodus*) nesting sites near the Vantage Pipeline alignment have been designated as critical habitat (Figure 3.13-1). The distance between the alignment and the nearest critical habitat units is 0.25 to 0.5 miles. Given the close proximity to these critical habitats, a potential for short-term impacts would exist during construction due to noise and construction-related traffic. The plovers begin arriving to the breeding grounds in early to mid-April and typically depart by the beginning of September each year. The USFWS recommends that construction within 0.5 miles of the designated Critical Habitat areas take place outside of the period when the plover are present in the breeding area (April 1 to September 1). Further, development of tire tracks or other depressions on shorelines within piping plover habitat may result in potential mortality of plover chicks if a chick becomes trapped or potentially drowns in a depression. For this reason, the USFWS recommends that construction traffic not be allowed within 200 feet of the shoreline of potential habitat to avoid construction related impacts to the shoreline. During construction, the USFWS additionally recommends that a 0.5 mile no entry buffer be maintained around known or potential nesting habitat during the nesting period.

In order to avoid potential impacts to the piping plover, a baseline study to identify potential habitat adjacent to the Vantage Pipeline alignment will take place during the pre-construction survey. Vantage would also survey potential habitats adjacent to the known habitat and any potential surface water habitat within 0.5 miles of the pipeline alignment to determine whether they are being utilized for nesting or feeding. A survey methodology developed specifically for this project will be followed that will employ search methods for individuals, nests, and habitat indicators. The survey will also involve communications with the Lostwood National Wildlife Refuge plover biologist and the USFWS Endangered Species Biologist in Bismarck. A report with results will be prepared and submitted with GIS data to the USFWS upon completion. Plans to mitigate construction-related impacts would be developed through coordination with the USFWS.

The risk of disturbance and habitat impacts would be minimized by the avoidance of potential piping plover wetland nesting and brooding sites within the construction corridor of the Vantage Pipeline (70 foot width). After completing field surveys for piping plover individuals and habitat, Vantage would identify locations and appropriate buffers to mitigate construction related impacts to the piping plover. Plans to mitigate construction related impacts would be developed through coordination with the USFWS.

Long-term impacts during operation of the pipeline are not anticipated. Once construction and reclamation activities are completed, noise and traffic related to the pipeline would be minimal. Traffic related to pipeline operations would be limited to inspections and maintenance activities that would typically focus on the block valve locations. However, the nearest block valve would be located over 2 miles from the nearest known piping plover designated Critical Habitat.

Habitat for Sprague's Pipit (*Anthus spragueii*) includes grassland habitats for wintering and large prairie areas for nesting. The short-term impact and risk to the Sprague's pipit could be minimized through: 1) construction scheduling to avoid potential nesting areas in the nesting period; 2) pre-construction measures (employed in the fall, prior to subsequent spring nesting) to remove grass cover through mowing and discing of the 70-foot-wide pipeline right-of-way; and 3) reclamation plantings (seed mix and planting prescription) to restore pre-construction grassland cover immediately following construction.

Fish

Pallid Sturgeon are known to occur in the Yellowstone and Missouri Rivers. The nearest point from the Vantage Pipeline to the Missouri River is approximately 15 miles. Little or no risk of impact is expected from this project on the riparian, riverine wetland, deepwater aquatic, and backwater habitats important to the pallid sturgeon.

As discussed above for the interior least tern, construction of the Vantage Pipeline would result in short-term impact to water quality in the Little Muddy River, a tributary of the Missouri River. During construction, Vantage would utilize BMPs in accordance with an approved stormwater management plan to control erosion and sediment discharge to the Little Muddy River, which in turn, would avoid any potential impacts to the Missouri River and/or the pallid sturgeon.

4.1.12.2 Migratory Birds

Short-term impacts to migratory birds within the habitat adjacent to the Vantage Pipeline alignment would consist of loss of habitat during construction of the pipeline until the restored area could support vegetation sufficient to replace habitat impacted by construction. During this period, migratory birds that would have nested or fed within, or adjacent to, the area disturbed during construction would be temporarily displaced due to construction activities, noise, and traffic. During the spring and fall, migrating birds would avoid construction-impacted areas and utilize areas not impacted by construction. The extent to which migrating birds would be impacted would be dependent upon the timing of construction. Greater impacts would occur if the start of construction occurs during the breeding and nesting period (February 1 to July 15) for ground and shrub-nesting birds. If the construction disturbance occurs outside of this period, birds would avoid the disturbed construction right-of-way since suitable habitat would not be present.

A one-mile study corridor was surveyed for active and inactive raptor nesting locations and possible nesting habitat present within the designated survey area in May, 2011. Five northern harriers and a Swainsons' hawk were observed along with two raptor nests. The documented raptor nests include: one

active red-tailed hawk nest (approximately 1,300 ft. from the route centerline) and one inactive buteo nest (approximately 1,200 ft. from the pipeline centerline).

Northern harrier nests were not identified during the aerial survey, but the presence of ground-nesting species will be evaluated during the pre-construction survey. No cliff or bluff nest substrate was identified within the corridor, and tree nest substrates were limited to mostly shelter belts located in cultivated crop areas. The landscape was heavily fragmented with wheat stubble fields and summer fallowed dirt fields, leaving limited native pasture for raptor foraging and prey production.

To avoid and minimize any nest destruction of ground and shrub-nesting birds within the 70-foot pipeline corridor disturbance area, it has been suggested by the USFWS that the construction corridor be mowed or disced to remove vegetation cover in the fall preceding construction to discourage ground and shrub-nesting. After construction, the site would immediately be reclaimed to pre-construction habitat conditions. If construction were to occur between February 1 and July 15, Vantage would also have a qualified biologist conduct bird surveys within 5 days before construction was to begin within a particular area. If migratory birds and/or nests are discovered within the construction corridor, construction would cease in that immediate area and the USFWS would be consulted. To the extent possible, the 70-foot pipeline corridor disturbance area would also be pre-cleared by mowing the grasslands during the 4th quarter of the previous year. This would discourage nesting in the 70-foot pipeline corridor disturbance area during the subsequent nesting season.

4.1.12.2 Bald and Golden Eagle Protection Act

Bald and golden eagles may use the project area that would potentially be impacted during construction of the Vantage Pipeline. The USFWS recommends that a buffer of at least one-half mile should be maintained from all eagle nests during construction and that construction be scheduled between late summer and winter, to the extent practicable, in order to avoid impacts. The proposed pipeline was routed to avoid tree groves to the greatest and most practicable extent possible.

Nest location and nest occupancy surveys for the bald and golden eagles which took place in May, 2011 documented no bald or golden eagles within a one-mile corridor along the pipeline alignment. This survey will be followed by a final survey prior to construction. Should active nesting sites be identified, measures would be taken to delay construction in those sections until young are fledged from the site. With the implementation of these measures, the risk of impact to eagles is anticipated to be negligible. Reclamation and restoration standards would return the disturbed habitats to pre-construction conditions.

4.1.12.3 High-Value Habitat

During the development of the route for the Vantage Pipeline, high-value habitat areas were avoided to the greatest extent practicable. This includes USFWS refuges, Waterfowl Production Areas (see Section 3.19), and wetland and grassland easements. The proposed route alignment traverses several parcels that are enrolled as USFWS wetland easements. Vantage has provided the routing in these areas to the USFWS and would coordinate with the USFWS to mitigate potential impacts. Vantage would obtain any Special Use or right-of-way permits from the USFWS required for construction. Vantage would coordinate with the Crosby Wetland Management District regarding the USFWS wetland easements.

Mitigation Summary

- If a whooping crane is sighted within one mile of the area affected by construction of the pipeline, all work would cease within the sighted area and the USFWS would be contacted immediately. In

coordination with the USFWS, work in the sighted area would resume after the crane(s) left the area.

- Construction within 0.5 miles of piping plover designated Critical Habitats would take place outside of the breeding season (April 1 to September 1). During construction, a 0.5 mile no-entry buffer would be maintained around known or potential nesting habitat during the nesting period.
- Construction traffic would not be allowed within 200 feet of the shoreline of potential piping plover habitat to avoid construction related impacts to the shoreline.
- Vantage would conduct a survey to identify potential piping plover habitat adjacent to the Vantage Pipeline alignment. Vantage would also survey potential habitats and wetlands adjacent to the known habitat to determine if they are being utilized for feeding. Planning to mitigate construction-related impacts would be developed through coordination with the USFWS.
- During construction, Vantage would utilize BMPs in accordance with an approved stormwater management plan to control erosion and sediment discharge to the Little Muddy River.
- Vantage would coordinate with USFWS to develop mitigation strategies to avoid the taking of migratory birds.
- A buffer of at least one-half mile from active bald and golden eagle nests would be maintained during construction. To the extent practicable, construction would be scheduled between late summer and winter.
- Vantage would complete a nesting survey for bald and golden eagles during 2011 and provide the required buffers around any identified active nest site until the young have fledged. Vantage would coordinate with the USFWS throughout the construction process.
- Vantage would coordinate with the USFWS to mitigate potential impacts to high-value habitat and obtain any Special Use or right-of-way permits required for construction.
- Vantage would coordinate with the Crosby Wetland Management District regarding the USFWS wetland easements.
- If construction were to occur between February 1 and July 15, Vantage would have a qualified biologist conduct bird surveys within 5 days prior to construction. If migratory birds and/or nests are discovered, construction would cease and the USFWS would be consulted.
- If construction were to occur between February 1 and July 15, Vantage would, to the extent possible, pre-clear the 70-foot pipeline corridor disturbance area by mowing any grasslands during the 4th quarter of the previous year. This would discourage nesting in the 70 foot pipeline corridor disturbance area.

4.1.13 TRANSPORTATION

Alternative I – No Action

Under the No Action alternative, the Vantage Pipeline would not be built and no project-related impacts to transportation would occur.

Alternative II – Proposed Action

The Proposed Action may cause short-term impacts during construction to transportation infrastructure. Short-term impacts would mainly be caused to: (i) traffic flow; and (ii) road quality. For instance,

highways, county roads and local roads would be used to transport materials, crews, and heavy construction equipment. Such use could impact traffic flow, as well as road quality. Further, both traffic flow and road quality would be temporarily impacted by boring procedures where the pipeline crosses a paved or gravel road. Likewise, areas where the pipeline crosses an unimproved trail would be temporarily impacted by trenching.

Disruption of Traffic Flow. Impacts to the flow of traffic could largely be mitigated by coordinating and limiting the hours of construction. For example, transportation of construction materials would generally take place outside peak commuting hours. Daily arrival and departure of crews, materials, and equipment from the construction site would also be coordinated in order to avoid peak hours. Multi-lane highways would be used to the extent possible for transport of heavy, slow moving equipment to minimize traffic flow impacts by allowing traffic to pass utilized construction equipment.

Traffic impacts at pipeline crossings would further be minimized by using a horizontal boring process at all gravel and paved road crossings, where possible. Vantage would also prepare detours in locations requiring open cuts. Where crossings are open cut, temporary measures would be available to allow for emergency crossings.

Damage to Road Quality. Any damage to road quality by transport of heavy construction equipment or other procedures related to pipeline construction would be mitigated by repairing roadways to pre-existing conditions following construction. Soil transport onto paved highways during passage to and from the construction site would also be monitored and any remaining soil would be removed.

Compliance with Local, State and Federal Regulations. Vantage Pipeline construction procedures would comply with all local, state, and federal traffic regulations and load restrictions.

Mitigation Summary

- Vantage would use a horizontal boring process at all gravel and paved road crossings, where possible.
- Vantage would prepare detours in locations requiring open cuts. Where crossings are open cut, temporary measures would be available to allow for emergency crossings.
- Damage to road quality from heavy construction equipment or other procedures related to pipeline construction would be repaired to pre-existing conditions following construction.
- Soil transport onto paved highways during passage to and from the construction site would be monitored and any remaining soil would be removed.
- Construction procedures would comply with all local, state, and federal traffic regulations and load restrictions.

4.1.14 VEGETATION

Alternative I – No Action

Under the No Action alternative, the Vantage Pipeline would not be built and no project-related impacts to vegetation would occur.

Alternative II – Proposed Action

If the Proposed Action were to occur, temporary impacts would be caused to both: (i) upland vegetation; and (ii) wetland vegetation. Permanent impacts would also be caused to upland vegetation in the block valve locations and access roads.

Cultivated Pasture/Hay and Herbaceous Uplands

Approximately 291 acres of uplands consisting of herbaceous natural and semi-natural vegetation would be temporarily disturbed during construction of the Vantage Pipeline. The upland areas would include temporary impacts to herbaceous and semi-natural vegetation within Conservation Reserve Program (CRP) tracts. Vantage would restore upland areas to preconstruction conditions as soon as practical following construction. Each area would be seeded to establish the dominant species at the site prior to construction disturbance.

Further, approximately 0.32 acres of herbaceous natural/ semi-natural and herbaceous planted vegetation would be permanently impacted due to the construction and operation of block valve locations and roads providing access to those valve locations. Specifically, three block valve locations would be located within upland areas that would not be restored following completion of the construction activities. The block valve locations would be fenced and would each include an access road to allow inspections and maintenance. The impacts to upland areas caused by each block valve location are identified below in Table 4.1.14-1.

Table 4.1.14-1. Block Valve Locations Pasture and Grassland			
BLOCK VALVE NUMBER	MILEPOST	LAND COVER	AREA (acres)
BV-0	0.0	Grassland	0.05
BV-1	7.8	Grassland	0.11
BV-4	52.7	Grassland	0.11
BV-7	71.9	Pasture	0.05
Total area*			0.32

Vantage would restore upland areas to preconstruction conditions as soon as practical following construction. Each area would be seeded to establish the dominant species at the site prior to construction disturbance.

Wetlands

Approximately 1.05 acres of wetland would be crossed by the 30-foot-wide permanent construction right-of-way. This area consists of 14 locations that would be crossed by the permanent 30-foot-wide right-of-way. In order to reduce temporary impacts to wetlands, the width of the construction right-of-way would be reduced locally to avoid impacts to wetlands in the temporary work space. Using this approach, Vantage would be able to avoid disturbances to all wetlands within the temporary work area. Temporary impacts would occur at wetland locations within the permanent right-of-way during construction as the result of trenching, pipe installation and backfilling activities. In order to further reduce impacts to the unavoidable wetlands, Vantage would employ the mitigation measures described in the EPP. No permanent facilities or structures, including fill, would result from constructing the Vantage Pipeline in wetland areas. All wetland areas disturbed during construction would be restored to the original preconstruction contour and allowed to revegetate naturally to the dominant wetland plant species that

existed in the area prior to construction disturbance. Construction impacts for wetland crossings are discussed in Section 4.1.17 and in the EPP.

Mitigation Summary

- All wetland areas disturbed during construction would be restored to the original preconstruction contour and allowed to revegetate naturally to the dominant wetland plant species that existed in the area prior to construction disturbance.

4.1.15 VISUAL RESOURCES

The Vantage Pipeline would potentially affect visual resources in Divide and Williams counties if it were to introduce elements to the landscape that attract attention and disturb the appreciation of persons viewing the scenery for aesthetic values. A number of conditions must be met for there to be an impact to visual resources. These are an expressed interest in managing for landscape character and quality, an uncharacteristic change to the landscape, viewer exposure to the landscape, and a reaction from a set of viewers who are attuned to landscape quality and aesthetics.

Alternative I – No Action

Under the No Action Alternative, the Vantage Pipeline would not be built. Therefore there would be no change to any visual resources in Divide and Williams counties.

Alternative II – Proposed Action

Stewardship over landscape aesthetics is the prerogative of private land owners in Divide and Williams counties. The treatment of the land along the pipeline route during and after construction is described in Section 2.1. As noted in Section 1.5, Vantage would attempt to accommodate landowner interests through the right-of-way acquisition process and the negotiation of surface use agreements. These agreements typically include standards for restoration and revegetation of the disturbed right-of-way and, if necessary, site-specific construction plans to address construction near residential and commercial structures.

With most of the pipeline route crossing private land in agricultural use or reserve, the primary objective of surface use agreements would likely be to restore the landscape to its pre-construction function as cultivated land or pasture. Aesthetics are not likely to be a primary concern of agreements, but meeting the terms of landowner negotiated surface use agreements likely would restore the landscape to, at worst, a close approximation of its pre-construction character and appearance. (See Section 4.1.14 for discussion of revegetation).

Once the surface is restored and revegetated, the Vantage Pipeline route would likely become almost undistinguishable from its surroundings with a minor exception. The exception is the introduction of miscellaneous facilities at points along the pipeline route that are required for ongoing operations. The facilities are eight block valves which would be spaced more or less evenly along the route, and occasional pipeline warning signs and markers.

The 20-foot-by-30 foot valve site plots, which include an exposed segment of the pipeline, fittings, a small building and chain-link fencing, would perhaps stand out in contrast to the farm fields or grasslands where they may be built. The visual contrast introduced by the warning signs and markers installed along buried segment of the pipeline is unavoidable because the signage is intended to be seen and to attract attention at close range.

Several factors would mitigate the impact of these facilities on views that may be seen from near the pipeline corridor. The main factor is that these structures are unlikely to be seen by anyone concerned with landscape appearance. If they are visible, it would likely be from intersections where the pipeline crosses main roads (SH 40 north of Tioga, U.S. 85 northwest of Alamo, and S.H. 5 west of Fortuna), a paralleling segment of SH 50 east of Alamo, or one of the many side roads accessing farms and grasslands.

From observation points on main roads, which have relatively low traffic and no scenic designation as noted in Section 3.16, viewers would likely be focused on the road and in any case, a glimpse of such facilities from a vehicle would likely be fleeting. On local roads, very few potential viewers are likely to pass a facility in the course of a day, most are likely to be traveling for work in either the agriculture or petroleum industry, and most if not all are unlikely to be interested in other than the landscape's functionality. The second factor is that at a distance of a quarter mile or more (a middle-ground to background perspective) and given the topography described in Section 3.16, valve sites and signage likely would be more or less hidden by the combination of even modest landscape relief and stands of vegetation. Finally, valve sites and miscellaneous pipeline works are not out of character with the landscape of Divide and Williams counties as a whole, which are located in the productive Williston Basin oil field.

Mitigation Summary

Structures associated with the Vantage Pipeline are unlikely to be seen by anyone concerned with landscape appearance. If structures are visible, it would likely be from intersections where the pipeline crosses main roads. The occasional appearance of valve sites would not generally be out of character with such landscapes as are located in the productive Williston Basin oil field. No mitigation measures would therefore be required for visual resources.

4.1.16 WATER QUALITY

Alternative I – No Action

Under the No Action Alternative, the Vantage Pipeline would not be built, and there would be no project-related impacts to water quality.

Alternative II – Proposed Action

4.1.16.1 Groundwater Impact and Mitigation

If the Proposed Action were to occur, short-term impacts to groundwater may result, however, long-term impacts would likely be avoided. Pipeline construction activities such as trenching and backfilling are primarily limited to the upper 5 feet, which is above the water table of most of the aquifers. Dewatering may result in minor short-term fluctuations in groundwater levels within shallow surficial aquifers. After construction the groundwater levels typically recover quickly.

Potential groundwater impacts could result from accidental spills of fuels, hydraulic fluid, or chemicals during construction. Impacts from spills during pipeline construction are primarily associated with fuel storage, equipment refueling, and maintenance. A Spill Prevention Control and Countermeasures (SPCC) program would be required if sufficient volumes of fuel and other oil were stored on-site during construction. Vantage's construction contractor would implement a SPCC program during construction which would define the Best Management Practices that would be implemented to prevent accidental releases of fuels and other hazardous substances during construction. The SPCC program would describe

response, containment, cleanup, and reporting procedures. The SPCC plan describes preventative measures such as spill training for construction personnel, regular inspection of equipment for leaks, and construction of containment systems around temporary fuel storage areas. Implementation of the SPCC program would reduce the potential for long-term impacts and contamination due to construction activities. Storage of fuel or oil is not required during operation of the pipeline; therefore, an SPCC plan would not be required for pipeline operations.

4.1.16.2 Surface Water Impact and Mitigation

Surface waters in the Vicinity of the Vantage Pipeline that are listed on the Section 303(d) list are described above in section 3.17.2. Potential for construction-related impacts for each of the Section 303(d) listed waters are described below.

Powers Lake is located in the White Earth River drainage and is outside of the area that would be impacted by construction of the Vantage Pipeline. The Little Muddy River is a tributary to the Missouri River (Lake Sakakawea) and would receive runoff from the section of the Vantage Pipeline within the Little Muddy hydrologic unit. In-stream construction would result in the greatest potential impact on surface waters. The level of impact would depend on flow velocity, soil erodibility, and sediment particle size. The majority of the Vantage Pipeline route would traverse the upper reach of the Little Muddy hydrologic sub-basin, avoiding the crossing of perennial streams. Short-term impacts from in-stream construction are not anticipated to be significant. Increased runoff could transport additional sediment into the Little Muddy River and ultimately Lake Sakakawea, resulting in increased turbidity levels and sedimentation rates in the receiving waterbody. Vantage would develop a Stormwater Pollution Prevention Plan (SWPPP) to minimize impacts to surface waters associated with silt-laden runoff during construction. The stormwater plan would be developed prior to construction as required by the North Dakota Department of Health.

The majority of the waterbodies that would be crossed by the Vantage Pipeline are intermittent drainages and washes that are expected to be dry at the time of construction. These drainages do not typically support fisheries or provide critical aquatic habitat for aquatic organisms. Crossings in these locations would use conventional upland construction methods if the drainages are dry at the time of construction. The depth of cover over the pipeline once reclaimed would be a minimum of 4 feet. The crossing location would be reclaimed to original contour and preconstruction conditions. Impacts on intermittent drainages would be limited to temporary alteration of channel beds and banks and possibly increased sediment load during initial storm events following construction. If drainages are flowing at the time of construction, Vantage would evaluate other installation alternatives including the open-cut method and horizontal drilling.

Prairie potholes and wetland areas adjacent to and downgradient of areas cleared during construction may potentially be impacted. Clearing and grading of the Vantage Pipeline right-of-way would expose soil to erosion and use of heavy equipment for construction would cause compaction of near-surface soils. If uncontrolled this would result in increased runoff and sediment discharge into wetlands and other surface waters.

During construction, impacts on surface water resources would be minimized or avoided by using Best Management Practices as outlined in the SWPPP. To minimize impacts from sedimentation and turbidity, Vantage would adhere to the BMPs such as use of sediment barriers such as silt fence to prevent or significantly reduce runoff into streams and wetlands, and complete construction as quickly as possible to shorten the duration of sedimentation and turbidity. Following completion of construction, Vantage would stabilize the construction site as soon as practicable, including the stream banks and also restore channel morphology and bed material.

Refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters could create a potential for contamination. If a spill were to occur, downstream wetlands and other surface water could experience impacts. Acute and chronic toxic effects on aquatic organisms could also result from such a spill. Vantage would implement procedures described in the SPCC Plan to avoid surface water impacts related to fuel, oil, or other hazardous materials.

4.1.16.3 Hydrostatic Testing

Before placing the Vantage Pipeline into service Vantage would verify the integrity of the pipeline with hydrostatic tests. Potential for pipeline leakage is evaluated by filling the pipeline with water, pressurizing it, and then checking for pressure losses. Hydrostatic test water would be obtained from water supply sources in the vicinity of the Tioga Gas Plant; a permit for temporary water use would not be required for this source. Hydrostatic testing would require approximately 300,000 gallons (0.92 acre-feet) of water. Separate tests would be completed for each section of pipeline locations.

In order to reduce the volume of test water required, Vantage would transfer the test water from one section for reuse in testing subsequent pipeline sections. Testing would begin at the south end of the pipeline. Vantage would acquire the necessary permits (if required) from state agencies before withdrawing and disposal of hydrostatic test water, including specific approvals from applicable resource agencies. Vantage would minimize the potential effects of hydrostatic testing on surface water resources by adhering to permit requirements such as screening intake hoses to prevent the entrainment of fish and other aquatic organisms and controlling the rate of withdrawal from the source. Chemicals would not be added to the water during testing.

4.1.16.3 Operations Impacts

Operation of the Vantage Pipeline would be regulated by the Department of Transportation – Office of Pipeline Safety. Accidental leaks from the pipeline system during operations are not anticipated to have a potential to affect groundwater. Any fugitive ethane that leaks from the pipeline or above-ground facilities would vaporize and be dispersed into the atmosphere. Vantage would implement an inspection program to monitor the integrity of the pipeline system. Vantage would install a cathodic protection system that would address the potential corrosion of the steel pipe installed below the ground surface. Regular monitoring of the above-ground facilities would occur on a monthly schedule. In addition, Vantage would perform aerial flyovers to inspect the pipeline right-of-way and would complete pipe integrity inspections using computerized inspection tools that travel through the pipe bore. Vantage would maintain an Emergency Response Plan, which has been reviewed and approved by the Department of Transportation – Office of Pipeline Safety.

Mitigation Summary

- Vantage would minimize the potential effects of hydrostatic testing on surface water resources by adhering to permit requirements such as screening intake hoses to prevent the entrainment of fish and other aquatic organisms and controlling the rate of withdrawal from the source.
- Chemicals would not be added to the water during hydrostatic testing.
- Vantage would implement an inspection program to monitor the integrity of the pipeline system.
- Vantage would install a cathodic protection system that would address the potential corrosion of the steel pipe installed below the ground surface. Regular monitoring of the above-ground facilities would occur on a monthly schedule.

- Vantage would perform aerial flyovers to inspect the pipeline right-of-way and would complete pipe integrity inspections using computerized inspection tools that travel through the pipe bore.
- Vantage would maintain an Emergency Response Plan, which has been reviewed and approved by the Department of Transportation – Office of Pipeline Safety.

4.1.17 WETLANDS AND RIPARIAN ZONES

Alternative I – No Action

Under the No Action alternative, the Vantage Pipeline would not be built and no project-related impacts to wetlands would occur.

Alternative II – Proposed Action

The proposed Vantage Pipeline would be installed using open-cut trenching techniques. Vantage would maintain a 30-foot permanent right-of-way (five (5) feet on one side of the pipeline and 25 feet on the other). Additionally, a 40-foot temporary construction right-of-way would be established adjacent to the permanent right-of-way. The combined right-of-way would be 70 feet wide with the pipeline at the center of the permanent right-of-way.

For purposes of the field investigation, a 500-foot corridor was established as the project area. The field investigation and aerial photography review resulted in the identification and mapping of 201 wetlands present within the final 500-foot corridor selected for the project and are further characterized in Section 3.18 of this report. Fourteen (14) wetlands would be within the 30-foot permanent right-of-way. In an effort to avoid and minimize impacts to wetlands and other important natural and cultural resources, the initial pipeline corridor was revised through several iterations. Final design of the pipeline routing would delineate the areas to be excluded from the temporary work areas by necking down the work area width.

Permanent Impacts to Wetlands

Permanent impacts are those that involve permanent dredging of material from, or the placement of permanent fill into waters of the United States, including wetlands. No pump stations or other permanent structures would be constructed. The proposed project would therefore not create any permanent impacts to wetlands.

Temporary Impacts to Wetlands

The proposed project would temporarily impact 1.05 acres of wetland within the permanent right-of-way. Vantage would consider various mitigation measures identified in the EPP to reduce wetland impacts. All of the wetland impacts would be minimized to the extent practicable. For instance, wetland soils excavated during pipeline construction would be stockpiled for reuse and the area would be restored to its original grade and seeded or planted with native plants after construction. Many other construction activities, such as stockpiles, lay down areas, and construction staging areas would be located outside of wetlands.

i. Temporary impacts within the permanent right-of-way. Wetlands within the proposed 30-foot permanent right-of-way include 14 wetlands that were identified and mapped during the field investigation and review of aerial photography. Within the 30-foot corridor, a total of 1.05 acres would be temporarily impacted as a result of the proposed project. These impacts are summarized by wetland type in Table 4.1.17-1.

Table 4.1.17-1. Temporary Wetlands Impacts by Type within the Permanent Right-of-Way

CLASSIFICATION		WETLANDS OBSERVED	
Circular 39 ¹	Cowardin ²	Number	Area (acres)
1	PEMA	1	0.05
2	PEMB	5	0.09
2/3	PEMB/C	5	0.30
3	PEMC	1	0.22
3/4	PEMC/F	1	0.05
5	PUB	1	0.34
Totals*		14	1.05

*Note that areas listed in tables do not sum to total impact area due to rounding

¹ *Wetlands of the United States, Circular 39.* (Shaw and Fredine, United States Fish and Wildlife Service, 1956)

² *Classification of Wetlands and Deepwater Habitats of the United States.* (Cowardin *et al.*, December 1979)

ii. Temporary impacts within the construction right-of-way. Vantage would implement additional measures to avoid impacts to wetlands by the temporary right of way by either necking down the right-of-way for a short distance in order to avoid identified wetlands, or by relocating the construction right-of-way to the opposite side of the permanent right-of-way in order to fully avoid temporary impacts.

Wetland Type Conversion

While the 30-foot permanent right-of-way would be maintained free of trees and shrubs, no wetlands dominated by shrubs or trees (PSS / Type 6 and PFO / Type 7, respectively) were observed within the permanent or construction right-of-ways. Tree and shrub removal is not considered to constitute a wetland loss, but does result in permanent wetland type conversion. The clearing of any tree and/or shrub vegetation is considered a secondary wetland impact and would be regulated by the U.S. Army Corps of Engineers. No clearing of this type of vegetation would be necessary, and no permanent wetland type conversion would occur as a result of the proposed project.

Regulatory Considerations

Wetlands that are abutting, adjacent to, or share a significant nexus with a traditional navigable water or a relatively permanent water are considered waters of the United States and are regulated under Section 404 of the Clean Water Act. Isolated wetlands, such as many of the prairie potholes identified within the project area, are not considered to be waters of the United States, and therefore, are not subject to federal jurisdiction. The U.S. Army Corps of Engineers would establish its jurisdiction on wetlands proposed to be impacted through a formal jurisdictional determination process prior to construction.

Mitigation Summary

All wetland impacts caused by construction/operation of the Vantage Pipeline would be temporary. Vantage would consider various mitigation measures identified in the EPP to reduce any temporary wetland impacts. No additional mitigation measures are necessary/proposed.

4.1.18 WILDLIFE AND FISHERIES

Alternative I – No Action

Under the No Action alternative, the Vantage Pipeline would not be built and no project-related impacts to wildlife and fisheries would occur.

Alternative II – Proposed Action

Construction and operation of the project is not expected to have a significant impact on wildlife. Construction and operation of the project would not significantly alter the character of the landscape along the pipeline route since the majority of the area disturbed during construction would be restored to replace the habitat that existed prior to construction.

Permanent Impacts to Terrestrial and/or Aquatic Wildlife

Permanent facilities during operations would consist of eight block valve locations. The fenced area for all eight of the block valve locations would have an area of approximately 0.36 acres. Fences built around these sites would be designed to be wildlife-friendly to the standards prescribed by the North Dakota Game and Fish Department. A permanent access road would be constructed to each location. The roads would be graveled, would be approximately 12 feet wide, and would follow the permanent right-of-way. Construction of the permanent facilities would result in a total loss of habitat of approximately 0.58 acres, representing approximately 0.1 percent of the total area affected during pipeline construction. Due to the small disturbed area, permanent impacts to terrestrial wildlife are not expected to be significant. No permanent impacts to aquatic wildlife are anticipated.

Temporary Impacts to Terrestrial Wildlife

Temporary impacts to wildlife and wildlife habitat would occur during construction of the Vantage Pipeline due to clearing of vegetation, disturbance of soils in the right-of-way, and human presence during construction. Clearing the right-of-way would remove vegetative cover and would cause temporary displacement of wildlife species, including upland game birds and several species of passerine birds, along the pipeline route. This would have the greatest impact in the area not managed as cultivated cropland, which would include a total area of approximately 291.06 acres. Vantage would survey the right-of-way in these areas prior to construction to determine if ground nesting species are present. In order to mitigate or minimize impacts to species that may utilize habitat in the right-of-way for nesting, Vantage would consider mitigation measures identified in the EPP that would reduce impacts to species utilizing upland areas for nesting. Measures that would be taken for Threatened and Endangered, Candidate species, sensitive species, species under the provisions of the Bald Eagle Act and Migratory Bird Treaty Act are discussed in section 4.1.12.2.

Sharp-tailed grouse leks identified within 0.25 mile of the pipeline route would be avoided during the nesting/breeding season (March 1 to May 15) in order to mitigate potential impacts. Construction activities should not occur until 2 hours after official sunrise in order to avoid birds remaining on the lek. If construction occurs within 0.25 mile of the lek locations identified on Figure 3.19-1, the hours when construction occurs would be limited.

The construction right-of-way and extra workspaces would remain relatively clear of vegetation until reclamation efforts are completed or cropland is placed back into production. Impacts to upland game birds and several species of passerine birds are not expected to be significant since their habitat consists of introduced plants which can be reclaimed. Some smaller, less mobile wildlife such as amphibians,

reptiles, and small mammals may experience direct mortality during clearing and grading activities. Larger, more mobile animals would disperse from the project area after construction activities began. Displaced species should relocate into adjacent, undisturbed areas, and re-occupy formerly occupied habitats after construction has been completed and habitat is restored. The amount of construction-related disturbances would depend on the particular species and the time of year construction occurs.

Construction right-of-way and extra workspaces would be seeded with herbaceous species and allowed to revegetate. Any trees or shrubs removed during construction would be replaced in accordance with NDGF's requirements.

Temporary Impacts to Aquatic Wildlife

The proposed pipeline route would not cross perennial streams. Numerous intermittent streams and cultivated drainages occur along the pipeline route (see Section 3.17). Most of these drainages would convey runoff during snowmelt or storm events and could impact downstream aquatic habitat with sediment originating from construction activities. Several of the drainages flow into lakes, including Cottonwood Lake and Big Meadow Lake. Vantage would employ Best Management Practices from the EPP to reduce potential sediment discharge and related impacts to these water bodies.

Sediment loads would be temporarily increased in drainages downstream of the right-of-way at drainage crossings. These increased loads may temporarily affect the more sensitive fish eggs, fish fry, and invertebrates inhabiting the downstream area. Drainage crossings would be completed as quickly as possible and stabilized in accordance with the EPP to control erosion and sediment discharge.

Mitigation Summary

- Vantage would survey areas within the proposed pipeline right-of-way not identified as cultivated cropland prior to construction to determine if ground nesting species are present.
- Vantage would employ measures to minimize impacts through operational timing and consider mitigation measures identified in the EPP that would reduce impacts to species utilizing upland areas for nesting.
- Construction right-of-way and extra workspaces would be seeded with desired herbaceous species, occupying each site prior to disturbance, and using the re-establishment methods prescribed by local Natural Resource Conservation Service.
- Any trees or shrubs removed during construction would be replaced in accordance with North Dakota Game and Fish Departments requirements.
- Vantage would employ Best Management Practices from the EPP to reduce potential sediment discharge and related impacts to these water bodies.
- Waterbody crossings would be completed as quickly as possible and stabilized in accordance with the EPP to control erosion and sediment discharge.
- The eight block valve inspection locations would be fenced, according to wildlife-friendly fencing standards prescribed by the NDGF.
- A detailed plan for monitoring would be submitted to the USFWS, Ecological Services office in Bismarck, North Dakota and the NDGF for comment prior to construction.

5. CUMULATIVE IMPACTS

5.1 INTRODUCTION

The cumulative impacts assessment for the Vantage Pipeline focuses on potential changes to the environment and socio-economic conditions caused by the Project, in combination with other projects or activities in the past, present and/or reasonably foreseeable future. This assessment examines a larger geographic study area and a longer time frame than the environmental effects assessment, and includes the assessment of effects from adjacent and unrelated activities.

Indirect effects are defined as effects “caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems” (40 C.F.R. § 1508.8).

Cumulative impacts are “... [t]he impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 C.F.R. § 1508.7). Cumulative impacts consider not only the localized effect of the construction and operation of the proposed Vantage Pipeline, but also past actions.

Cumulative environmental and socio-economic effects were assessed if all three of the following conditions were met:

- the Project results in a residual environmental or socio-economic effect on a component of the biophysical or human environment that can be measured, or can be expected to occur;
- the Project’s residual environmental or socio-economic effect on that component does, or is likely to, act in a cumulative fashion with the effects of other past or future projects and activities that are likely to occur; and
- the Project’s contribution to cumulative effects can be reasonably expected to affect the viability or sustainability of the resource or a value such as a regulatory ‘threshold’ or standard

5.1.1 North Dakota Oil and Natural Gas Production

The state of North Dakota is currently the fourth largest producer of oil in the United States. Current oil production is just over 342,000 barrels per day. Studies conducted by the North Dakota Department of Natural Resources in 2008 and 2010 indicate 4.0 – 6.3 billion barrels of recoverable reserves in North Dakota’s Bakken and Three Forks formations. This reserve base would drive at least an additional 10 to 20 years of intense drilling and development, followed by several more years of petroleum production. The North Dakota Department of Mineral Resources periodically updates a comprehensive oil production forecast. The most recent forecast indicates that oil production may reach 450,000 to 700,000 barrels per day of oil. As a result of the existing and forecast oil production from the Williston Basin a number of energy infrastructure projects have been and/or are in development.

Construction and/or operation of the Vantage Pipeline is not expected to increase and/or drive additional oil or natural gas development or production in North Dakota since North Dakota oil and natural gas resources would be developed regardless of whether or not the Vantage Pipeline were constructed. Any

impact to oil and gas development would be limited in scope since the majority of the current oil and gas development is in the southern half of Williams County, as well as Mckenzie, Mountrail, Dunn and Billings Counties, not in the vicinity of the Vantage Pipeline. The Vantage Pipeline may, however, cause extraction of ethane from produced natural gas to increase since access to a market for ethane is not currently available to North Dakota producers.

5.1.2 Ethane Production in Canada

In addition to examining the incremental emissions from the ethane supply source, Vantage examined the incremental emissions that would be generated when ethane transported by the Vantage Pipeline is consumed in Canada. The ethane would be fed to the Joffre plant near Red Deer, Alberta, Canada which is owned by Nova Chemical Corporation. At this location the ethane would be further processed and further upgraded into marketable products. For this assessment, Vantage assumed an additional 40,000 barrels per day of ethane would be transported by the Vantage Pipeline from the North Dakota area to the petrochemical plant near Red Deer, AB. The annual incremental GHG emissions generated from processing/upgrading an incremental 40,000 barrels per day of ethane is approximately 500,000 tons per year as compared to the total GHG emissions in Alberta in 2008 of 244,323,000 tons (from Environment Canada National Inventory Report). The incremental emissions from an additional 40,000 barrels per day would increase the total GHG emissions in Alberta by only 0.2 percent, and therefore, are not significant.

5.1.3 New Oil and/or Gas Plants and Expansions within North Dakota

Several new gas plants or gas plant expansions have been announced to occur within North Dakota. The largest expansion is the HESS plant near Tioga, ND. On April 13, 2010 Hess Corporation (Hess) filed a letter of intent with the North Dakota Public Service Commission to expand the Tioga Plant. The Tioga Plant is currently the largest and oldest natural gas processing plant in the state of North Dakota. The expansion would more than double the current capacity of the Tioga Plant to exceed 250 million cubic feet per day (mmcf) of natural gas. In addition to the plant expansion, Hess plans to construct a 120,000 barrel per day oil and natural gas liquid rail loading terminal. Construction on both the plant expansion and rail loading terminal have commenced in 2010 and are expected to be in service by the end of 2012. The capital cost of the facility is estimated to be \$325 million. In addition to the gas plant, gas gathering and railcar terminal expansion, Hess has announced production expenditures of approximately \$3.1 billion would be spent in the Bakken oil shale where Hess plans to operate 15 rigs.

The cumulative impact of the Vantage Pipeline construction coinciding with Hess plant construction would be a short-term impact. The Vantage Pipeline construction crew would install approximately 2-3 miles of pipe per day; therefore, for a 3-4 day period the Vantage Pipeline crew would be working close to the Hess plant. During this short period of time there would be a slight increase in traffic, noise, air emissions, and dust emissions due to the Vantage Pipeline construction occurring at the same time as the Hess Tioga plant construction. The Hess Tioga plant construction, however, would be almost complete when the Vantage Pipeline construction is occurring; therefore, the construction work force at the Hess Tioga plant would be significantly reduced from the peak work force at the Hess Tioga plant.

Other gas plant applications approved or pending before the PSC include:

ONEOK Stateline Plant: ONEOK has announced a new gas processing plant called the Stateline Gas Plant. It is located approximately 16 miles northwest of Williston in Williams County and is approximately 35 miles southwest of the south end of the Vantage Pipeline. The Stateline gas plant would be designed to 100 mmcf of natural gas and is expected to cost \$142 million. The construction is expected to commence in 2011 and be complete by mid 2012.

ONEOK Garden Creek Plant: ONEOK Garden Creek plant is designed to process 100 mmcf of natural gas. The Garden Creek plant is located approximately 42 miles southwest of the south end of the Vantage Pipeline in McKenzie county. The Garden Creek plant is expected to cost \$150 – 210 million and is expected to be complete in late 2011.

Hiland Partners Watford City Plant: Hiland has begun construction of a new 50 mmcf gas processing plant approximately 10 miles northwest of Cartwright, ND in McKenzie county. The Watford City gas plant is located approximately 55 miles southwest of the south end of the Vantage Pipeline. The Watford City Plant and gathering system is expected to cost \$150 – 200 million and is expected to be in operation by mid-2011.

Cumulative impacts caused by construction of the above projects are expected to be insignificant since many of the projects would be fully constructed prior to scheduled construction of the Vantage Pipeline and are not, except for the Hess Plant, geographically proximate to the Vantage Pipeline. Cumulative impacts caused by the overlapping construction of the planned expansions/plants, if any, are addressed in Sections 5.2-5.7 below.

Cumulative impacts caused by operation of the planned plants/expansions are also expected to be insignificant. In order for any gas plant to produce ethane of a sufficient quality to be transported by the Vantage Pipeline, additional processing equipment would need to be added to the plants' designs and operations. This additional processing equipment would likely result in additional air emissions, but the resulting emissions would be small in comparison to the total emissions in North Dakota. For instance, the Hess Plant is the origin of the Vantage Pipeline and where the Vantage Pipeline would initially obtain ethane feedstock to transport to Canada. An accounting of the emissions relating to the supply of the ethane to the pipeline is typically left to ethane suppliers. Vantage, however, completed an analysis of the incremental emissions generated by the supply source (Hess gas processing plant) to upgrade the ethane in the natural gas stream into specification ethane that would be delivered to the Vantage Pipeline. The incremental emissions are generated by burning of additional natural gas in a heater. The heater is required to provide heat to the gas plant process to upgrade the ethane into specification ethane. The incremental emissions are shown in Table 5.1-1 below.

Table 5.1-1. Incremental Emissions from Supply Source

SUPPLY SOURCE	CO (tons/yr)	NO _x (tons/yr)	CH ₄ (tons/yr)	N ₂ O (tons/yr)	CO ₂ (tons/yr)	CO _{2e} (tons/yr)
Heater	20.45	34.09	0.56	0.16	29,220	29,280

Note: Heater emission factors from American Petroleum Institute AP-42.

The total incremental emissions of CO_{2e} is 0.055 percent of the total emissions emitted in North Dakota in 2007 (53,975,960 tons). The impact on air quality from the incremental emissions produced as a result of producing ethane at the Hess Tioga plant is minimal.

A comparison of the incremental GHG emissions from the supply source as compared to the total GHG emissions from the state of North Dakota in 2007 is shown in Table 5.1-2.

Table 5.1-2. GHG Emissions from Pipeline Operation Compared to ND GHG Emissions

EMISSION SOURCES	VANTAGE GHG EMISSIONS (tons)	% OF TOTAL GHG EMISSIONS IN NORTH DAKOTA
Vantage Pipeline Construction GHG emissions	2,006	0.004%



Vantage Pipeline Operations Annual GHG emissions	39	Less than 0.001%
Supply Source Annual GHG emissions	29,280	0.054%
Total GHG emissions from North Dakota in 2007	53,975,960	

Notes:

1. Total GHG emissions from North Dakota in 2007 sourced from Table 7.4 located in Climate Change Supplementary Information Report Montana, North Dakota and South Dakota Bureau of Land Management.

The Vantage Pipeline would have additional capacity to enable transport of ethane produced from other North Dakota-area natural gas producers and it is therefore possible that the Vantage Pipeline could eventually connect to other natural gas plants in order to transport their ethane to Canada; however, no such agreements with producers have been entered into, and thus, any discussion on future expansion of the Vantage Pipeline to connect to these facilities is purely speculative.

5.1.4 New Oil and/or Gas Pipelines within North Dakota

All current and proposed pipeline development are predominately in the south half of Williams County, whereas the Vantage Pipeline is in the north half of Williams County and through Divide County. The one pipeline development that affects the northwest portion of Williams County is the proposed Plains Bakken North Pipeline (oil) project. The south end of this pipeline project is approximately 40 miles southwest of the south end of the Vantage Pipeline project and as the Plains Bakken North Pipeline route extends north the distance between the Vantage Pipeline and the Plains pipeline narrows to approximately 8 miles before the Plains pipeline extends west in to Montana. The Plains pipeline is expected to be constructed in 2012 which is the same timeframe for construction as the Vantage Pipeline.

Other pipeline applications pending before the NDPA include:

- **Enbridge Portal Reversal (Phase 7 Expansion):** The US portion of the project is estimated to be \$180 million US and includes 45 miles of 12 or 16 inch pipe and 45 miles of 8 or 10 inch pipe, 2 new truck facilities and storage tanks and two new pump stations. The majority of the new pipeline construction is in Williams and Mountrail counties. The closest distance between the Vantage Pipeline and the new Enbridge pipeline is approximately 7 miles. Construction of the new Enbridge pipeline is expected to be in 2011.
- **Bridger Pipeline Four Bears Pipeline Expansion:** Addition of 77 miles of 12 inch pipe estimated to cost \$29 million US. The pipeline is located primarily in McKenzie and Billings counties. The closest distance between the Vantage Pipeline and the proposed Four Bears pipeline expansion is approximately 30 miles. Construction is scheduled for 2011.
- **Proposed Quintanna Bakken Link Pipeline:** 304 miles of 10 to 16 inch pipe at an estimated cost of \$650 million. The pipeline starts in the south portion of Williams county and extends southward, traversing McKenzie, Billings, Wibaux and Fallon counties. The closest distance between the Vantage Pipeline and the proposed Four Bears pipeline expansion is approximately 36 miles. Construction is scheduled for 2013.
- **Proposed Plains Bakken North Pipeline:** 103 miles of 12 inch pipeline at an estimated cost of \$160 – 200 million. The pipeline starts at Trenton in Williams county and extends northwest into Montana. The closest distance between Vantage and the proposed Bakken North Pipeline is approximately 8 miles. Construction is proposed for late 2012.
- **Proposed Rangeland Energy’s COLT Hub:** 20 miles of 8 inch pipeline starting at Epping and terminating at Beaver Lodge which is located in the south half of Williams County. The closest

distance between Vantage and the proposed Rangeland Energy's pipeline is approximately 8 miles. Construction is proposed for 2011.

The above-listed projects have formally been registered with the North Dakota Public Service Commission; however, it is unknown whether any will proceed.

Since the Vantage Pipeline is independent of the other planned pipeline projects, it is not a connected action. Cumulative impacts caused by these pipeline projects, if any, are addressed in Sections 5.2-5.7 below.

5.2 SOIL

The soils resource APE for the Proposed Action is the disturbance area required for construction. This area includes the areas of the temporary and permanent right-of-way.

Soils along approximately 80 percent of the pipeline alignment have previously and are currently being impacted by agricultural activities. The majority of the land area impacted during construction of the Proposed Action would be reclaimed as grassland, pasture, or returned to agricultural production. Therefore, impacts due to construction are considered short-term. Ongoing development of oil wells, access roads, and pipelines in the area would act cumulatively with effects from the Proposed Action. The long-term area impacted by the Proposed Action would be much less than the area impacted by a single oil well and access road. The greatest long-term impact to soils in the APE would occur where construction activities during oil well drill and development impact soils during the production life for each well. Soils in these areas would be removed from agricultural production, would be subject to erosion, would become compacted, and could be potentially contaminated by hydrocarbons. These activities in Divide and Williams Counties (particularly construction of well pads and access roads) would result in a net loss in terms of both time and space. Therefore, such impacts are considered to have the potential to cause residual effects. With the implementation of BMPs, guidelines and mitigative measures impacts on soil capability caused by the Proposed Action are not probable, and thus, not significant. Further, cumulative impacts caused by the construction/expansion of natural gas plants and/or pipelines would also be negligible since the impacted area is small relative to the large areas utilized for agricultural activities.

5.3 SURFACE WATER QUANTITY AND QUALITY

The Proposed Action may act cumulatively with past and present activities including agriculture/livestock grazing (riparian and streambank degradation, erosion and sedimentation), oil and gas (trenching streambanks causing erosion, sedimentation bank instability, stream widening; channel migration; and riparian degradation), and transportation/utility corridors (sedimentation and erosion from surface runoff, problem culverts and vehicle crossings; bank instability; and riparian degradation) to impact water quantity and quality.

The Proposed Action would act cumulatively with other proposed pipeline construction projects and well development activities in Williams and Divide Counties where an incremental change in localized natural flow patterns and change of surface water quality may occur. These residual effects include potential alteration of natural flow patterns and increase in suspended solids during isolated crossings.

In general, no additional mitigation pertaining to surface water quantity and quality would be warranted given the proposed mitigation outlined in the EPP. With the implementation of mitigation measures, it is anticipated that the cumulative residual effects of the Proposed Action on water quantity and quality

would be reversible in the immediate to short-term and of low magnitude. There are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude that cannot be technically or economically compensated. Consequently, the cumulative residual effects of the construction and/or operation of the Vantage Pipeline on water quality and quantity would be not significant.

5.4 WETLANDS

In general, the potential residual effects of pipeline construction and operation on local wetlands are expected to be localized, short-term, and reversible in nature. The 201 potentially traversed wetlands identified during the 2010/2011 field season have already been directly impacted by agriculture (margins tilled, vegetation cut for hay, etc.), and approximately 5 percent of the potentially traversed wetlands are within areas already impacted by construction, drilling, and production activities related to oil well development, primarily in Williams County. Potential impacts to wetlands as a result of construction activities associated with the Proposed Action would therefore overlap with effects from other activities in Divide and Williams Counties (particularly agriculture, well pad construction and drilling, pipelines, and roads) in terms of both time and space. This would result in the temporary, localized increase of certain effects such as sedimentation, disruption to local wildlife and vegetation, and alteration of surface drainage patterns.

By adhering to established and successful mitigation practices and reclamation methods, and following a proactive post-construction monitoring program, it is believed that there would be no long-term or permanent cumulative impacts to local wetlands as a result of the Proposed Action or other projects. Any potential cumulative impacts are expected to be equally localized, short-lived, and reversible.

5.5 FISH AND FISH HABITAT

The project may act cumulatively with past and present activities including agriculture/livestock grazing (riparian and streambank degradation, erosion and sedimentation), oil and gas (trenching streambanks causing erosion, sedimentation bank instability, stream widening; channel migration; and riparian degradation), and transportation/utility corridors (sedimentation and erosion from surface runoff, problem culverts and vehicle crossings; bank instability; and riparian degradation) to impact fish and fish habitat. Future construction related to drilling and production activities during oil well development would act cumulatively with impacts from the Proposed Action and past activities.

The watercourses traversed by the Proposed Action consist of intermittent drainages and washes that are predominately dry and not fish-bearing. The Proposed Action could potentially impact downstream fish and fish habitat through increased suspended sediment concentrations. The mitigation measures proposed to control erosion and sediment discharge are effective methods to minimize potential long-term impact to fish and fish habitat.

Most residual effects on instream and riparian habitat caused by the construction of the Proposed Action would be alleviated through mitigation and revegetation, and would not contribute in any substantive long-term way with similar impacts associated with past or future activities. Therefore, the cumulative residual effect of pipeline construction on fish and fish habitat is considered to be short-term and reversible and of low magnitude.

5.6 VEGETATION

Future construction related to drilling and production activities during oil well development would act cumulatively with impacts from the Proposed Action and past activities in areas where construction occurs within areas consisting of native grassland or pasture. Long term impacts would occur in locations where well pad and roads are constructed in vegetated areas. The potential residual effects from construction of the Proposed Action are expected to be localized, short-term, and reversible in nature. Approximately 80 percent of the lands traversed along the proposed pipeline route are used for agricultural purposes including the production of cultivated crops, pasture land, and hay production. The remaining 20 percent includes native grasslands and less than one percent wetlands. A small area of 0.58 acres would be required for permanent facilities for pipeline operation. Grasslands disturbed during construction would be reclaimed with native species and minimal long-term disturbances would be anticipated. Agricultural lands would be returned to production in the growing season following construction. Introduction of invasive species along the pipeline route and its vicinity would be a cumulative impact with agricultural activities and future development of oil and gas. Construction-related disturbances would promote the spread of invasive weed species from disturbed croplands and their weedy fringes onto native prairie sites.

The ongoing development of oil and gas in portions of the region may result in the further impacts to agricultural and native grasslands in the area. The new well sites and related facilities may further fragment native prairie features.

Given the small width of the right-of-way, trench line, and project service area, and the successful application of the recommended mitigation options for the construction and post-construction phases of the project, it is anticipated that the impacts on the regionally representative vegetation would be minimal.

5.7 WILDLIFE AND WILDLIFE HABITAT

Cumulative impacts to wildlife and wildlife habitat would result during development of oil wells in Divide and Williams Counties. Construction and oil production activities would increase traffic and human encounters with wildlife. Habitat would be impacted by land requirements to construct well pads, access roads and pipelines.

The potential residual effects associated with the construction of the Proposed Action and infrastructure on wildlife and wildlife habitat include:

- Temporary alteration and human disturbance of native prairie, as well as wetland habitats;
- Temporary loss of habitat connectivity;
- Disturbance of wildlife, including displacement away from the pipeline during both sensitive and non-critical periods; and
- Potential for wildlife mortality due to: wildlife-traffic collisions during construction and commute; destruction of undiscovered nests, dens, hibernacula, or other habitats on the right-of-way, and animals caught in the pipeline trench during construction activities.

In general, the potential residual effects of pipeline construction and operation on wildlife and wildlife habitat are expected to be localized, short-term, low to moderate in impact and reversible. There are no cases where a permanent or long-term effect of significant or measurable impact at the population level of a species is predicted. With employment of measures to minimize and mitigate impacts, the potential environmental effects of wildlife habitat alteration, wildlife disturbance and mortality are predicted not to be significant.

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6. TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCY DISCUSSIONS

The DOS is responsible for consultation with Tribes; please refer to section 1.6



7. LIST OF PREPARERS

Table 7-1 identifies the third-party consultant interdisciplinary team principally involved with preparing this EA.

Table 7-1. Consultant Interdisciplinary Team		
NAME	AFFILIATION	RESPONSIBILITY
Gary Holsan	Gary Holsan Environmental Planning	Interdisciplinary Team Leader, Project Manager
George Blankenship	Blankenship Consulting, LLC	Socioeconomics, Environmental Justice
David Cameron	KC Harvey	Land Use, Noise, Noxious Weeds, Soils, Vegetation, Wetlands
Susan Connell	Carter Lake Consulting	Climate and Air Quality
Lloyd Levy	Lloyd Levy Consulting	Recreation, Visual Resources
Brad Kovach	KC Harvey	Wildlife and T&E Species
Lynelle Peterson	Ethnoscience	Cultural Resources
Gus Winterfeld	Erathem-Vanir Geological Consultants	Geology, Minerals, Paleontology

8. REFERENCES

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APPENDIX A TO ENVIRONMENTAL REPORT

ENVIRONMENTAL PROTECTION PLAN FOR THE PROPOSED VANTAGE PIPELINE PROJECT

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ATTACHMENTS

Attachment 1 EPP Typical Details

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1 INTRODUCTION

This Pipeline Environmental Protection Plan (EPP) describes environmental measures to be used during construction of the Vantage Pipeline in order to minimize potential construction related impacts. The EPP contains environmental best management practices (BMPs) to be implemented by the pipeline contractor(s).

Construction of the Vantage Pipeline is scheduled to take place in the third and fourth quarter of 2012. Clean-up and reclamation of disturbed portions of the right-of-way (ROW) will be conducted immediately following construction or as soon as soil and weather conditions permit.

This EPP will be included in the contract documents. Selected Contractors and Vantage Pipeline Representatives will be provided with copies of the approved EPP, including the most recent updates and revisions. Unless otherwise specified, the primary construction contractor (Contractor) will be responsible for implementing the requirements of the EPP. All contractors and subcontractors engaged in the construction are expected to follow the EPP requirements. Vantage representatives will provide pipeline construction oversight.

The following sections of the EPP include: pre-construction activities; construction activities; clean-up and reclamation; post construction monitoring; emergency and project contacts; and contingency plans.

2 PRECONSTRUCTION ACTIVITIES

2.1 Permitting

Required licenses and permits shall be obtained prior to construction. The North Dakota Public Service Commission is responsible for siting facilities such as power plants and transmission lines and enforcement of safety requirements for intrastate distribution and transmission of natural gas.

2.2 Pre-Construction Meeting

This meeting will provide supervisory personnel with an overview of the key environmental issues, contingency planning, and rules and regulations applicable to the Vantage Pipeline construction. In addition, periodic meetings will be conducted with agency representatives to communicate permit related activities.

Vantage personnel and Contractor support staff will possess a thorough understanding of pipeline planning, construction methods, and their potential environmental impacts, including the timely implementation of the EPP during all critical phases (topsoil stripping and replacement, grading, soils handling, watercourse and wetland crossings, reclamation, and clean-up). Field support staff, including, but not limited to biologists, wetland specialists, soil scientists, reclamation scientists, and cultural resource specialists will be available for consultation throughout the project.

2.3 Line List

Vantage will provide the contractor with a construction Line List that describes special requirements (*e.g.*, soil salvage, seeding, road crossings, restoration measures, fencing requirements, etc.) as determined from

the alignment location and design, in addition to any permit requirements and Landowners stipulations. The contractor must comply with these special requirements, or take all appropriate precautions to protect livestock and crops affected by construction. The Line List reflects requirements and comments provided by Landowners; however, it is not a comprehensive list of construction requirements. The Line List must be considered in conjunction with other project documents. The contractor shall not make any agreements between the contractor and the landowner without approval from Vantage.

2.4 Pre-construction Weed Control

A pre-construction weed species survey will be conducted on all lands along the pipeline route. All construction equipment shall arrive and leave the pipeline construction area in a weed free condition to minimize the risk of weed introduction. Recommendations made in the pre-construction weed survey shall be followed to limit the risk of transporting weed seeds from weed infested areas. In addition, local county officials will be contacted to obtain information about weed control and issues.

Weed growth on soil stockpiles will be monitored during construction activities. In addition, spot spraying of herbicides or weed mowing may be considered, if warranted.

2.5 Construction Stipulations

Stipulations (STIPs) constitute restrictions or a restricted activity period for construction activities. For example, a stipulation might require construction activities to stop during a specific time of year due to bird nesting. STIPs will be identified prior to initiating construction activities. All construction activities and schedules must comply with stipulations. Stipulations related to wildlife and threatened and endangered species are presented in Section 8.9.

2.6 Conditions Requiring Contingency Planning

Various conditions that would require implementation of environmental protection during construction would be mitigated using the contingency plans explained in Section 8 below. The conditions that may require the implementation of contingency plans are described in sections 2.6.1-2.6.12 below. All key personnel on the construction ROW should have an understanding of the conditions outlined below that would require contingency plan implementation, as well as any associated monitoring and reporting requirements.

2.6.1 Wet Weather

In order to minimize terrain disturbance, compaction, soil structure damage, and erosion and sediment discharge, construction activities will be suspended or modified in the event of excessively wet soil conditions. Contingency measures will be initiated if the following indicators occur: excessive rutting, wheel slip, build-up of mud on tires and cleats, and excessive tracking of mud down the road as vehicles leave the construction area. The wet weather shut-down decision will be made by Vantage as specified in the Soil Conditions Contingency Plan (Section 8.3).

2.6.2 Water Withdrawal and Dewatering

If required, the North Dakota Department of Health (NDDH) would be contacted regarding allocations for temporary water usage for the purpose of hydrostatic pressure testing. If temporary water use permits are needed, the contractor would be required to comply with all permit requirements.

A temporary discharge permit for construction dewatering (NDDH) would be required for trench dewatering. The contractor would be required to comply with the permit limits, and monitoring and report requirements.

2.6.3 Spill Prevention

The U.S. Environmental Protection Agency (EPA) Oil Pollution Prevention regulation (40 CFR part 112), which includes requirements for specific facilities to prepare, amend, and implement Spill Prevention, Control, and Countermeasure (SPCC) Plans is applicable to the construction of the Vantage pipeline. The SPCC rules are applicable to any owner or operators of non-transportation-related facilities that: Drill, produce, store, process, refine, transfer, distribute, use, or consume oil or oil products, and could reasonably be expected to discharge oil into U.S. navigable waters or adjoining shorelines. Facilities are subject to the SPCC rule if they meet at least one of the following capacity thresholds: aboveground oil storage capacity greater than 1,320 gallons, or completely buried oil storage capacity greater than 42,000 gallons. The following are exempt from the rule: completely buried storage tanks subject to all the technical requirements of the underground storage tank regulations, containers with a storage capacity less than 55 gallons and motive power containers. Further, mobile fuelers used during construction are exempt from sized secondary containment requirements, although general secondary containment requirements apply.

The details for the contractor specific SPCC plan and compliance with the SPCC rules would be developed for the specific storage requirements, equipment, activities and other factors that are controlled by the contractor. Therefore, the SPCC Plan will be prepared by the contractor so contractor specific factors can be incorporated in the plan. The contractor's SPCC plan will be presented as Attachment 5 to this EPP.

The Contractor(s) shall ensure that during the course of the project, no release of hazardous substances including fuel, lubricating and hydraulic fluids, methanol, antifreeze, herbicides, or other chemicals are occur on the ground or into any watercourse. In the event of a spill of any quantity, a spill report and spill cleanup will be implemented immediately as described in the spill contingency plan guidelines (Section 8.1). The SPCC plan for construction shall be prepared and administered by the primary construction contractor and should be developed to address the site specific conditions related to the contractors equipment, fueling, maintenance and fuel storage requirements. The North Dakota Department of Health (NDDH) has jurisdiction over spill reporting. The NDDH requires reporting in the event of a reportable spill. The required form is available at the following link: <http://www.ndhealth.gov/ehs/eir/NonOilfield/>.

2.6.4 Equipment Refueling and Servicing

Spills resulting from equipment fueling and maintenance activities may result in discharge to surface and groundwater, and impacts to soils. Vantage would implement BMPs included in the SPCC Plan and the Storm Water Pollution Prevention (SWPP) Plan to mitigate potential impacts. Secondary containment would be placed beneath servicing and refueling equipment with the potential for accidental spills (e.g., oil changes, servicing of hydraulic systems, temporary tanks). Refueling, oil changes, and lubricating of mobile construction equipment would be conducted a minimum of 100 yards away from waterbodies or watercourses to minimize the potential for impacts. Refueling would be conducted on road sides rather than on agricultural land, if feasible.

Waste oil, lubricants, and filters will be collected in labeled drums and recycled or disposed of at an approved location. Contractors will be trained on the requirements of the SPCC Plan (Attachment 5) and the Emergency Response Plan (Attachment 3). Contingency measures will include spill response and reporting, spill sorbent material, and recommended spill cleanup materials for construction activity in accordance with the Fuels and Hazardous Materials Spill Contingency Plan (Attachment 4).

The following measures will be employed to minimize the risk of fuel spills in water, where stationary equipment is required to operate within 100 yards of a sensitive area (e.g., wetland).

- all containers, valves, hoses, nozzles, and lubrication systems are leak free;
- all fuel nozzles are equipped with automatic shut-offs;
- no equipment washing will be allowed within 100 yards of water courses or water bodies;
- operators will be present during fueling operations within visibility of both ends; and
- fuel remaining in the hose is returned to the storage tank.

2.6.5 Noise

Equipment will be in good working condition to minimize unnecessary noise (*i.e.*, mufflers). Pipeline construction activities performed near populated areas or rural residences will be conducted during daylight hours.

2.6.6 Wildlife Stipulations

During pipeline construction, all actions must comply with the Endangered Species Act, which includes coordination with the USFWS and prevention of actions that may affect a threatened or endangered species. Additionally, all actions during pipeline construction must comply with the Bald and Golden Eagle Protection Act, which prohibits anyone without a permit from taking Bald or Golden Eagles, including their parts, nests, or eggs. Likewise, all actions during pipeline construction must also comply with the Migratory Bird Treaty Act, which prohibits the taking, killing, possession, and transportation (among other actions) of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. Stipulations to mitigate potential impacts to the listed threatened and endangered species, critical habitat, Golden and Bald Eagles, and Migratory Birds are presented in the Wildlife Contingency Plan (Section 8.9).

2.6.7 Garbage

All construction garbage and debris will be collected and disposed of on a routine basis (weekly) at an approved facility. Waste containers will accompany each working unit. All construction personnel will follow guidelines established in the contractors Waste Management Plan (Attachment 7).

2.6.8 Construction Roads and Access

Construction activities and traffic will be confined to the ROW areas. All roads damaged by construction vehicles will be repaired to pre-construction conditions. All traffic safety and road closure regulations will be followed in accordance with North Dakota DOT or specific county requirements. Access route with known soils prone to compaction, rutting or other conditions that may be problematic would be identified during the pre-construction meeting.

2.6.9 Erosion and Sedimentation

Soil erosion and sedimentation will be controlled by implementing stormwater best management practices designated in the Stormwater Pollution Prevention Plan (SWPP Plan, Attachment 6). Vantage will obtain a Construction Stormwater Permit from the North Dakota Health Department prior to the commencement

of construction. The SWPP Plan will be prepared at that time in accordance with requirement of the NDHD. The construction contractor will be responsible for implementing and monitoring the SWPP Plan and construction related BMPs during construction and post-construction.

2.6.10 Wildlife and Livestock Encounters

Construction personnel are not allowed to have dogs on the construction ROW. Any incidents with or collisions with wildlife will be reported to the appropriate agency. Vantage and contractors personnel are not allowed to possess firearms or to hunt while engaged in construction activities.

2.6.11 Fires

Construction personnel will be made aware of proper disposal methods for ignition sources including welding rods, cigarette butts, and other flammable materials. Smoking will be permitted in specified smoking areas only. Vehicles will be in good working condition to prevent fuel leaks or other conditions that may result in fire. Precautions will be made for vehicles parked on stubble or tall grass. A water truck will be maintained on the ROW when the fire hazard is high. Mowing may be required in certain situations to alleviate fire risks. Construction crews will be equipped with fire-fighting equipment and extinguishers capable of controlling wildland fire that may occur as a result of their activities. Contact information for fire departments will be reviewed during the Pre-Construction meeting.

2.6.12 Cultural Resources

Cultural sites discovered during construction will cause pipeline construction in the proximity of the cultural site to be suspended immediately. Work in these locations would be discontinued until permission is granted by the appropriate agency as defined in the Cultural Resources Contingency Plan (Section 8.10).

2.7 Notification of Concerned Parties

2.7.1 Regulatory Agencies:

Notification of appropriate regulatory agencies will be conducted prior to construction. Coordination with key agency contacts will be maintained until project completion. The following agencies and companies would be periodically contacted during the construction project:

- U.S. Army Corp of Engineers
- Divide County
- North Dakota Department of Health, Division of Water Quality
- North Dakota Department of Health, Environmental Health Section
- North Dakota Department of Transportation
- North Dakota Fish and Game
- North Dakota Public Service Commission
- North Dakota State Land Department
- Private Landowners
- Rail Companies
- USDA - Farm Service Agency
- USDA: Natural Resource Conservation Service
- U.S. Fish and Wildlife Service
- Utility companies

- Williams County

Prior to the preconstruction meeting a list of personnel to serve as contacts for each agency or company will be defined.

2.7.2 Landowner Notification

All landowner notifications and coordination will be made by land agents representing Vantage. The land agents will work closely with Vantage and the Contractor to develop a structured approach for landowner notification and coordination. Land agents will be available at all times during construction for landowner coordination. Protocols for landowner coordination will be addressed in the pre-construction meeting.

3 CONSTRUCTION ACTIVITIES

3.1 Miscellaneous

3.1.1 Surveying

Boundaries of the ROW and any identified additional temporary workspace (TWS) would be staked. No additional clearing or grading will be allowed beyond the stakes unless an additional TWS authorization is obtained from the appropriate Vantage Pipeline representative. The ROWs will be staked so that watercourses and roads are crossed according to crossing agreements. Any required runoff controls will be staked to prevent erosion and stormwater problems.

Extra TWS locations will be identified on Alignment Sheets (Attachment 2) with examples including:

- sharp ROW bends, rail crossing, and road crossings;
- locations where additional soil handling and stockpiling may be required; and
- watercourse crossings to ensure sufficient room to permit storage of topsoil and spoil.

3.1.2 Fences

Temporary fencing and gates will be installed where practical or as requested by the landowner/lessees where necessary to maintain livestock containment.

3.1.3 Line Crossings

Topsoil will be salvaged prior to excavating the pipeline trench. Utility lines will be located and “daylighted” if crossings are required. In addition, hydrovac equipment will be available to assist with trenching operations through localized wet areas to minimize rutting.

3.1.4 Soil Salvage for Construction Purposes

Soil will be salvaged to the extent designated on alignment sheets. Soil salvage information is based on soil mapping unit information provided by the USDA, NRCS.

3.1.5 Road and Railroad Crossings

Roads and railroads will be crossed by either open cut or boring methods as indicated on Alignment Sheets (Attachment 2). Borrow ditch ramps and culverts will be installed in specific locations according to approved details (Attachment 1).

3.1.6 Watercourse Vegetation, Trees and Shrubs

Vegetation will be maintained in ecologically sensitive areas (e.g., along a watercourse) unless it is necessary to remove. Trees and vegetation will be removed in a manner to reduce damage to water course banks and beds, and adjacent trees. Shrubs will be salvaged for replanting or replaced within the riparian zone to provide bank stabilization. Grubbing will be restricted to within 10 ft of watercourses bank except along the trench line. Trees and shrubs removed during construction will be replaced in accordance with North Dakota Fish and Game Requirements. Trees damaged during construction activities will be immediately removed.

3.1.7 Hay and Crops

Arrangements will be made for landowner/lessees to harvest hay or cereal grain crops prior to stripping, if possible. Mowing may be performed along the ROW to facilitate topsoil handling.

3.2 Grading and Topsoil Salvage

3.2.1 Grading

Grading operations will be minimized along the pipeline route to reduce the erosion potential and the amount of reclamation required once the pipeline has been installed. Topsoil salvage plans, that detail how soil materials are to be stockpiled, are described on the typical detail, and Alignment Sheets (Appendices 1 and 2).

3.2.2 Roadway Ditch Ramps

When ramp construction is required for crossing roadway ditches or other obstacles, ramp construction will use only subsoil material. Topsoil salvage would be completed prior to placing fill for temporary ramps.

3.2.3 Watercourses and Wetlands

Grading operations will be performed in a manner to minimize sedimentation of watercourses and wetlands. Shrubs will be salvaged or replaced in accordance with agency requirements. Soil salvage in areas traversing watercourses and wetlands would be limited to removal of soil over the trench line only.

3.2.4 Temporary Berms and Silt Fences

Temporary berms and silt fence(s) will be placed near the base of approach slopes to watercourses following soil salvage and grading. Inspections of temporary erosion control structures will be performed on a daily basis and repaired, if warranted, in accordance with the SWPP Plan.

3.3 Cut and Fill

Fill material will not be placed on slopes within 50 ft of the crest of the slopes unless otherwise advised by a geotechnical engineer. Cut and fills slopes will be maintained within the ROW and cut slopes would be constructed in accordance with Occupational Safety and Health Administration (OSHA) standards. Grading will not be permitted in proximity to known archaeological sites. If required, a cultural resource specialist will be available during construction through areas of high archaeological value (see Section 8.10).

3.4 Topsoil Salvage and Storage

Soil salvage requirements are shown on the Alignment Sheets (Appendix 2). Limiting factors to the soil salvage operations include the amount of topsoil, identification of boundary between topsoil and subsoil, watercourse and wetlands areas, and specific request(s) for alternative topsoil handling by landowner or lessee.

3.4.1 Topsoil Salvage Schedule

Weather conditions (e.g., high wind conditions) may require postponement of pipeline trenching and related topsoil salvage to minimize the period that soil is exposed to wind. Vantage Pipeline representatives will determine when it is necessary to stop work due to wind erosion. Soil Erosion Contingency Plan options to mitigate erosion are described in (Section 8.4).

3.4.2 Stripping Depth

Soil salvage of all available topsoil and subsoil material will be implemented in the locations identified on the Alignment Sheet (Attachment 2) and as described on the typical details (Attachment 1). If unexpected soil conditions are encountered, Vantage Pipeline representatives would be consulted for appropriate construction methods.

3.4.3 Topsoil Salvage

Soil salvage for cultivated prime farm land, will include stockpiling of topsoil, subsoil, and spoil material in separate windrows. Prime farmland locations have been identified on the NRCS soil survey data for Williams and Divide Counties. For all other lands (e.g., pasture land, non-prime farmland), soil salvage will be composed of two stockpiled windrows, one for topsoil and the other for subsoil/spoil material (refer to Alignment Sheets).

Various options for soil salvage are presented in the Details in Attachment 1, and include:

- Option 1- Full width stripping (for cultivated lands, or grassland and pasture land)
- Option 2- Full width stripping (for cultivated lands, or grassland and pasture land) same as Option 1 with alternative stockpile locations.
- Option 3- No stripping within the TWS portion of the ROW (pasture or grassland).
- Option 4- Full width stripping with salvage of the A and B soil horizon (Prime Farm Land).
- Option 5- Limited stripping over the trench line (wetland and watercourse crossings and frozen conditions).

Typical details to be used during pipeline construction are provided in Attachment 1, but variations of the above options may be used when the final design is completed and during construction of the pipeline.

3.4.4 Subsoil Beneficial Use and Salvage

Subsoil would be borrowed from larger areas where topsoil is stripped (*i.e.*, crossings, graded areas) for beneficial uses such as ramp or berm construction. In areas designated as prime farmland, A and B soil horizons would be salvaged prior subsoil excavation (refer to Attachments 1 and 2).

3.4.5 Windrow Gaps

Soil salvage windrow gaps will be left in obvious drainage courses and where requested to allow farm machinery, livestock, and wildlife the ability to cross the ROW. Gaps will be provided at crossings where materials are stockpiled in the TWS.

3.5 Trenching and Stringing

3.5.1 Timing

Pipeline construction work is most desirable during dry soil conditions to ensure that there is low enough soil moisture to allow trenching without causing excessive rutting or soil compaction.

3.5.2 Gaps in Set-Up Pipe

Gaps in pipe set-up, spoil piles, and trenching will be made to allow crossing opportunities for livestock, wildlife, and farm equipment within the ROW. Breaks in pipe shall be coincident with gaps in topsoil and spoil windrows. Gaps will also be located at obvious drainages, crossings for livestock, wildlife, and farm equipment.

3.5.3 Trenching

Trenching width will be according to specifications to minimize disturbed soil and windrow requirements. Open ditch length at any one time will be minimized to reduce the risk of trench sloughing and wildlife/livestock accidents. In addition, a 2:1 sloped ramp will be built at the end of the trench each day to allow accidentally trapped wildlife/livestock with an escape route. The trench will be inspected at least twice each day for trapped wildlife/livestock.

3.5.4 Drain Tile

Locations of any drainage tile or culverts will be marked prior to pipeline construction activities to prevent clogging with soil or debris.

3.5.5 Trench Dewatering

Trench dewatering may be required periodically during high rainfall events. Water may be pumped into an approved dewatering structure, or onto a stable and well-vegetated areas at least 100 yards from a watercourse or wetland

3.5.6 Topsoil/Subsoil Separation

Topsoil windrow piles will be kept separate from subsoil and/or spoil piles to prevent mixing.

3.5.7 Unstable Trench Walls

Trenching may result in soil sloughing in certain areas based on soil characteristics. If sloughing is evident, a wider area for soil storage may be necessary to avoid the potential mixing of segregated soils. When unstable trench conditions occur, the time in which the trench is left open should be minimized to reduce the risk of sloughing.

3.6 Backfilling

3.6.1 Install Trench Breakers

Installation of trench breakers (e.g., sack, foam or bentonite) may be warranted on moderate and steep slopes and at the edge of watercourses or wetlands (see details, Attachment 1). Exact location of trench breakers will be determined in the field based on slope length and slope angle.

3.6.1 Watercourses/Wetlands

Where the trench has the potential to impact a wetland or watercourse, trench breakers will be installed to maintain the original hydrology. Care will be taken to ensure that trench crowns or subsidence are not left in these hydrologically sensitive areas

3.6.2 Backfill Trench

Backfilling of the trench will be completed according to project specifications. Mixing of topsoil with spoil is not permitted in any trench backfilling location. Equipment with fine depth control will be used in backfilling operations. In general, the lower lift consists of placement of spoil and subsoil material prior to the placing the upper lift. Compact fill with equipment capable of adequately compacting the trench.

3.6.1 Excess Trench Backfill Material

Excess backfill and topsoil material from the stripped portion of the ROW will be placed or feathered out over the stripped area in a manner not to cause excessive subsidence of the trench.

3.6.2 Crown Trench

Excess soil will be placed forming a crown over the trenching to allow for settlement. Trench crown breaks will be located in obvious drainages and wherever seepage occurs to minimize interference with natural surface water drainage.

3.6.3 ROW Contouring

Grading of the ROW will be performed with a goal of restoring the contours to pre-construction grades and to reestablish the original drainage patterns. Special attention will be paid to areas comprised of wetlands, and watercourses. All temporary construction fill (e.g., ramps) will be removed.

3.6.1 Drainage Tiles

Drainage tiles or culverts damaged during trenching will be replaced.

3.7 Hydrostatic Testing

Once the pipeline has been installed, hydrostatic testing will be conducted to evaluate the integrity of the pipeline. The specific steps outlined for the hydrostatic testing procedures are as follows:

3.7.1 Notification, Sampling, and Reporting

Ensure the proper permit requirements are completed prior to dewatering activities. Adhere to applicable notification, sampling, and reporting requirements for discharge (if required) by the North Dakota Department of Health.

3.7.2 Equipment and Workers

Ensure that an adequate number of workers and equipment are available on-site to repair any rupture, leak, or erosion problem that arises during testing.

3.7.3 Isolate Pumps

Test pumps and lined storage tanks will be isolated to prevent spills of fuels or lubricants.

3.7.4 Pigging Debris

Pigging debris will be transported for approved disposal (*i.e.*, landfill).

3.7.5 Dewatering

Proper dewatering procedures will be used to minimize erosion, flooding, and risk of water quality impacts.

3.7.6 Daylighting

Applicable measures for pipeline exposure (daylighting) monitoring will be adhered to during pipeline inspections and repairs.

3.8 Watercourse and Wetland Crossings

Pipeline construction in or near watercourses or wetlands requires special consideration due to unstable soils and protection of natural ecosystems. Whenever possible, construction activities will be minimized in wetlands including reduction of temporary work areas. Pre-construction planning will consider construction methods, timing, erosion control, and restoration/reclamation. The contractor must use the construction ROW, TWS and approved roads to access watercourse or wetland areas.

3.8.1 General Requirements

Storage of Fuels and Other Materials

No storage of fuels, lubricating oils, hazardous materials, or chemicals will be permitted in, or within 100 yards from a watercourse or wetland boundary.

Refueling and Fuel Handling

Refueling and fuel handling will be conducted in upland areas at least 100 feet from watercourse or wetland boundaries. If boring equipment is located within 100 feet of a water body, refueling would occur in accordance with requirements outlined in the SPCC Plan.

Clearing

Clearing the construction ROW in a watercourse or wetland will be limited to topsoil salvage over the trench line. A minimum vegetative buffer of 10 feet would be provided outside of the stream bank. Typical details for flowing and non-flowing watercourse crossings are presented in Attachment 1. Requirements for stormwater BMPs are provided in Attachment 1 and within the SWPP Plan. In locations where the ROW traverses an adjacent wetland, a buffer zone would be maintained between the wetland and the construction work area. Sediment controls in accordance with the SWPP Plan would be implemented.

Vegetation and Shrub Salvage

Live shrubs or bushes and other wetland species from the banks of all watercourses and wetland will be salvaged, if possible, in accordance with NDFG requirements.

Temporary Berms and Silt Fences

Temporary sediment control structures (berms and silt fencing) will be installed on approach slopes during crossing construction. Structures will be repaired before the end of each working day, or as needed.

All trench related drilling equipment will be equipped with spill containment kits (e.g., sorbent pads and pigs) prior to commencing construction. In addition, spill response equipment will be available for containment of fluids.

3.8.2 Watercourse or Wetland Construction Techniques

Recommended pipeline watercourse or wetlands crossing methods are referenced in the alignment sheets. In general, the watercourse crossings traversed by the Vantage Pipeline are non-flowing and the open cut crossing method would be used. Directional boring may be required if water is present and the open cut method is not feasible at the time of construction. Details of boring methods are provided in Attachment 1. Pre-construction planning will help determine equipment requirements and open cut methods for each watercourse or wetland area. Consideration should be given to soil type, moisture content, potential for rutting, compaction, and trench sloughing. Pre-built pipe runs will generally be integrity tested prior to initiating watercourse or wetland construction.

The locations of anticipated watercourse and wetland crossings are identified on Table A-1. A description of each crossing is provided and identifies wetland type and potential for open water and flooded conditions.

Table A-1. Watercourses and Wetlands Crossing Methods

Site No.	Mile Post	Wetland Type	Restricted Activity Period	Comments
1	2.51	Palustrine Emergent B/C	April 15 to June 1	Fresh wet meadows / shallow marshes
2	9.38	Palustrine Emergent C/F	April 15 to June 1	Shallow/deep marshes
3	12.82	Palustrine Emergent B/C	April 15 to June 1	Fresh wet meadows / shallow marshes
4	14.97	Palustrine Emergent B	April 15 to June 1	Fresh wet meadows
5	16.02	Palustrine Emergent B	April 15 to June 1	Fresh wet meadows
6	18.47	Palustrine Emergent A	April 15 to June 1	Seasonally flooded basins
7	25.51	Palustrine Emergent B/C	April 15 to June 1	Fresh wet meadows / shallow marshes
8	25.92	Palustrine Emergent B/C	April 15 to June 1	Fresh wet meadows / shallow marshes
9	30.22	Palustrine Emergent B/C	April 15 to June 1	Fresh wet meadows / shallow marshes
10	43.56	Palustrine Emergent C	April 15 to June 1	Shallow marshes
11	44.79	Palustrine Emergent B/C	April 15 to June 1	Fresh wet meadows / shallow marshes
12	69.53	Palustrine Unconsolidated Bottom	April 15 to June 1	Shallow open water
13	77.60	Palustrine Emergent B	April 15 to June 1	Fresh wet meadows

Open Cut Crossings

Open cut crossing will be used for non-flow and flowing waterways unless it is determined by the project engineer that use of the open cut method is not feasible. Following open cut crossings, native material/washed backfilled gravel will be placed back into the crossing as soon as possible after lowering-in of the prefabricated pipeline.

For watercourse or wetlands crossing with standing water and saturated soils, the pipeline will be assembled in upland areas. Excavation of the trench may be performed by using a backhoe supported on geotextile materials or timber mats. The prefabricated section of pipe will be positioned across the wetland and lowered into the trench followed by backfilling.

Horizontal Directional Bore Method

Directional boring methods may be used to install underground pipe runs in a prescribed path below the surface. The benefit of the push/pull boring method is the minimal impact to the surrounding area. This method allows for crossing under watercourses or roadways where open trench pipe installation is not feasible. A directional bore machine pushes a bore head, connected to hollow drill pipe, into the ground at an angle to excavate the pilot borehole. As each joint of drill pipe is pushed into the ground, a new one is added behind. Non-hazardous drilling fluid, composed of a mixture of bentonite clay and water, is used for drilling lubrication. Once the bit reaches the exit point, it is replaced with a reamer and the hole is enlarged by operating the drill in the reverse direction. After enlarging the bore, the product pipe is pulled from the exit point back to the boring machine. Once the pipe is installed, the exit and entry points are excavated if necessary with connections made as needed.

3.8.3 Construction Monitoring

Watercourse and wetlands crossings will be monitored for immediate effects of crossing construction to ensure the effectiveness of prescribed mitigation measures. Photo documentation of before and after watercourse and/or wetlands condition will be completed to establish baseline conditions and to evaluate restoration.

3.8.4 Bank Protection

Installation of temporary erosion and sediment control measures, such as silt fencing, rip rap, temporary diversion berms, sandbags, or straw bales may be necessary to maintain bank stability. Trench breakers may also be installed if banks are composed of erodible materials.

3.8.5 Reclamation

Banks and approaches of all watercourses are to be reclaimed with appropriate seed mix identified in Section 4.7 below. Stormwater controls will be maintained at the base of approach slopes until revegetation of the ROW is complete in accordance with the SWPP Plan. Rolled Erosion Control Products (RECP) can be used, if deemed necessary by the Vantage representative.

3.8.6 Post-Construction Monitoring

Erosion and sediment control measures will be monitored frequently and after significant precipitation events or rapid melt of snow as specified in the SWPP Plan. Documentation of post-construction site conditions will be performed, including success of revegetation (see Section 5).

4 CLEAN-UP AND RECLAMATION

4.1 Clean-up Schedule

Clean-up of garbage and construction debris along ROWs will occur immediately after each segments of pipeline construction is completed. Designated garbage disposal containers will be located for contractor access for solid waste clean-up each day.

4.2 Restoration of Watercourse(s)/Wetland(s)

Temporary crossings at watercourse or wetlands will be removed as quickly as practical. Appropriate erosion and sediment control best management practices (BMPs) will be established and maintained in accordance with the SWPP Plan, until revegetation stabilizes the area. On steep banks, use of RECPs over seeded areas will be implemented to provide bank stabilization until seeding becomes established. Application of fertilizer or mulch in or near watercourses or wetlands is prohibited.

4.3 Slopebreakers

Stormwater BMPs (e.g., slopebreakers) will be installed in selected locations to prevent run-off and subsequent erosion along the ROW. Locations for slopebreakers will be determined in the field and will be constructed of subsoil material capped with topsoil.

4.4 Grading

Grading will be performed for areas with vehicle ruts, erosion gullies, or trench settlement prior to topsoil placement, tillage, and seeding operations. Any temporary fills placed to accommodate construction access will be removed and cut materials replace in the original borrow location.

4.5 Soil Tillage and Preparation

A multi-shank ripper may be employed for compacted soils caused by excessive equipment traffic or prolonged wet weather. Tillage equipment including a chisel plow, disc, or harrow may be used to smooth the soil surface prior to seeding operations. Boulders that might interfere with topsoil placement and seeding will be removed. Disc and harrow operations will be conducted only if the site is to be seeded immediately, otherwise ripped soil provides a means of temporarily reducing the wind erosion potential.

4.6 Topsoil Placement

Topsoil will be placed evenly across the graded subsoil surface. If necessary, excess topsoil can be feathered-out over the stripped area. Topsoil placement may need to be postponed during wet weather or high winds to reduce soil loss. Seedbed preparation may be required depending on soil surface conditions and seeding equipment selection. Cultivation will be limited in areas of fine textured soils to prevent pulverization of the soil.

4.7 Seeding

Seeding of the ROW will be arranged by the Vantage representative. Traffic should be minimizing on seeded areas to allow the vegetation to become established. Seed selection will be prescribed to match the surrounding land use. Tables A-2 through A-4 contain seed mix recommendations for native grassland, pastureland, and wetland sites. Cultivated crop land will not be seeded until it is put back into production by the land owner or lessee.

Table A-2. Seed Mix A - Native Grassland

SEED MIX A		
SCIENTIFIC NAME	COMMON NAME	%
<i>Hesperostipa comata</i>	Needle and thread grass	15
<i>Stipa viridula</i>	Green needle grass	15
<i>Schizachyrium scoparium</i>	Little Bluestem	15
<i>Bouteloua curtipendula</i>	Sideoats Grama	10
<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	10
<i>Pascopyrum smithii</i>	Western wheatgrass	10
<i>Elymus trachycaulus</i>	Slender wheatgrass	10
<i>Acnatherum hymenoides</i>	Indian Ricegrass	10
<i>Koeleria macrantha</i>	Junegrass	3
<i>Astragalus Canadensis</i>	Canada milk vetch	1
<i>Vicia Americana</i>	American vetch	1

Note: Drill at 14 lbs/acre if drill seeded or 28 lbs/acre if broadcast. If highly erodible soil is encountered add *Triticum aestivum* at 7 lbs/ac to Seed Mix A.

The selected seed mix will be confirmed with the landowner/lessee prior to seeding. Limited disturbance to wetland sites is anticipated where soil will be stripped from the trench line at watercourse crossings. Hand seeding in these locations would use Seed Mix B.

Table A-3. Seed Mix B - Wetlands, Depressions and Saline Sites

SEED MIX B		
SCIENTIFIC NAME	COMMON NAME	%
<i>Agropyron smithii</i>	Western wheatgrass	20
<i>Agropyron trachycaulum var. trachycaulum</i>	Slender wheatgrass	20
<i>Poa juncifolia</i>	Alkali bluegrass	10
<i>Puccinellia nuttalliana</i>	Nuttall's alkali grass	10
<i>Deschampsia caespitosa</i>	Tufted hair grass	10
<i>Beckmannia syzigachne</i>	Slough grass	10
<i>Hierochloe oderata</i>	Sweet grass	10
<i>Poa palustris</i>	Fowl bluegrass	10

Note: Hand seed at 15 lbs/acre equivalent and hand rake.

Seeding of disturbed soil on pasture or hay land, or CRP land will be conducted with a seed mix approved by the landowner/lessee. Seed mix C will be used if the landowner or land management agency does not specify use of other mixtures.

Table A-4. Seed Mix C – Pasture Lands

SEED MIX C		
SCIENTIFIC NAME	COMMON NAME	%
<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	20
<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	20
<i>Elymus trachycaulus</i>	Slender wheatgrass	20
<i>Acnatherum hymenoides</i>	Indian Ricegrass	15
<i>Pascopyrum smithii</i>	Western wheatgrass	15
<i>Koeleria macrantha</i>	Junegrass	10

Note: Drill at 14 lbs/acre if drill seeded or 28 lbs/acre if broadcast. If highly erodible soil is encountered add *Triticum aestivum* at 7 lbs/acre to Seed Mix C.

4.7.1 Seeding of Road Ditches

Seed road ditches with the same mix as adjacent land, where applicable. Vantage will coordinate with the NDDOT to determine seeding requirements for highway road crossing.

4.8 Fences

Temporary fences will be installed at locations determined by the Vantage representative and landowner/lessee to be required for livestock containment purposes.

4.9 Fertilization and Weed Control

Fertilizer and weed control practices will be used according to adjacent land use standard practices while being protective of water resources.

5 POST-CONSTRUCTION MONITORING (PCM) and FOLLOW-UP

5.1 Post-Construction Soils Assessment – Soil Parameters

A representative from Vantage with expertise in environmental science will conduct a post-construction soil assessment. Documentation of locations along the ROW will be pre-determined after having consulted available soil mapping. Soil properties including topsoil depths, problem soils, and stability, will be evaluated. Criteria to be considered in determining the locations for soils assessments may include topsoil depths, landscape variation, land use, and construction procedures. The reclaimed surface will be inspected to identify settlement of trench backfill.

Soil parameters will be assessed including but not limited to: the degree of subsoil compaction; topsoil depth; topsoil and subsoil texture; degree of topsoil and subsoil mixing; contour restoration and erosion. Field forms and photography will be used to document observations and measurements.

5.2 Reclamation Performance and Vegetation Monitoring

The ROW will be visually inspected for vegetation issues such as invasive weed infestations, poor vegetation establishment, and reduced crop growth along the ROW. If visual differences are noted on and off the ROW, then plant yield indices such as height, density and vigor will be considered. Particular attention will be paid to areas with extensive surface disturbance, moderate to steep slopes, watercourse and wetlands crossings, and areas of terrain instability that may be prone to erosion. Detailed vegetation assessments will be conducted, if warranted, at sites where reclamation problems are identified.

5.3 Watercourse Monitoring

The ROW will be inspected at all watercourse crossings during the post-construction reclamation soil and vegetation assessments. The banks and approach slopes will be monitored for stability, erosion, invasive weed infestations, and vegetation cover. The ROW will also be monitored to determine if there is any disruption of natural drainage patterns. Photography will be used to document observations.

5.4 Mitigative Measures

Mitigative measures will be recommended if issues are identified during PCM. Vantage will implement mitigative measures as soon as feasible. Issues that cannot be mitigated immediately (*e.g.*, subsoil compaction) will be documented in a report for future mitigation.

5.5 Documentation and Reporting

The PCM program will document all environmental issues identified for the project. Issues that have been successfully mitigated will be listed as resolved. The report will also include any locations with unresolved environmental issues and planned mitigation activities.

6 OPERATIONS AND MAINTENANCE ACTIVITIES

Vantage's environmental and operations personnel will conduct regular inspections along the ROWs as needed to document weeds, trench subsidence, and erosion. Mitigative measures would be implemented on a timely basis during operations. Routine monitoring by Vantage personnel will continue throughout the life of the pipeline.

7 EMERGENCY AND PROJECT CONTACTS

The following tables provide information on the emergency services available in vicinity of the proposed project area (Table A-5), project and government personnel (Table A-6), and county contact information (Table A-7)

Table A-5. Emergency Services

SERVICE	COUNTY	LOCATION/ CONTACT	PHONE NUMBER
If it is an emergency, dial 911.			
Emergency Response Management	Divide County	Rob Melby P.O. Box 275 Crosby, ND 58730	701-965-6461
	Williams County	Mike Hallesy 223 E. Broadway St., Suite 202 Williston, ND 58801	701-577-7707

Table A-5. Emergency Services, continued

SERVICE	COUNTY	LOCATION/ CONTACT	PHONE NUMBER
If it is an emergency, dial 911.			
Ambulance	Divide County	Divide County Ambulance Service Paul Peterson 107 Central Ave W Crosby, ND 58730	701-965-5844 day 701-965-6359 evening
	Williams County	Grenora Ambulance Service Jane Schenstad 205 Main Street Grenora, ND 58845	701-694-3391 day 701-694-2932 evening
		Ray Community Ambulance District Myron Eide 24 1st Ave W Ray, ND 58849	701-568-2294
		Tioga Ambulance Service Daniel McGinnity 12 Front St NE Tioga, ND 58852	701-664-2578 day 701-641-2045 evening
		Williston Ambulance Service Richard Shearer 317 11th St W Williston, ND 58801	701-572-3400 day 701-770-0350 evening
If it is an emergency, dial 911.			
Fire	Divide County	Crosby and Rural Fire Department 107 West Central Crosby, ND 58730	701-965-6304
		Fortuna Rural Fire Protection District 270 Main Street Fortuna, ND	701-834-2212
		Noonan Fire Department Main Street Noonan, ND	701-925-5783
	Williams County	Alamo Rural Fire Protection District 13257 75 th Street Alamo, ND	701-528-3662
		Grenora Rural Fire Protection District 210 Main Street Grenora, ND	701-694-6203
		Ray Fire Protection District 1 st Avenue Ray, ND	701-568-3421
		Tioga Rural Fire Department 514 Willard Blvd Tioga, ND 58852	701-664-2200
		Wildrose Fire Protection District Carmody Street Wildrose, ND 58795	701-593-2110
Williston Rural Fire Protection District- Ambulance 317 11 th Street W Williston, ND	701-572-3400		

Table A-5. Emergency Services, continued

SERVICE	COUNTY	LOCATION/ CONTACT	PHONE NUMBER
If it is an emergency, dial 911.			
Hospital/Health Centre	Divide County	St. Luke's Hospital 702 1 st Street SW Crosby, ND 58730	701-965-6384
	Williams County	Tioga Medical Center 810 N Welo Street Tioga, ND 58852	701-664-3308
		Mercy Medical Center 1301 15 th Ave. W Williston, ND 58801	701-774-7400
If it is an emergency, dial 911.			
County Sheriff	Divide County	Divide County Sheriff P.O. Box 275 Crosby, ND 58730	701-965-6461
	Williams County	Williams County Law Enforcement Center 223 East Broadway, Suite 301 Williston, ND 58801	701-577-7700

Table A-6. Project Contacts

CONTACT	NAME AND POSITION	ADDRESS	CONTACT INFORMATION
Chief Operating Officer	David Schmunk Chief Operating Officer	Mistral Energy Inc. 440, 521-3 rd Ave. SW Calgary, AB T2P 3T3	Phone: (403) 781-8181 Fax: (403) 777-1907 Email: dschmunk@mistralenergyvantagepipeline.com.ca
Operations Manager	Bruce Edmondson Vice President - Operations	Vantage Pipeline Canada Inc. 440, 521-3 rd Ave. SW Calgary, AB T2P 3T3	Phone: (403) 781-8181 Email: bedmondson@vantagepipeline.com
Land Management Specialist	Byron Nelson Vice President - Lands	CLS 113 East Broadway Williston, ND 58801	Phone: (805) 828-6000 Email: bnelson@contractlandstaff.com
Environmental Consultant	David Cameron	KC Harvey Environmental LLC 376 Gallatin Park Drive Bozeman, MT 59715	Phone: (406) 585-7402 Fax: (406) 585-7428 Email: dcameron@kcharvey.com
Project Engineer	Susan Saurette Project Manager	Sunstone Projects Ltd. 400, 540-5 th Ave. SW Calgary, AB T2P 0M2	Phone: (403) 218-6817 Email: susan.saurette@sunstone.ab.ca
NEPA Coordinator	Gary Holsan	Gary Holsan Environmental Planning PO Box 275 Thayne, WY 83127	Phone: (307) 883-2883 Email: ghep@silverstar.com
Archeologist	Lynelle Peterson	Ethnoscience, Inc 4140 King Avenue East Billings, MT 59101	Phone: (406) 252-7945 Email: lynelle@ethnoscience.com

CONTACT	NAME AND POSITION	ADDRESS	CONTACT INFORMATION
GOVERNMENT- FEDERAL			
US Fish and Wildlife Service	Heidi Riddle Fish and Wildlife Biologist	U.S. Fish and Wildlife Service North Dakota Ecological Services Field Office 3425 Miriam Avenue Bismarck ND 58501	Phone: (701) 250-4481 Email: heidi_riddle@fws.gov
US Army Corp of Engineers	Daniel Cimarosti North Dakota Regulatory Program	US Army Corps of Engineers 1513 South 12th Street Bismarck, ND 58504	Phone: (701) 255-0015 Fax: (701) 255-4917 Email: Daniel.E.Cimarosti@usace.army.mil
USDA - NRCS Divide County, North Dakota	Robert Casteel District Conservationist	NRCS Wallin Building 206 Main Street, Box 66 Crosby, ND 58730-0066	Phone: (701) 965-6491 Fax: 701-965-6064 Email: rob.casteel@nd.usda.gov
USDA - NRCS Williams County, North Dakota	David W. Schmidt District Conservationist	Williston Field Office 1106 West 2nd Street Williston, ND 58801	Phone: (701) 572-6729 Fax: 701-572-0484 Email: david.schmidt@nd.usda.gov
In the Event of a Spill	National Response Center	National Response Center c/o United States Coast Guard (CG-5335) - Stop 7581 2100 2nd Street, SW Washington, DC 20593-0001	Toll Free: 800-424-8802 Direct: (202) 267-2675 Fax: (202) 267-1322 Email: HQS-DG-1st-NRCINFO@uscg.mil
GOVERNMENT- STATE			
State Historical Society of North Dakota	Paul Picha Chief Archaeologist	North Dakota Heritage Center 612 East Boulevard Avenue Bismarck, ND 58505-0830	Phone: (701) 328-3574 Fax: (701) 328-3574 Email: ppicha@nd.gov
North Dakota Game and Fish Department	Bruce Kreft Resource Biologist	100 North Bismarck Expressway Bismarck, ND 58501-5095	Phone: (701) 328-6224 Fax: (701) 328-6352 Email: bkreft@state.nd.us
North Dakota Department of Agriculture Plant Industries Division	Judy Carlson Director of Noxious Weed Team	600 E Boulevard Ave, Dept 602 Bismarck, ND 58505	Phone: (701) 328-4997 Email: jcarlson@nd.gov

Table A-7. County Official and Offices

COUNTY	CONTACT NAME	CONTACT NUMBER
Divide County Commissioners	Tim Selle	701-834-2451
	Gerald Brady	701-965-6112
	Douglas Graupe	701-965-6489
Williams County Commissioners	David Montgomery	701-577-4500
	Dan Kalil	701-577-4500
	Barry Ramberg	701-577-4500
	Martin Hanson-Zahl	701-577-4500
	Don Arnson	701-577-4500
Williams County Highway Office	Dennis Nelson, Superintendent	701-577-4521
Crosby Municipal Highway Department	705 5th Avenue Southeast Crosby, ND 58730	701-965-6192
Williams County Weed Officer	Jim Basaraba	701-572-4883
Divide County Weed Officer	Gary Smithberg	701-925-5798

8 CONTINGENCY PLANS

8.1 Spill Contingency Plan Guidelines

Completion of a detailed Spill Prevention Control and Countermeasures Plan (SPCC Plan) that addresses potential spills related to pipeline construction activities is the responsibility of the Vantage Pipeline Contractor (see Attachment 5). The detailed SPCC plan will address the following in the event of a release.

8.1.1 Initial Spill Response

In the event of a spill, responders are required to complete the following actions:

- Control danger to human life and appoint an on-site lead person;
- Remove the source of ignition, if safe to do so;
- Identify the source of the spill and stop or contain spill, if safe to do so;
- Conduct appropriate steps for following the Vantage Emergency Response Plans including contacting Vantage's Spill Coordinator/Environmental Staff;
- Refer to the Spill Prevention Control and Countermeasures (SPCC) Plan section that details spill response;
- Advise Vantage's Environmental Spill Coordinator/Environmental Staff of clean-up requirements and assist in arranging the necessary spill response equipment and/or contractors to be mobilized to control and contain the spill;
- Prevent traffic on contaminated soils; and
- Ensure the proper agencies have been contacted and spill reports have been completed.

8.1.2 General Spill Clean-up Procedure

Clean-up requirements for spills generally involve one or more of the following steps:

- Contain spilled petroleum product;
- Pump liquids into a tanker or appropriate container;
- Clean-up residual contaminated soil area with spill clean-up equipment; and
- Dispose of sorbent pads, heavily contaminated soil and vegetation at an approved facility.

8.1.3 Spill Clean-up next to Waterbodies

- Construct berm and/or trenches to contain spilled product prior to entry into a waterbody;
- Deploy booms, skimmers, sorbents etc., if feasible, to contain and recover spilled material from waterbody;
- Pick up spilled product and clean-up impacted areas including streambanks and shorelines; and
- Dispose of heavily contaminated soil and vegetation at an approved facility.

8.1.4 Spill Report Form

A spill report form is included in the contractors SPCC Plan. In addition, a link to the North Dakota spill reporting form is available at <http://www.ndhealth.gov/ehs/eir/NonOilfield/>.

8.2 Fire Contingency Plan

Prior to commencement of construction, the primary Vantage Pipeline Contractor will designate a staff member as Lead Fire Representative (LFR). Contact information for fire departments in Divide and Williams Counties are listed below in Table A-8. This individual will be familiar with all fire-fighting methods and equipment, and local fire-fighting departments.

- All vehicles and equipment will be required to carry fire-fighting equipment including shovels and fire extinguishers. In addition, all motorized equipment must carry a fully charged fire extinguisher. All fire extinguishers will be checked at least monthly.
- The LFR will ensure the following fire prevention measures are implemented:
 - Belly pans of crawler tractors are periodically removed and cleaned;
 - Fire contact list is current and reporting requirements are understood by all crews;
 - Equipment used on-site is in good working order and does not present a fire danger; and
 - Safety meetings include basic training procedures including fire extinguisher use and maintenance.
- Crews that experience a fire will follow steps, including:
 - Perform fire suppression measures immediately upon detection of fire **if safe to do so**;
 - Report location, size, and current status of fire to Vantage Safety personnel and local fire department;
 - Deploy fire-fighting equipment and crew to create fire breaks or extinguish the fire directly **if safe to do so**; and
 - Request additional local fire department assistance if Contractor resources are insufficient.

Table A-8. Fire Contact Information

COUNTY	LOCATION/ CONTACT	PHONE NUMBER
If it is an emergency, dial 911.		
Divide County	Crosby and Rural Fire Department 107 West Central Crosby, ND 58730	701-965-6304
	Fortuna Rural Fire Protection District 270 Main Street Fortuna, ND	701-834-2212
	Noonan Fire Department Main Street Noonan, ND	701-925-5783
Williams County	Alamo Rural Fire Protection District 13257 75 th Street Alamo, ND	701-528-3662
	Grenora Rural Fire Protection District 210 Main Street Grenora, ND	701-694-6203
	Ray Fire Protection District 1 st Avenue Ray, ND	701-568-3421
	Tioga Rural Fire Department 514 Willard Blvd Tioga, ND 58852	701-664-2200
	Wildrose Fire Protection District Carmody Street Wildrose, ND 58795	701-593-2110
	Williston Rural Fire Protection District- Ambulance 317 11 th Street W Williston, ND	701-572-3400

8.3 Soil Conditions Contingency Plan

During pipeline construction, the following problems may arise which could result in loss of soil productivity if not addressed. Environmental soil handling options to reduce the potential impacts are listed in the following table.

Table A-9. Soil Handling Environmental Protection Options

CONDITION/CONCERN	ENVIRONMENTAL PROTECTION OPTIONS
Wet soils	<ul style="list-style-type: none"> • Restrict construction vehicle traffic to equipment with low-ground pressure tires or wide pad tracks. • Salvage topsoil from full ROW to prevent mixing and rutting. • Shut down construction activities until conditions improve. • Use matting to minimize soil mixing
Limiting topsoil depth	<ul style="list-style-type: none"> • Salvage surface soil to a depth of first color change or depth indicated on the alignment sheets whichever is greatest.
Topsoil identification	<ul style="list-style-type: none"> • Use topsoil depths provided on Alignment Sheets as a guide. • Assign a construction oversight person to guide the equipment operator.
Uneven surfaces	<ul style="list-style-type: none"> • Use topsoil depths provided on Alignment Sheets as a guide. • Assign a construction oversight person to guide the equipment operator. • Use equipment with fine depth control.
Stony soils	<ul style="list-style-type: none"> • Attempt to use conventional excavation equipment to strip topsoil. • Employ backhoe, if conventional equipment fails. • Replace stones and rocks to the equivalent of surrounding land areas.
Shallow bedrock	<ul style="list-style-type: none"> • Ripping is preferable where rock trenching is required. • Excess bedrock should not be replaced in the upper 1.5 feet of the trench. • Excess bedrock will be transported for disposal at locations approved by the landowner/lessee. • Replacement backfill will be transported from a source approved by the landowner/lessee.
Unstable trench walls	<ul style="list-style-type: none"> • Strip extra width of topsoil if topsoil could slough into the trench. • Back slope the trench until stable (up to 1:1). • Prepare pipe runs prior to trenching at locations with soil prone to sloughing to minimize the time the trench is left open.
Soil pulverization	<ul style="list-style-type: none"> • Minimize traffic on ROW. • Increase topsoil stripping to full ROW if fine textured soils will be subjected to undue traffic and pulverization. • Minimize tillage operations once topsoil has been replaced. • Postpone seed bed preparation until immediately prior to seeding.
High winds	<ul style="list-style-type: none"> • Suspend topsoil handling during high wind conditions.

8.4 Soil Erosion Contingency Plan

Soil water and wind erosion contingency planning may be required during the construction of the Vantage Pipeline. The following tables provide erosion control options that may be implemented depending on the field conditions.

8.4.1 Soil Erosion Environmental Protection Options

Table A-10. Soil Water Erosion Protection Options

CONCERN	ENVIRONMENTAL PROTECTION OPTIONS
Erosion by Water	(Refer to SWPP Plan)
Cultivated Land/ Hay Land and Improved Pasture	<ul style="list-style-type: none"> • Construct temporary berms of subsoil, sandbags or bales during construction activities. • Salvage remaining topsoil and stockpile away from area to be regraded. • Install silt fences near the base of slopes. • Regrade rill or gully erosion. • Seed annual cover crop. • Construct temporary cross ditches on slopes following approval by landowner/lessee. • Employ erosion netting, mulch, or tackifier to keep surface soil in place.

Table A-11. Soil Wind Erosion Protection Options

Erosion by Wind	
Topsoil Stockpiles	<ul style="list-style-type: none"> • Refer to alignment sheets regarding erosion prone soils. • Develop measures (e.g., daily watering) to reduce wind erosion of fine-textured loose soils that are vulnerable when stockpiled or windrowed. • Ensure that windrows do not exceed three feet in height and no steeper than 2:1. • Postpone topsoil stripping until three days prior to trenching. • Apply water to the topsoil windrow. • Install silt fences. • Seed cereal cover crop. • Employ mulch or straw crimping at recommended rates (e.g., 1 tons/ac). • Apply hydromulch or tackifier.
Watercourse or Wetlands Erosion	<ul style="list-style-type: none"> • Plant willow stakes in the spring. • Transplant willow clumps and/or install willow wattles. • Apply approved RECP. • Armor bank with riprap. • Install vegetated geogrid.

8.5 Instream Boring Fluids Mud Release Contingency Plan

The Vantage Pipeline is anticipated to cross non-flowing (based on observation during the fall of 2010) watercourse or wetland areas in approximately eight locations. The open cut method of trenching is planned for these crossings due to limited instream water flow throughout the average year. However, in case direction drilling is required, the following contingency plan includes measures to address the potential release of drilling mud in order to minimize the environmental impacts.

8.5.1 General Measures

- Surface casing may be installed to contain a potential drilling mud release.
- Boring mud will consist of “environmentally friendly” substances (e.g., bentonite and inert additives).
- Berm(s) or sump(s) will be constructed at the entry point and proposed exit point with a capacity adequate to contain the anticipated volume of mud that could be released during pullback and other boring operations.
- The contractor’s boring plan would be required to include a section that addresses boring mud clean-up. This section will be reviewed with the contractor crews prior to boring operations. In addition, Vantage supervisory personnel will be made aware of this contingency plan and how boring mud clean up would be performed prior to initiating boring.

8.5.2 Monitoring

Supervisory personnel will be on-site at all times during boring, reaming, and pullback operations to ensure that emergency response measures will be implemented immediately and effectively. Vantage will assign personnel experienced in emergency spill response during all phases of boring the watercourse.

The amount of boring fluid returned to the mud tank will be measured. Visual inspections of both onshore and instream portions of the bore path and surrounding area will be evaluated for signs of mud release. Monitoring stations will also be established prior to boring for purposes of visual inspections and surface water quality sampling, if necessary.

On watercourses with ice cover, on-site conditions may allow visual monitoring of water quality by observing open reaches or, if safe, by auguring and maintaining an open hole in the ice for sampling.

8.5.3 Emergency Response

Sufficient quantities of the following emergency response equipment will be available on-site during boring operation: sandbags, silt fencing, T-bar posts, post pounders, straw bales, lighting towers, shovels, hydro-vac truck (optional), submersible pump, polyethylene, and water sampling equipment.

In general, boring operations will be immediately ceased if a mud release is detected. A Vantage representative will be immediately notified to address reporting requirements, and to determine the best mitigation procedures. Instream options for removal of drilling mud will likely include use of the submersible pumps or hydrovac truck. Drilling mud releases on land will be addressed similar to removal of hydrocarbon contaminated soil according to the procedures outlined in the SPCC plan.

Boring will only be allowed to resume if the potential for significant adverse impacts on the environment is low, as determined by Vantage and Agency personnel. Contacts for North Dakota Department of Health personnel are provided in the following table.

Table A-12. Instream Emergency Contacts

CONTACT	NUMBER
ND Department of Health: Environmental Health Section	701-329-5150
ND Department of Health: Division of Water Quality Dennis Fewless, director	701-328-5210 office 701-223-9398 home 701-400-7080 cell
ND Department of Health: Division of Water Quality Mike Ell, Water Pollution	701-328-5210 office 701-223-4237 home 701-220-5025 cell

8.6 Water Crossing Sediment Contingency Plan

Erosion and/or runoff caused by construction activities through water crossings may result in sedimentation. The watercourse bed and banks will be restored to pre-construction conditions. Habitat enhancement/compensation measures will be employed, if warranted, to ensure that the productive capacity of the watercourse.

To avoid impacts to water crossings, the following measures will be the responsibility of Vantage.

8.6.1 Fish Habitat Assessment

Review and conduct (if necessary) a fish habitat assessment, of specific watercourses. Recommendations from the consulting fisheries biologist will be followed to ensure the protection of aquatic resources.

8.6.2 Notification/Approvals

Vantage will notify the NDGF and NDDH of activities that may impact streams if flowing conditions are encountered. Applicable permits would be obtained prior to construction.

8.6.3 Fish Salvaging for Instream Construction Activities

Based on field surveys completed during 2010, fish salvage would not be required since fish habitat is not encountered in the watercourse crossings.

8.6.4 Contingency Crossing Method - Open Cut Crossings (Water Present)

Vantage will ensure stream flow is maintained at all times while open cutting during flowing conditions. Work may be performed from both sides of the watercourse, utilizing two backhoes if necessary, to expedite the crossing.

Excavated watercourse bottom sediment will be piled on the banks in a temporary storage area above the high watermark of the watercourse. Containment berms and spoil will be stored in accordance with requirements indicated on the typical crossing details (Attachment 1).

Backfill material will be replaced as soon as possible and will consist of native material/washed gravel. The watercourse streambed shall be returned to approximate pre-construction profile to ensure that flow patterns are unaltered.

Photo documentation (before and after) will provide evidence of baseline and post-construction conditions. In addition, a post construction walk through will be conducted to allow for inspection of erosion and sedimentation related to the pipeline crossing.

8.7 Winter or Frozen Conditions Contingency Plan

Winter conditions may be encountered depending on the duration/extent of pipeline construction. When working during frozen soil conditions, Vantage will ensure that there is sufficient frost or low enough soil moisture to allow construction without causing excessive rutting or soil compaction.

Vantage winter construction planning also includes snow management, topsoil salvage and stockpiling, backfilling, grading, clean-up, and reclamation/restoration practices in the event of frozen ground conditions.

8.7.1 Snow Management

Snow management may involve windrowing over the trench to prevent frost penetration along the trench line. The windrowed snow pack can be removed immediately prior to resuming trenching operations. Snow can also be graded along the ROW travel lanes to improve driving conditions.

8.7.2 Topsoil Salvage – Frozen Soil Conditions

During winter/frozen conditions, topsoil salvage will take place in an area approximately 10 feet wide over the centerline of the trench. Stripping activities will be limited to equipment capable of accurately stripping variable depths of topsoil or rip frozen topsoil to the same depth as the salvage requirements. If constructing through frozen wetlands, ensure stripped material is not stockpiled on adjacent uplands.

8.7.3 Backfilling

Backfill the pipeline trench and compact to minimize trench settlement. The lower lift of subsoil will be compacted prior to backfilling with the upper lift topsoil material. Whenever possible, mixing of soil and backfill material should be avoided. If necessary, postpone feathering-out of excess backfill until after winter conditions and soil settlement.

8.7.4 Grading

Final grading should be scheduled for spring to avoid frozen conditions that may impair restoration of the ROW.

8.7.5 Clean-Up

Final clean-up will be performed following backfilling and in the late winter or early spring once the trench soil settlement has occurred. Stockpiles and grade cuts should be stabilized to reduce wind and water induced soil erosion. Permanent stormwater BMPs (e.g., cross ditches and berms) can be installed in the spring, as necessary.

8.7.6 Reclamation/Restoration

Once the weather is conducive for grading operations, vehicle ruts, erosion gullies, and trench spoil will be contoured in preparation for final reclamation. Excess material can be feathered-out over the ROW to minimize soil mounds and trench crowns. Tillage and seeding operations will then be conducted in the spring to take advantage of optimum germination conditions.

8.8 Sensitive Plants Contingency Plan

The proposed Vantage Pipeline traverses a number of distinct vegetation communities, each supporting a vast array of plant species. Preliminary consultation with the USFWS did not indicate any Threatened or Endangered plant species in Divide and Williams Counties. Sensitive plant species that may be encountered in the construction area are identified in the environmental report. Due to the timing of the environmental surveys conducted during the fall of 2010, an evaluation of sensitive plant species was not completed. A survey of sensitive plant species to be conducted during the spring of 2011 will target wetland and riparian communities within the construction limits.

8.8.1 Potential Mitigation Measures

The preferred option in all cases will be avoidance of the plant species of concern. Should avoidance not be feasible, other mitigative options may include:

- Reduce the width of construction on the proposed ROW or TWS (neck down);
- Erect barrier-fencing or buffers;
- Provide protective matting or temporary bridges;
- Employ salvage, propagation and/or transplanting techniques; and
- Take measures to conserve the seed bank (soil handling practices).

8.9 Wildlife Contingency Plan

Note: To be updated during June 2011 upon completion on wildlife surveys and completion of review with the US Fish and Wildlife Service and other agencies.

8.9.1.1 Introduction

The following mitigation plan pertains primarily to issues regarding species protected under the federal *Migratory Bird Treaty Act*, the *Bald and Golden Eagle Protection Act*, the *Endangered Species Act*, and critical habitat designated by the USFWS.

8.9.2 Identification of Existing Wildlife Issues

Wildlife and wildlife habitat surveys will be conducted prior to construction, including a pre-construction survey of the proposed ROW and TWS, to locate, identify and reconfirm wildlife and habitat-related issues. Site-specific mitigation measures will be developed by professional biologists, and in consultation with appropriate government agencies, to minimize the project's potential impact(s) on the wildlife species and/or habitat. Locations for specific mitigation measures will be identified on the project alignment sheets.

The project's environmental monitor will be responsible for ensuring that all recommended wildlife mitigation measures for a particular issue/species are followed during all phases of construction and reclamation.

8.9.3 Wildlife Contingency Response

A pre-construction wildlife survey is planned for the proposed ROW and TWS for the year of construction, and will be conducted as close to the start of construction activities (including site preparation/staking) as possible. The survey will determine if ground nesting species are present within

the construction limits. During the pipeline construction phase, all employees, contractors and consultants will undergo orientation regarding species and habitat of concern that potentially may occur in the project area.

The possibility exists that previously unreported wildlife issues will be discovered immediately prior to or during construction. In that event, construction activities are to be halted and the environmental monitor must be notified. If appropriate, USFWS or other applicable government agencies will be contacted. The construction activities within that area may not resume until an approved mitigation plan has been prepared.

8.9.4 Wildlife Mitigation Measures

General wildlife-related mitigation measures that will be employed throughout the entire construction phase and over the entire length of the ROW include the following:

- use of “good housekeeping” practices to maintain a garbage-free work area (refer to Waste Management Plan for full details);
- all materials, chemicals and equipment will be removed from the site at completion of the project;
- all fuel burning equipment meet emission guidelines;
- all chemicals will be stored in double-walled containers or in secondary containment;
- used chemicals are stored for transportation off site for proper handling;
- in the event of a spill, the SPCC plan will be implemented immediately;
- vehicle servicing and refueling will occur in accordance with the SPCC Plan;
- vehicles will be monitored for petroleum leaks;
- any hazardous waste material generated by project construction or operation will be disposed of in a manner specified by state and federal regulations or as outlined in the Waste Management Plan;
- spill response materials will be kept readily available onsite; and
- in order to avoid disturbance to waterfowl and other wildlife, it is recommended that clearing and construction activities occur outside of the breeding season (February 1 to July 15).

Concerns and stipulations identified by the USFWS during preliminary consultation are identified in Table A-13. Potential mitigation measures that may be utilized in response to specific potential impacts on wildlife and/or wildlife habitat as a result of construction activities are also listed in Table A-13.

Table A-13. Recommended Wildlife Mitigation Measures

POTENTIAL IMPACT	PROTECTION MEASURES
Disturbance of Wildlife	<ul style="list-style-type: none"> • A “no feeding or harassment of wildlife” policy will be implemented and enforced • Employees will undergo wildlife orientation, which will encompass no wildlife feeding and wildlife avoidance, among other topics • Project personnel will not be allowed to have pets on site • All project activities will be contained to the project area. Personnel movement will be restricted to the project area and access routes • Artificial lighting will be directed toward project facilities to avoid light disturbance to surrounding wildlife • Timing restrictions (daily or seasonal) will be placed on construction activities in accordance with Table A-14

POTENTIAL IMPACT	PROTECTION MEASURES
	<ul style="list-style-type: none"> Dust control measures will be implemented when needed
Disturbance of Migratory Bird Nests	<ul style="list-style-type: none"> In order to avoid disturbance to nesting migratory birds and other species, construction will be avoided in habitats with high potential for migratory birds during the breeding season If this is not feasible the ROW will be cleared to prevent nesting, particularly within native prairie, pasture and shelterbelt habitats If pre-mowing is not feasible a bird nest survey adjacent to the ROW is recommended within the 7 days prior construction; if nests of migratory birds are found on the ROW, it is recommended to avoid activities in vicinity of the nest until the young have fledged from the nest site If construction is scheduled in areas where Sprague's Pipits have been recorded during the nesting season, it is recommended that a pre-construction survey be completed within the 7 days prior to construction. If a nest is found, USFWS would be contacted and construction may be delayed

Table A-13. Recommended Wildlife Mitigation Measures, continued

Destruction, Degradation or Alteration of Wildlife Habitat	<ul style="list-style-type: none"> Take measures to avoid disturbance of wildlife sensitive areas Minimize disturbance to wetlands and drainages; maintain vegetative buffer zones around stream riparian areas by extending bore lengths Existing trails and disturbed areas will be used where possible to minimize the addition of new linear corridors The proposed project site will be restored to pre-project conditions. Surrounding lands with similar habitat will be used as reference sites Protection will be provided for trees, shrubbery, and other vegetation not designated for removal during project construction Install silt fences and other BMPs as necessary for erosion control Appropriate seed mixes will be utilized to reclaim native prairie and other uncultivated habitats along the ROW Narrowing, rerouting or altering of proposed ROW or TWS may be necessary to avoid sensitive habitats
Restriction of Wildlife Movement	<ul style="list-style-type: none"> Minimizing open trench areas during construction will reduce the likelihood of wildlife falling into the trench Provide 20 ft wide break in spoil pile every ¼ mile to allow wildlife movement across the pipeline ROW Provide 2:1 sloped plugs every 1/4 mile along open trench to allow wildlife to escape from the trench The trench should be checked at least twice daily for trapped wildlife which would be removed by the environmental monitor
Increased Risk of Wildlife Mortality	<ul style="list-style-type: none"> Posting speed limits and signage along the ROW, access roads, and known wildlife crossings would minimize vehicle/wildlife collisions Vehicle numbers and trips will be limited and workers will be informed of sensitive areas along the ROW Project personnel will not be permitted to have firearms on the project site Hunting and fishing while on the project site or in the vicinity of the project area, including during travel to and from the site is prohibited. Infringement of this policy will be reported and may result in disciplinary measures During temporary closures, all open holes will be fenced or blocked, in order to prevent wildlife entrapment An environmental monitor will be employed to reduce potential effects of movement barriers and wildlife mortality during construction

8.9.5 Wildlife Monitoring

A wildlife monitor will be employed to detect the presence of Whooping Cranes during the crane migration period. All monitoring will be conducted from the active work areas to detect the presence of migrating birds within one mile of the work area. If birds are sighted within this distance, work would be discontinued within the one mile buffer area until the birds have left the area.

8.10 Cultural Resources Contingency Plan

A Class III cultural resource inventory conducted along the pipeline corridor identified 64 sites and 17

isolated finds. Vantage Pipeline has successfully avoided all sites through the use of reroutes and neck-downs. However, it is likely that a number of unforeseen changes in the pipeline route and/or the need for minor road improvements will be identified in advance of construction. Upon notification of potential impacts outside of the identified ROW, a cultural resource specialist will conduct a survey of the area to be impacted in a manner consistent with the methods and standards used during the 2010 survey. If a site is identified, a field consultation with Vantage personnel will be conducted to determine if changes can be implemented in order to avoid site impact.

If avoidance cannot be assured, the site will undergo immediate testing for eligibility determination, and if appropriate, Native American Tribal Monitors will be given the opportunity to examine the site. If the site is recommended as NRHP eligible, a determination of impact will be conducted. A report detailing the survey results shall be generated and submitted to the DoS, the appropriate federal and state land managing agencies and the North Dakota SHPO for review and comment. If an NRHP eligible site is present and cannot be avoided, the DoS will work with the appropriate agencies and Tribes to develop a programmatic agreement to mitigate the impacts associated with construction.

8.10.1 Procedures at Time of Discovery of Unanticipated Cultural Resources

Tribal and archaeology monitors will be present for ground disturbing activities conducted above glacial deposits. They will help to ensure construction stays within the temporary workspace near cultural sites and that proper procedures are followed in the case of unexpected discoveries. The construction crew and safety inspectors will also be given the name and phone number of the archaeologist representing Vantage, if unexpected discoveries are found and a monitor is not immediately available.

If unanticipated cultural resources¹ are discovered during construction, all construction activity will immediately cease within 50 feet in all directions from the discovery. The archaeologist will ascertain the nature of the cultural material, the extent of the cultural material, and the potential for intact deposits through an examination of the ground surface, backfill piles, and exposed construction surfaces. The consultant archaeologist will also discuss the potential for additional impacts to the cultural resource with the construction manager. Based on this examination, the consultant archaeologist will make an initial determination of the significance of the discovery as: (1) not a site (e.g., not cultural, an isolated find, or less than 50 years in age); (2) a National Register of Historic Places (NRHP)-ineligible site (e.g., a sparse scatter of historic artifacts with little potential for intact deposits); (3) a NRHP-eligible or culturally sensitive site for which no further impacts are likely to occur; (4) a NRHP-eligible or culturally sensitive site (e.g. .exposed hearths, house pits) that is likely to be impacted with further construction; or (5) a site for which additional information is required to ascertain extent and NRHP eligibility. If the discovery is not a site, the consultant archaeologist will approve the resumption of construction. If the finding is a site, the consultant archaeologist will provide information about the cultural resource to the DoS, the NDSHPO, and, if necessary, Tribes, who will determine the most appropriate action. In the event that a cultural resource specialist or other necessary persons are not immediately available, Vantage Pipeline will require that the discovery be protected until such time that the cultural resource specialist can be present for inspection and evaluation. Construction will not resume within the no-disturbance zone until approved by the DoS or approved agency.

¹ For the purpose of this report a cultural resource is any tangible or observable evidence of human activity that is over 50 years in age, regardless of significance. Cultural resources consist of objects, sites, structures, or landscapes. Evidence of cultural activity can include artifacts (e.g. flaking debris, bone, bottle glass shards), features (e.g., charcoal stains, patterned arrangements of rock), as well as human remains and/or funerary objects.

8.10.2 Emergency Salvage of Cultural Resources

Unstable earth conditions in trenches or other unforeseen natural or cultural events could endanger cultural resources discovered during construction of the pipeline. If cultural resources are in imminent danger of destruction, Vantage Pipeline will apply prudent methods to stabilize landforms around the unanticipated discovery. Once stabilized, the resource shall be assessed as described above in Section 8.10.1, subject to safety concerns. If the site is deemed significant and in immediate danger of destruction, immediate excavation measures may be discussed with the DoS and approved by phone. If the site is not in immediate danger of destruction, a mitigation plan will be developed for later excavation. This may occur after construction is complete.

8.10.3 Unexpected Discovery of Human Remains and Funerary Objects

Human remains encountered in a discovery situation shall be handled according to the provisions of the North Dakota burial laws. Unless evidence proves otherwise, unmarked graves shall be considered Native American. For graves or human remains encountered, Vantage Pipeline shall follow the steps listed below:

- 1.) Immediately stop work on the location of human remains. This shall include removing all equipment from the site to an adequate distance to assure site protection. This will be site-specific, depending on the extent of the discovery and the topography of the site;
- 2.) Depending on location, either the Divide County Sheriff or the Williams County Sheriff shall be notified as per Subsection 4, NDCC 23-06-27. Divide County Sheriff at Crosby (701) 965-6461. Williams County Sheriff at Williston (701) 577-7700;
- 3.) Notify the designated representative of the State Historical Society of North Dakota within 24 hours. The representative shall examine the remains and carry out the activities described in NDAC 40-02-03-04;
- 4.) If the burial is Native American, establish a meeting that includes Native Americans (a representative of the North Dakota Intertribal Reinterment Committee), the landowner/stewards, the designated representative of the State Historical Society Board, The North Dakota State Health Department, and the appropriate federal and state agencies. In addition, a representative of Vantage Pipeline shall also be notified. To insure that both the disturbed remains receive the maximum protection and that costly delays are avoided, this meeting will be conducted, if possible, within 24 to 36 hours of discovery; and
- 5.) Protect the remains from further disturbance until a consensus for the care of the human remains has been achieved. It is anticipated that any such remains will be buried at the location designated by North Dakota Intertribal Reinterment Committee representatives.

Site avoidance is preferred and generally feasible within a pipeline construction zone. If a site can be avoided, Vantage shall establish an appropriate setback and mark it as a “no disturbance” area.

For any graves that are relocated, Vantage shall pay reinterment costs. No scientific study shall be conducted on grave remains or burials excavated for reinterment deemed disrespectful of their spiritual and sacred nature. Grave remains will not be sent to local, state or federal agencies, universities, or research institutions for scientific study, unless approved by the North Dakota burial board. Additional cultural resource contingencies may apply per the recommendations of the DoS, concerning mitigation of discovery sites as well as during the Native American Consultation process.

8.10.4 Emergency Response

In the event of an accident or malfunction that may impact cultural resources, the supervising archaeologist will be contacted once the area has been deemed safe and all necessary repairs have taken place. The archaeologist shall consult with the Contractor, Vantage, and the appropriate state and/or federal agencies. If applicable, mitigation may be required to salvage or protect impacted cultural resources.

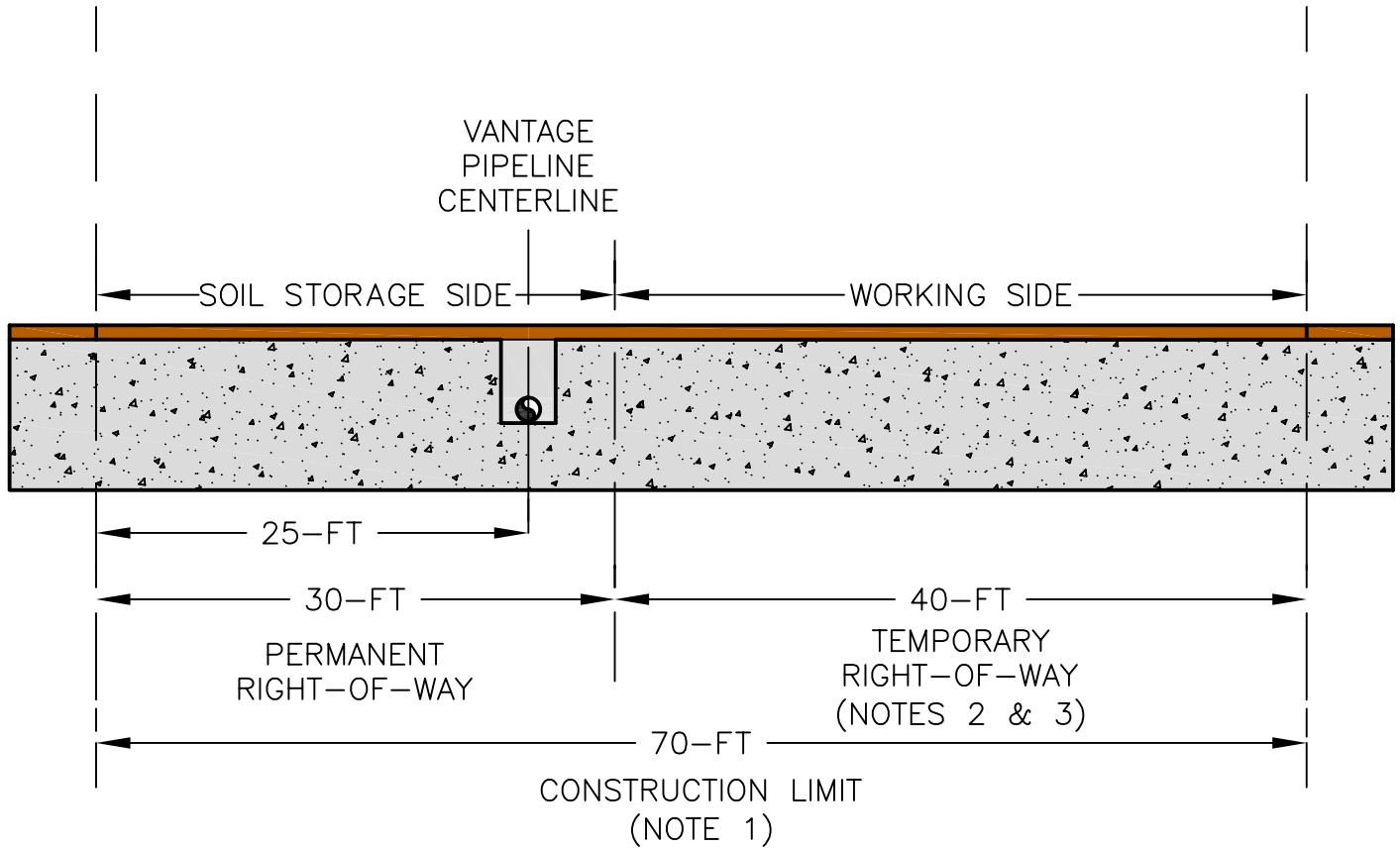
8.10.5 Curation or Disposition of Cultural Materials

All non-human and funerary cultural materials recovered from privately owned lands are the property of the landowner. Cultural materials will be returned to those landowners after analysis is complete. There is no provision at this time to curate identified materials.

ATTACHMENT 1
TO ENVIRONMENTAL PROTECTION PLAN
TYPICAL EPP DETAILS

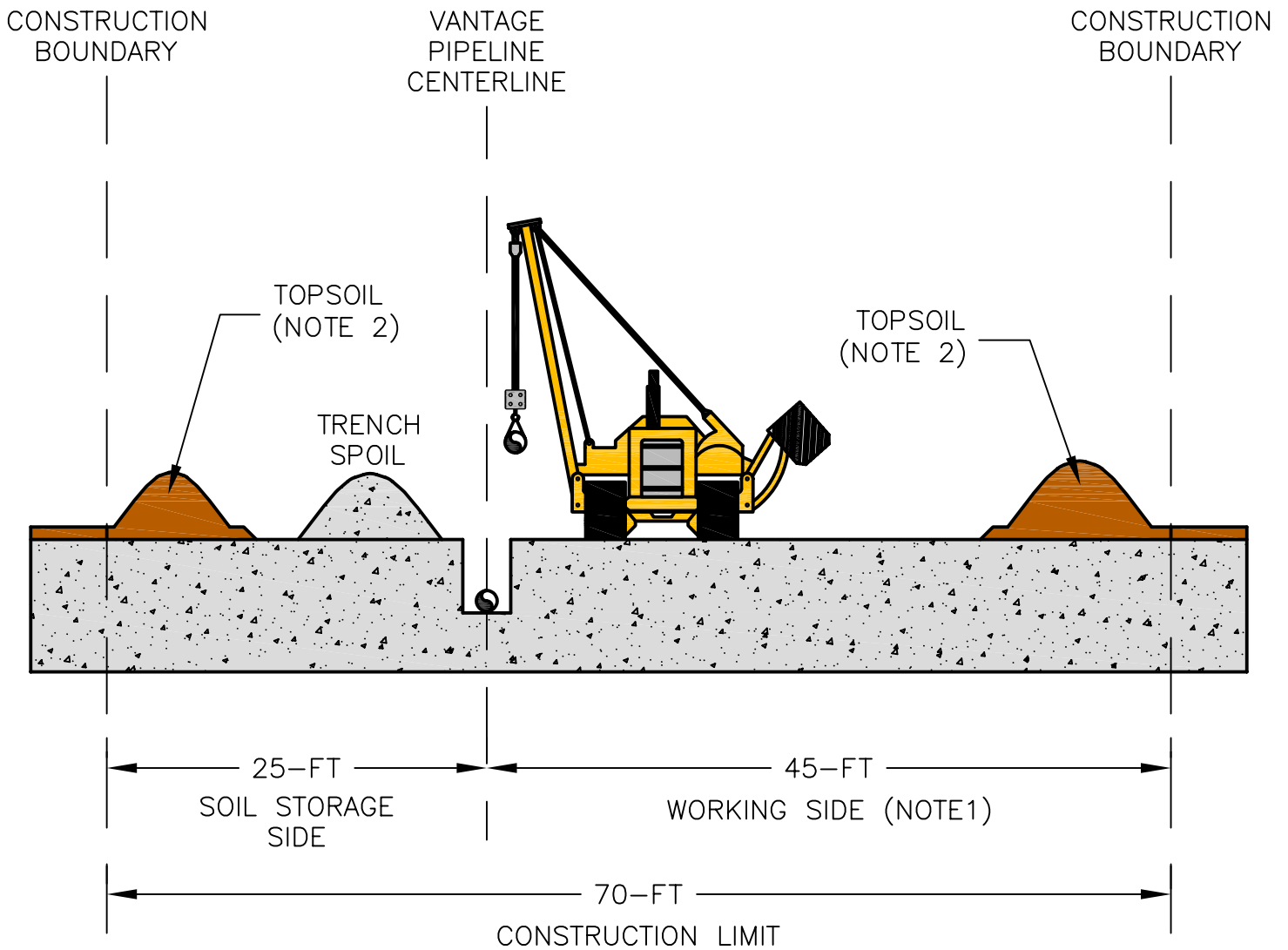
CONSTRUCTION
BOUNDARY

CONSTRUCTION
BOUNDARY



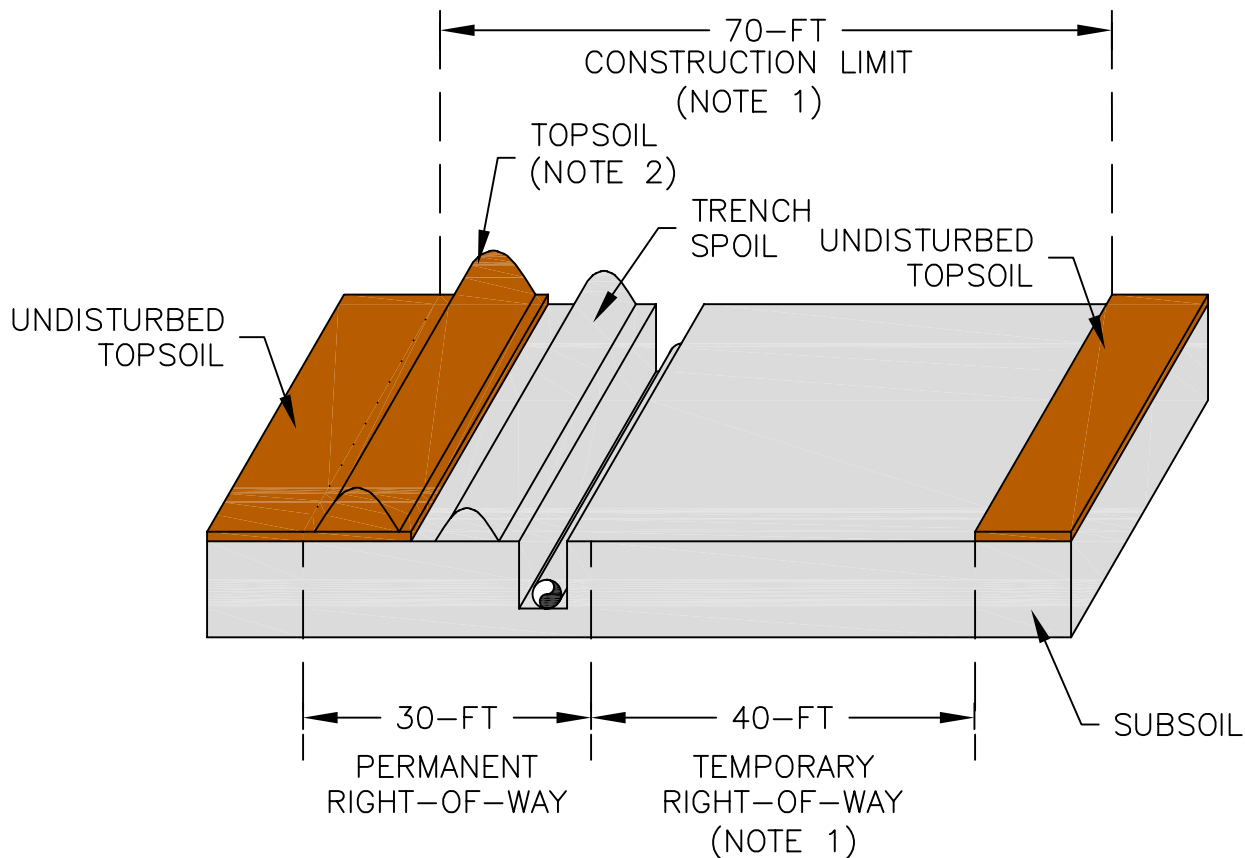
NOTES:

1. THE TYPICAL CONSTRUCTION LIMIT WIDTH WILL BE 70 FEET. THE WIDTH OF THE WORKING SIDE MAY BE DECREASED FOR SHORT DISTANCES IN LOCATIONS IDENTIFIED ON THE PLANS OR AS DIRECTED BY THE OWNER.
2. TEMPORARY RIGHT-OF-WAY WOULD BE LOCATED ON THE RIGHT SIDE OF THE ALIGNMENT UNLESS OTHERWISE NOTED ON THE PLANS.
3. ADDITIONAL TEMPORARY WORK SPACE MAY BE REQUIRED AT ROAD CROSSING LOCATIONS OR OTHER LOCATIONS IDENTIFIED ON THE CONSTRUCTION PLANS.
4. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



NOTES:

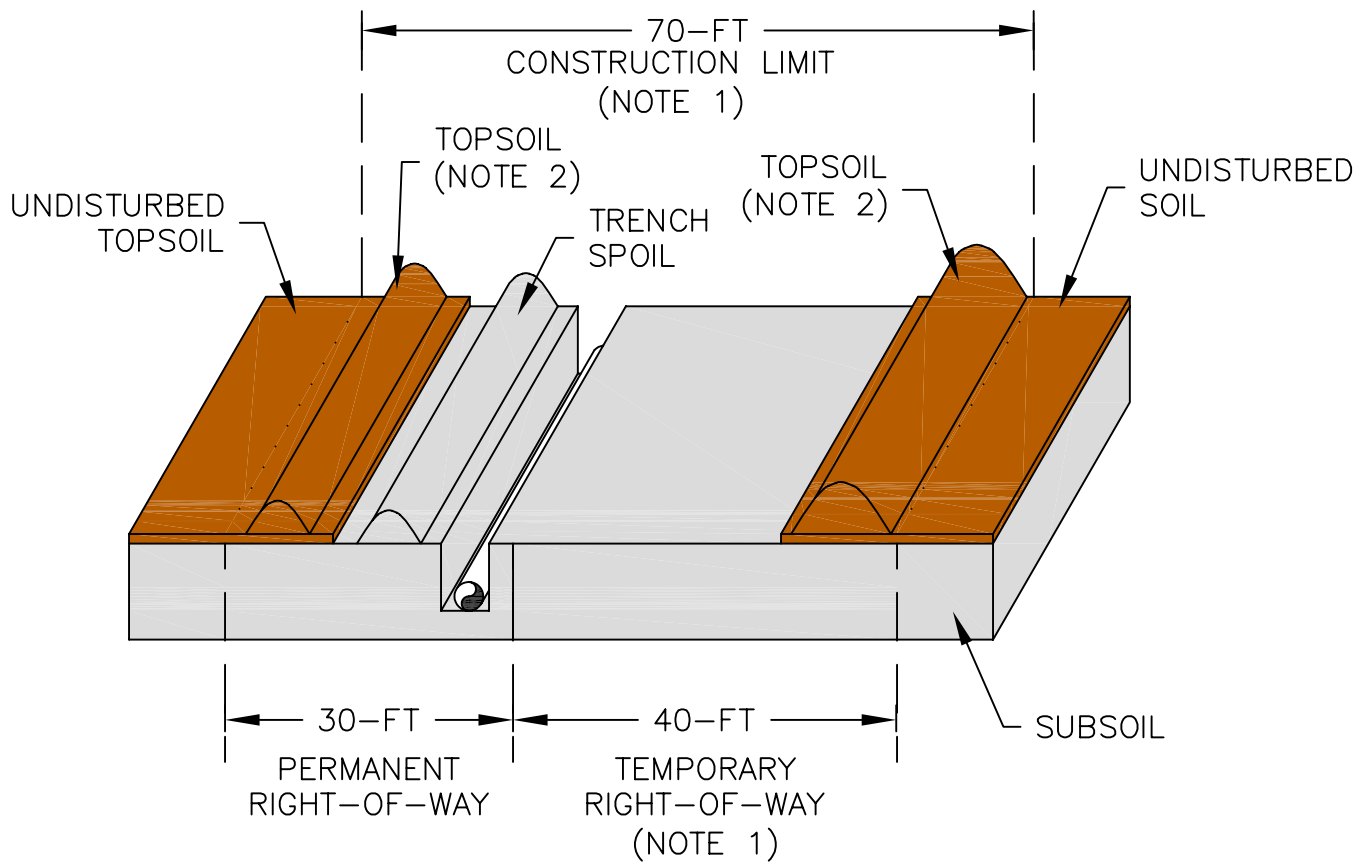
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2. STOCKPILE TOPSOIL AND TRENCH SPOIL SEPARATELY. TOPSOIL MAY BE PLACED IN A SINGLE STOCK PILE OR SPLIT INTO TWO LOCATIONS. REFER TO SOIL HANDLING DETAILS 3 THROUGH 7.
3. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



NOTES:

USE FULL ROW STRIPPING ON CULTIVATED LAND, AND ON GRASSLAND OR IMPROVED PASTURE LAND WHEN WET CONDITIONS MAY RESULT IN DEEP RUTTING.

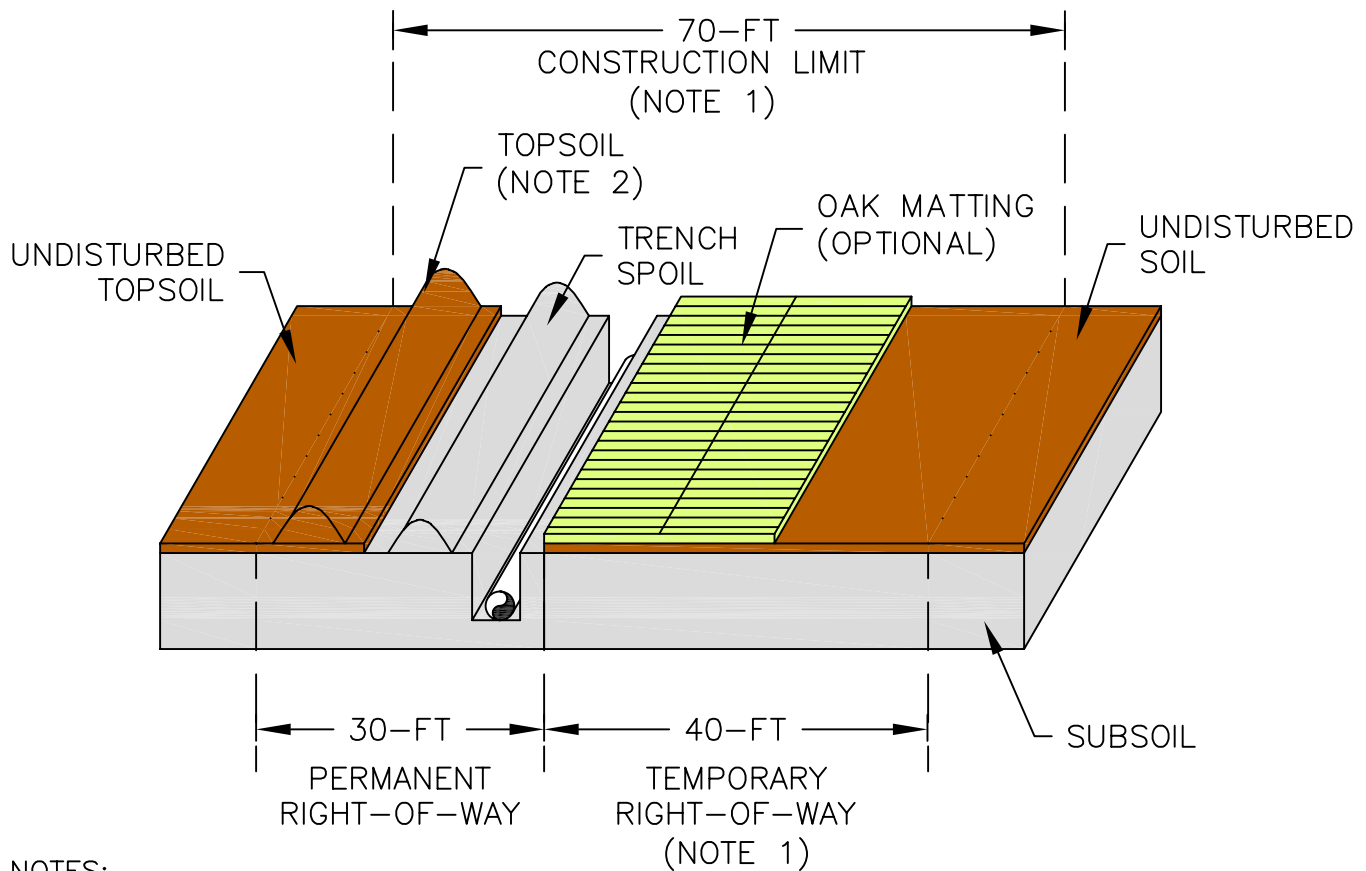
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2. TOPSOIL SHALL BE STRIPPED FROM THE AREA REQUIRED FOR SPOIL STORAGE, ABOVE THE TRENCH AND FROM THE WORK AREA. STRIP AND STOCKPILE TOPSOIL AND TRENCH SPOIL SEPARATELY. TOPSOIL STRIPPING IS NOT REQUIRED BELOW THE AREA REQUIRED FOR TOPSOIL STORAGE. PROVIDE ADEQUATE SEPARATION BETWEEN TOPSOIL AND SPOIL STOCKPILES TO PREVENT MIXING. TYPICAL A HORIZION DEPTH (TOPSOIL) FROM THE NRCS SOIL SURVEY IS INDICATED ON THE ALIGNMENT SHEETS AND IS INTEND AS A GUIDELINE. THE ACTUAL TOPSOIL SALVAGE DEPTH WILL VARY LOCALLY AND ADJUSTMENT OF DEPTH WILL BE REQUIRED TO SALVAGE ALL AVAILABLE TOPSOIL. SEVERAL PASSES USING A GRADER OR OTHER EQUIPEMENT MAY BE REQUIRED.
3. SOIL SALVAGE ACTIVITIES SHOULD NOT BE CONDUCTED IN WET CONDITIONS OR DURING HIGH WINDS IF SOIL IS PRONE TO WIND EROSION. DISCONTINE STRIPPING IN LOCATIONS WHERE BUFFERS ARE REQUIRED AT WATERWAYS, WETLANDS, OR OTHER SENSITIVE AREAS.
4. BACKFILL TRENCH WITH SPOIL AND COMPACT IN ACCORDANCE WITH PROJECT SPECIFICATIONS. PROVIDE CROWN OVER TRENCH USING AVAILABLE SPOIL TO ACCOMMODATE SETTLEMENT. CROWN SHOULD BE DISCONTINUED ACROSS DRAINAGEWAYS.
5. PROVIDE SUBSOIL COMPACTION RELIEF IF REQUIRED AND DISC TO BREAKUP LARGE CLODS IF NECESSARY. REMOVE OVERSIZED BOULDERS PRIOR TO TOPSOIL PLACEMENT.
6. PLACE TOPSOIL EVENLY ACROSS ENTIRE WORK AREA USING GRADER OR OTHER EQUIPEMENT. MAINTAIN CROWN OVER TRENCH CENTERLINE. REMOVE OVERSIZED MATERIALS FROM FINAL SURFACE TO BE CONSISTENT WITH LOCAL CONDITIONS.



NOTES:

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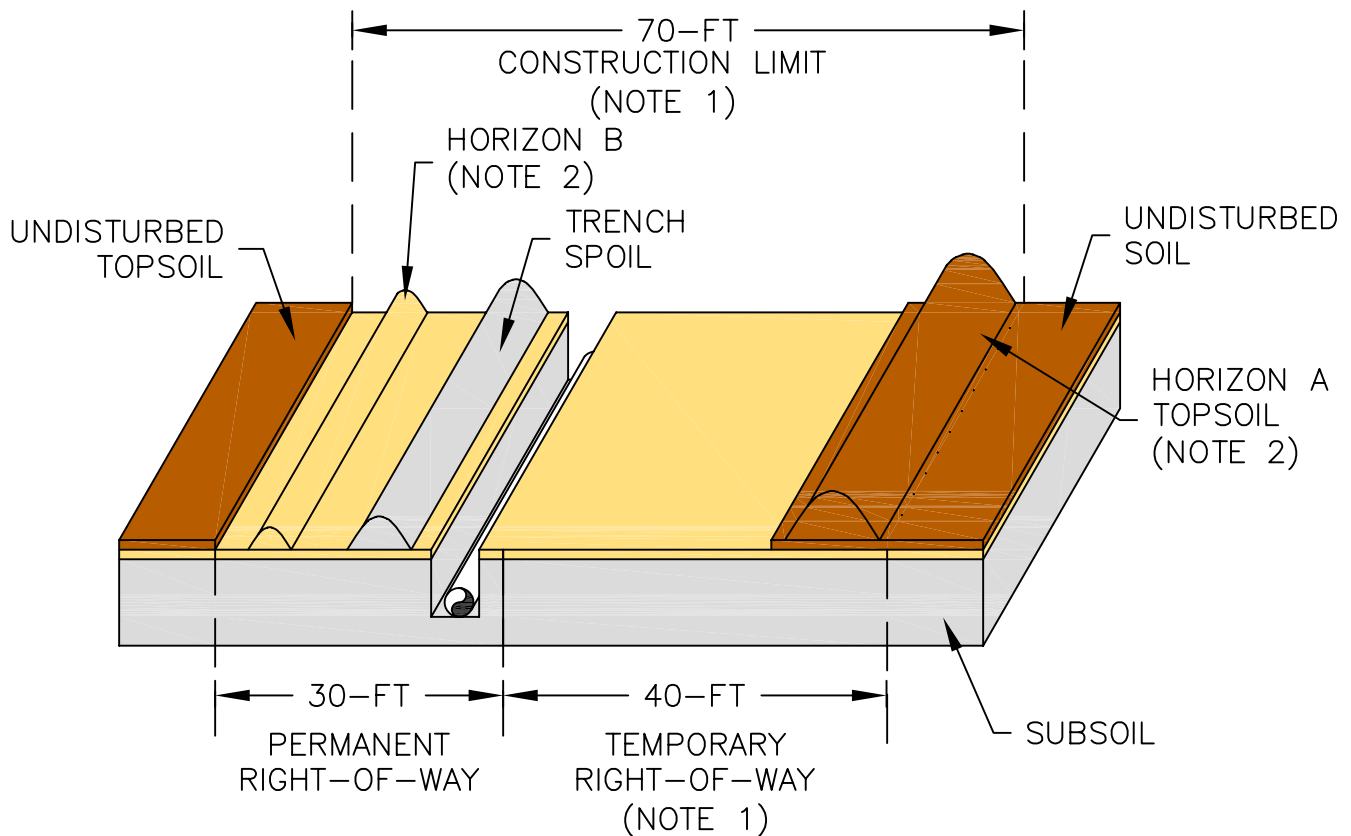
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NOTES:

LIMIT STRIPPING TO PERMANENT ROW ON CULTIVATED LAND, ON GRASSLAND OR IMPROVED PASTURE LAND FOR SOILS PRONE TO EXCESSIVE WIND EROSION. OPTION 3 MAY BE USED IN LOCATIONS WHERE THE WIDTH OF STRIPPING WOULD BE LIMITED.

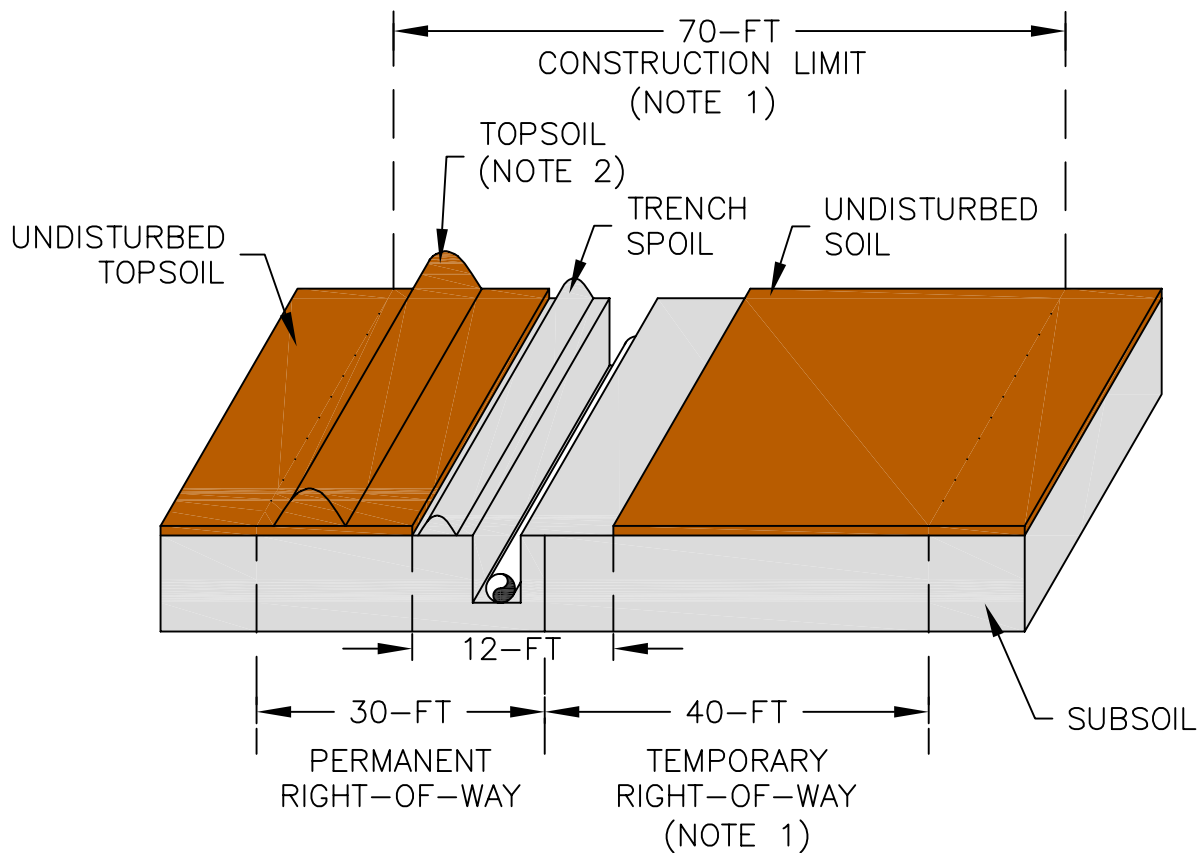
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5. REMOVE OVERSIZED BOULDERS FROM SURFACE PRIOR TO TOPSOIL PLACEMENT.
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NOTES:

FULL WIDTH ROW STRIPPING ON LAND DESIGNATED AS PRIME FARM LAND. THE A & B HORIZION SOILS WOULD BE SALVAGED AT PRIME FARM LAND LOCATIONS.

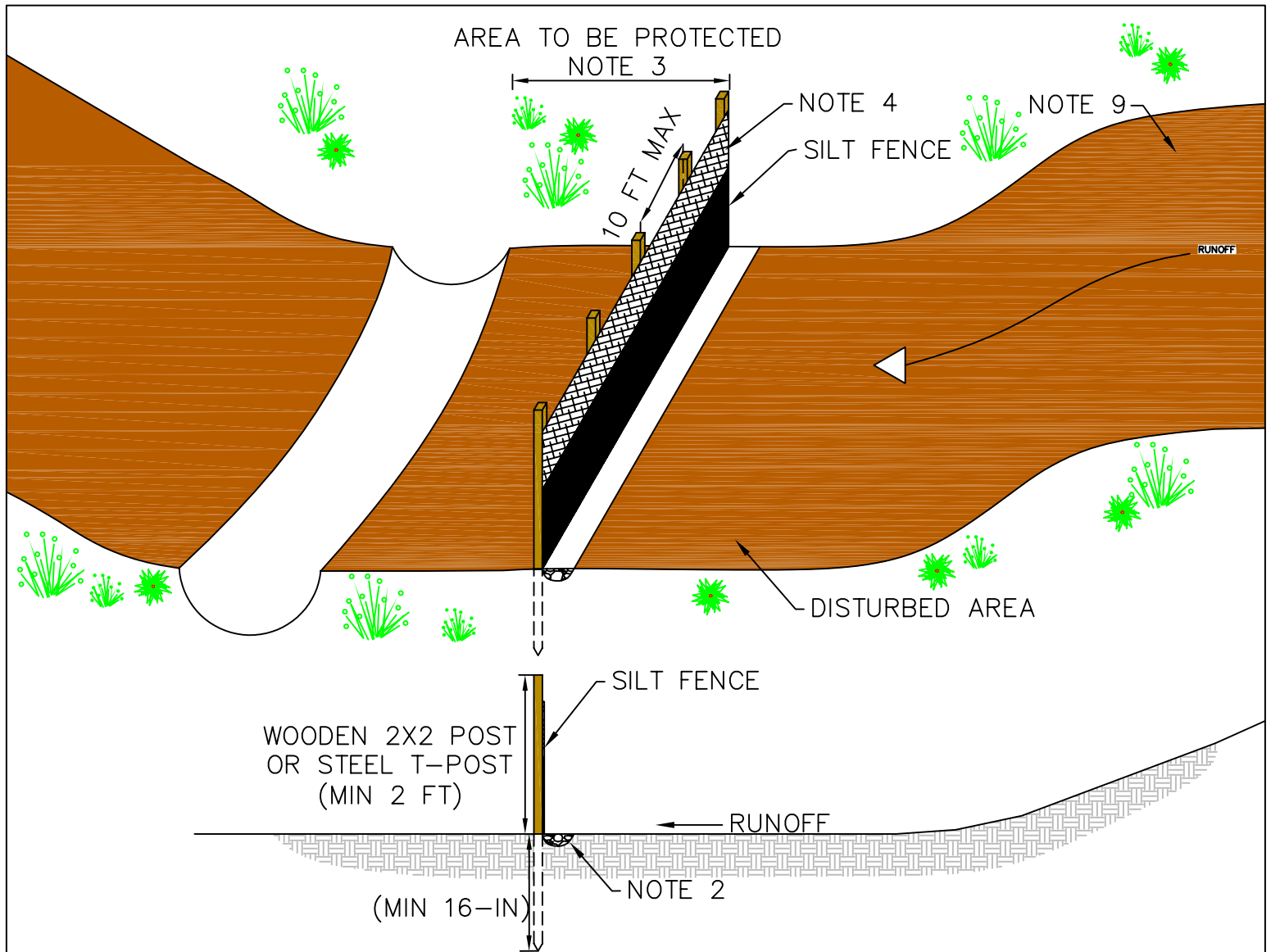
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2. TOPSOIL (A HORIZION SOIL) SHALL BE STRIPPED TO EXPOSE THE B HORIZION SOIL. THE A HORIZION SOIL WOULD BE STOCKPILED AT THE OUTSIDE EDGE OF THE TEMPORARY ROW. B HORIZION SOIL WOULD BE STRIPPED AND STOCKPILED WITHIN THE PERMANENT ROW. EXCAVATE TRENCH SPOIL AND STOCKPILE ADJACENT TO TRENCH. STOCKPILE B HORIZION SOIL AND TRENCH SPOIL SEPARATELY. TOPSOIL STRIPPING IS NOT REQUIRED BELOW THE AREA REQUIRED FOR TOPSOIL STORAGE. TYPICAL A AND B HORIZION DEPTHS BASED ON THE NRCS SOIL SURVEY IS INDICATED ON THE ALIGNMENT SHEETS AND IS INTEND AS A GUIDELINE. THE ACTUAL DEPTHS OF SOIL SALVAGE WILL VARY LOCALLY AND ADJUSTMENT OF DEPTH WILL BE REQUIRED TO SALVAGE AVAILABLE SOILS. SEVERAL PASSES USING A GRADER OR OTHER EQUIPEMENT MAY BE REQUIRED.
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4. BACKFILL TRENCH WITH SPOIL AND COMPACT PRIOR TO PLACING B HORIZION SOIL. USE CARE TO ENSURE SPOILS ARE REMOVED FROM B HORIZION SOILS BELOW SPOIL PILE. REPLACE AND COMPACT B HORIZION SOIL INTO TRENCH AND COMPACT IN ACCORDANCE WITH PROJECT SPECIFICATIONS. PROVIDE CROWN OVER TRENCH TO ACCOMMODATE SETTLEMENT. CROWN SHOULD BE DISCONTINUED ACROSS DRAINAGEWAYS.
5. PROVIDE COMPACTION RELIEF IF REQUIRED AND DISK IF TO BREAKUP LARGE CLOUDS IF NECESSARY. REMOVE OVERSIZED BOULDERS PRIOR TO TOPSOIL PLACEMENT.
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NOTES:

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5. REMOVE OVERSIZED BOULDERS FROM SUBSOIL SURFACE PRIOR TO TOPSOIL PLACEMENT.
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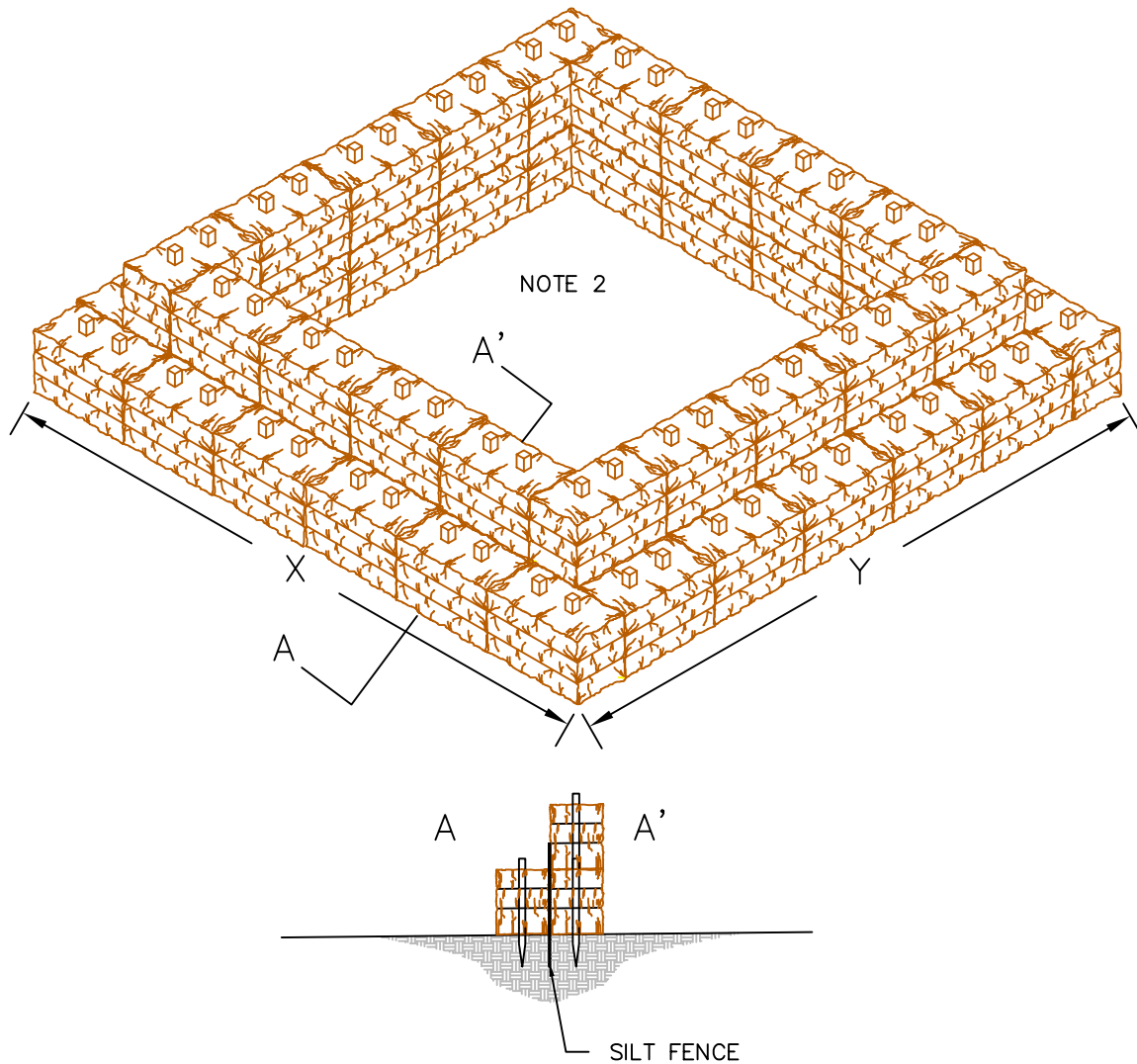


NOTES:

1. TEMPORARY SEDIMENT FENCE SHALL BE INSTALLED PRIOR TO ANY GRADING WORK IN THE AREA TO BE PROTECTED.
2. SILT FENCE MAY BE INSTALLED EITHER BY EXCAVATING AN ANCHOR TRENCH OR USING A SILT FENCE PLOW. ANCHOR TRENCH SHALL BE LOCATED ON UPHILL SIDE OF FENCE.
3. FIELD LOCATE SILT FENCING TO PROVIDE SEDIMENT CONTROL BETWEEN WATERWAYS OR WETLANDS LOCATED ADJACENT AND DOWNGRADIENT OF CONSTRUCTION DISTURBANCE. SILT FENCE SHOULD BE LOCATED TO PROVIDE A BUFFER OF UNDISTURBED VEGETATION BETWEEN WORK AREA AND PROTECTED AREA.
4. FOR LONG-TERM APPLICATIONS, WOVEN WIRE FENCE MAY BE FASTENED TO FENCE POST WITH TIES OR STAPLES.
5. FILTER CLOTH TO BE FASTENED SECURELY TO SMOOTH WIRE OR WOVEN WIRE FENCE WITH TIES.SPACED EVERY 24" ALONG TOP OF FABRIC.
6. WHEN TWO (2) SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX (6) INCHES AND FOLDED
7. SEDIMENT ACCUMULATION SHALL BE REMOVED WHEN BULGES DEVELOP IN THE SILT FENCE.
8. SILT FENCE SHALL BE MAINTAINED, AS NEEDED, THROUGHOUT THE CONSTRUCTION PERIOD AND REMOVED IN CONJUNCTION WITH THE FINAL GRADING AND SITE STABILIZATION.
9. PROVIDE SLOPE BREAKERS ABOVE SILT FENCE WHEN REQUIRED.
10. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



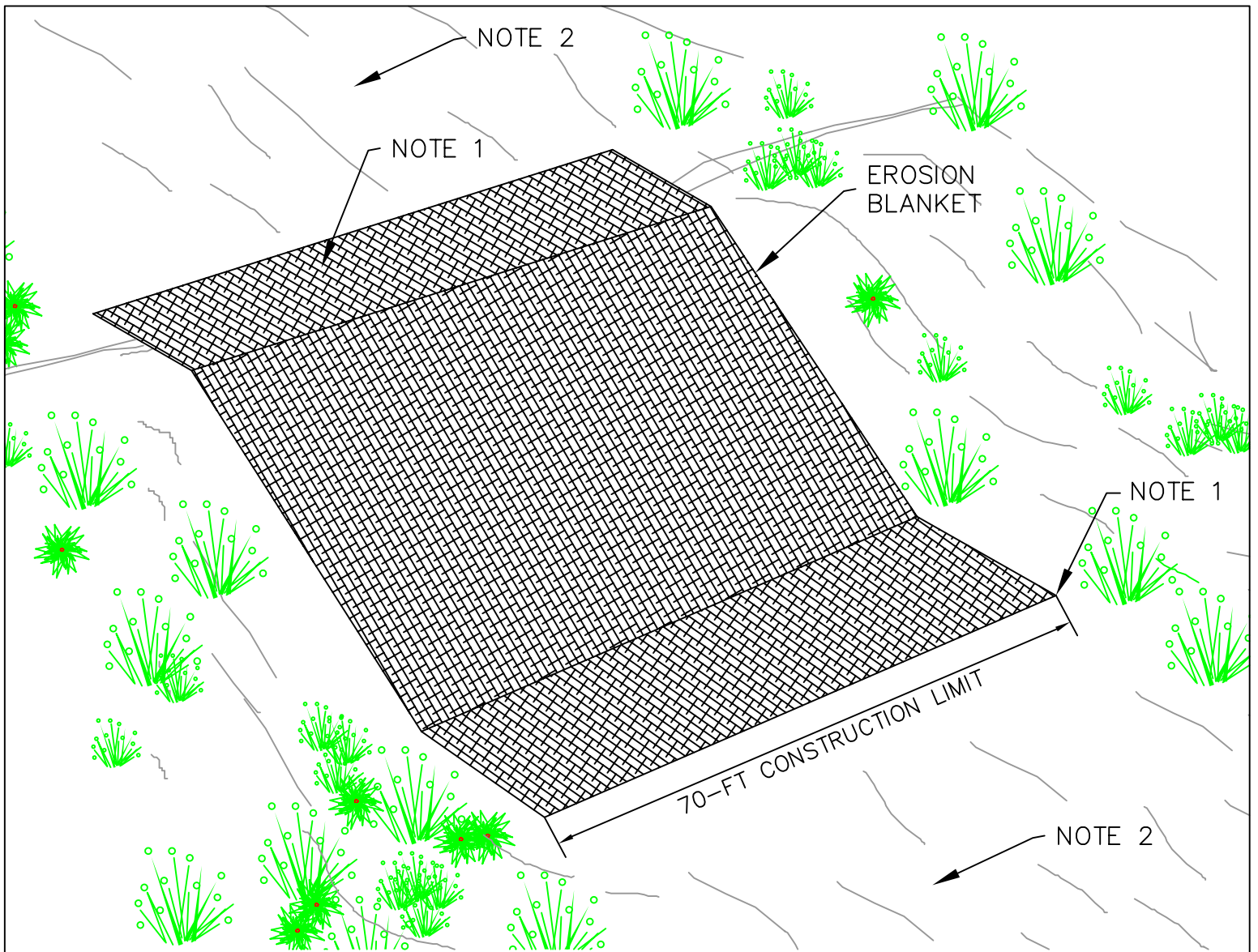
**VANTAGE PIPELINE PROJECT
DETAIL 8 - TYPICAL SILT FENCE INSTALLATION**



NOTES:

1. ARRANGE THE STRAW BALES TO THE X AND Y DIMENSIONS AS SPECIFIED BELOW FOR THE REQUIRED PUMPING RATE.
2. PROTECT SUMP FLOOR FROM EROSION. LINE ENTIRE SUMP FLOOR WITH GEOTEXTILE FILTER FABRIC OR OTHER MATERIALS TO PREVENT EROSION.
3. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.

X-DIMENSION	Y-DIMENSION	PUMPING RATE
FT	FT	GPM
10	20	300
15	20	350
20	20	400
20	25	450
25	25	500



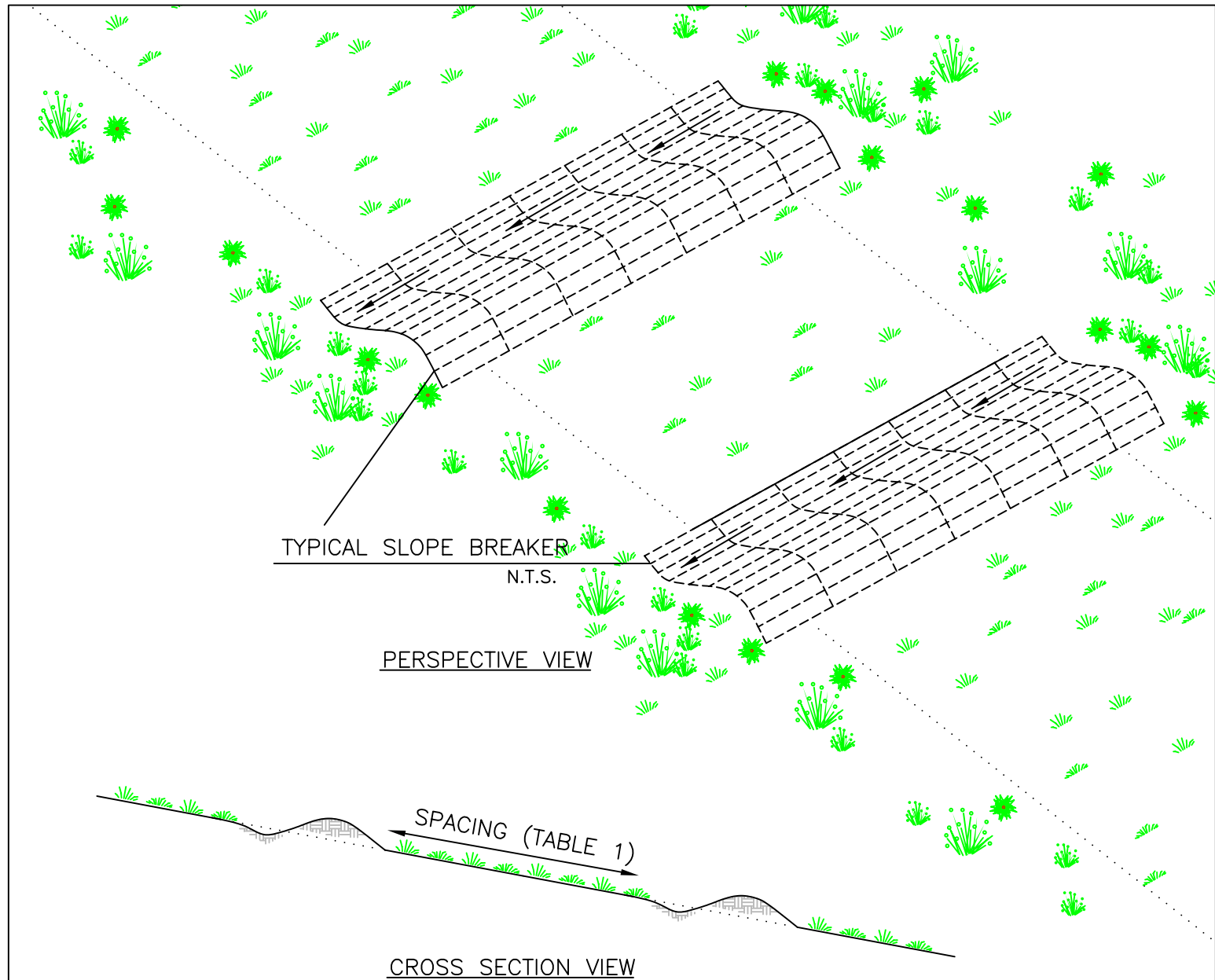
NOTES:

ROLLED EROSION CONTROL PRODUCTS (RECP). TEMPORARY DESIGNED FOR SHORT TERM (UP TO 1 YR).

USE DEGRADABLE MATERIALS (GENERALLY PREFERRED AND MORE PREVALENT) MADE FROM NATURALLY DECOMPOSING MATERIALS. DIFFERENT FIBERS YIELD DIFFERENT CHARACTERISTICS AND BREAKDOWN PATTERNS. RECPS ARE EITHER: PHOTODEGRADABLE – BROKEN DOWN BY SUNLIGHT EXPOSURE OR BIODEGRADABLE – DETERIORATED BY ACTION OF BIOLOGICAL ORGANISMS.

CONSULT PRODUCT DISTRIBUTORS FOR RECOMMENDATIONS REGARDING RECP SELECTION AND PERFORMANCE CRITERIA SUITABLE FOR SITE-SPECIFIC REQUIREMENTS. EVALUATE: DURATION, SLOPE GRADIENT, SOIL TYPE & ERODIBILITY, SEASONAL TEMPERATURE & WEATHER PATTERNS, REGIONAL PRECIPITATION DISTRIBUTION, VEGETATION NEEDS, ESPECIALLY WHERE GERMINATION CONDITIONS ARE NOT OPTIMAL.

1. ANCHOR RECP A MINIMUM OF 5 FEET ABOVE OR BELOW SLOPE BREAKS ACCORDING TO PRODUCT SPECIFICATIONS.
2. RECP TO MATCH GRADE ALONG ADJACENT RECLAIMED AND SEEDED TEMPORARY ROW. PROVIDE SLOPE BREAKERS ABOVE RECP APPLICATION, WHEN REQUIRED.
3. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



TYPICAL SLOPE BREAKER

N.T.S.

PERSPECTIVE VIEW

CROSS SECTION VIEW

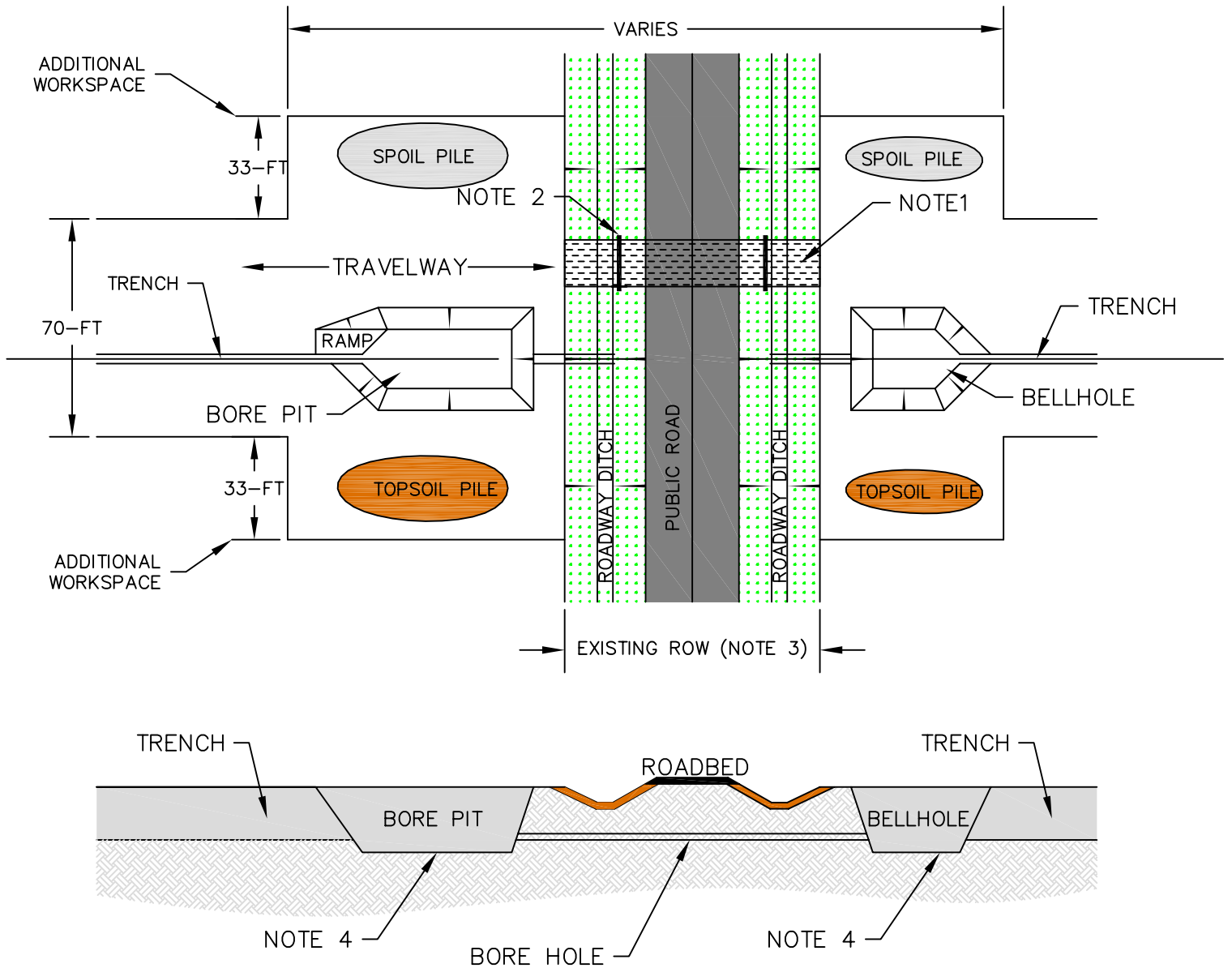
NOTES:

1. INSTALL PERMANENT SLOPE BREAKERS ACCORDING TO THE SPACING IN TABLE 1.
2. IF THE LENGTH OF THE SLOPE IS LESS THAN THE DISTANCE OF THE REQUIRED SPACING IN TABLE 1, NO SLOPE BREAKERS IS REQUIRED UNLESS THE SLOPE IS TO A WATERCOURSE, WHERE ONE LARGE BREAKER SHOULD BE INSTALLED AT THE TOE OF THE SLOPE.
3. DO NOT INSTALL PERMANENT SLOPE BREAKERS ON AGRICULTURAL LAND UNLESS SPECIFICALLY REQUESTED BY THE LANDOWNER.
4. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.

<u>TABLE 1</u>	
<u>SLOPE (%)</u>	<u>SPACING (FT)</u>
5-15%	300 FT
>15-30%	200 FT
>30%	100 FT

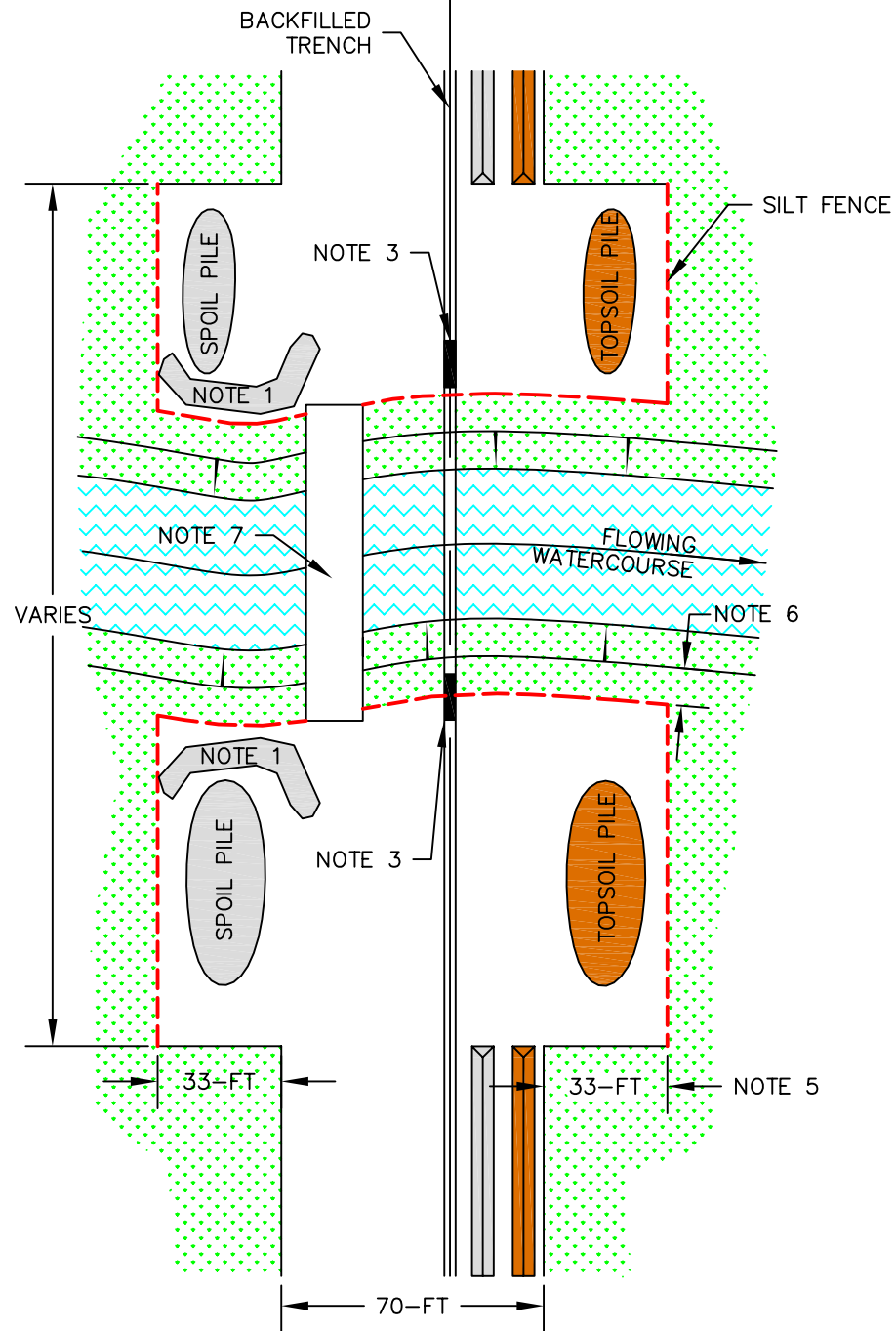


**VANTAGE PIPELINE PROJECT
DETAIL 11 - SLOPE BREAKERS**



NOTES:

1. INSTALL TEMPORARY CROSSING OVER ROADWAY AND BORROW PITS. PROTECTIVE LAYER SHALL BE USED ON PAVED ROAD SURFACES TO PREVENT DAMAGE FROM TRACKED EQUIPEMENT.
2. IF NECESSARY, INSTALL TEMPORARY CULVERT AND FILL IN BORROW PIT.
3. MAINTAIN EXISTING VEGETATION IN BORROW PITS. STRIPPING SHOULD BE LIMITED TO THE AREA OF TEMPORARY CROSSING. PROVIDE SEDIMENT CONTROLS IN ACCORADANCE WITH STORMWATER MANAGEMENT PLAN.
4. ELEVATION OF BORE PIT AND BELL HOLE FLOORS TO BE ADJUSTED TO PROVIDE MINIMUM COVER BELOW ROADWAY AND BORROW PITS.
5. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



NOTES:

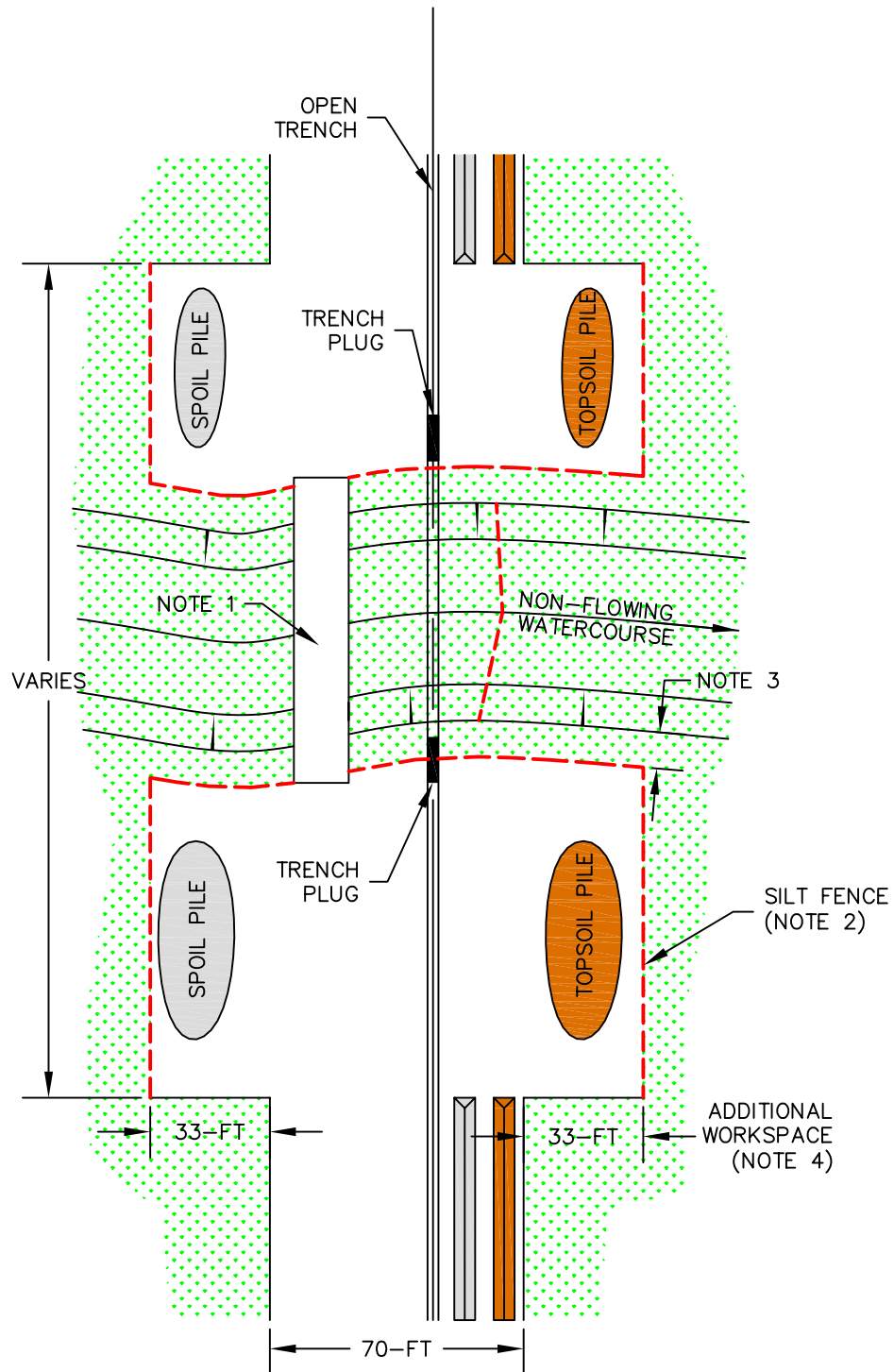
THIS METHOD APPLIES TO FLOWING WATERWAYS.

1. TOPSOIL AND SPOIL SHOULD BE STRIPPED FROM THE TRENCHLINE IN ALL WETLAND AND RIPARIAN AREAS. STOCKPILE WET MATERIALS IN TEMPORARY WORK AREA WITHIN SEDIMENT CONTAINMENT BERM CONSTRUCTED FROM SUBSOILS OBTAINED FROM THE STRIPPED ROW.
2. NO HEAVY SILT LADEN WATER SHALL BE DISCHARGED TO THE WATERBODY. USE STRAW BALE DEWATERING STRUCTURES TO TREAT WATER PUMPED FROM THE TRENCH.
3. DITCH PLUGS MUST REMAIN INPLACE TO SEPARATE THE MAINLINE DITCH FROM THE WATERBODY CROSSING UNTIL BACKFILL IS COMPLETE. CONTRACTOR SHALL EXCAVATE TRENCH IN CROSSING AS EXPEDITIOUSLY AS POSSIBLE AND INSTALL PIPE TO REDUCE DURATION OF WORK IN WATERBODY. TRENCH PLUGS SHALL BE INSTALLED UP SLOPE FROM SLOPE BREAKERS ADJACENT TO CROSSING.
4. CONTRACTOR SHALL RESTORE WATERBODY CHANNEL AND BANKS TO PRECONSTRUCTION CONTOUR, UNLESS OTHERWISE APPROVED BY THE PROJECT ENGINEER. INSTALL EROSION CONTROLS AT CROSSING AS PROVIDED IN THE SWPP PLAN. MAINTAIN STORMWATER BMPS UNTIL ADJACENT ROW IS STABILIZED.
5. PROVIDE ADDITIONAL WORKSPACE WHEN INDICATED ON THE CONSTRUCTION PLANS FOR STORAGE OF TOPSOIL AND SPOIL EXCAVATED FROM THE CROSSING. DO NOT STOCKPILE TOPSOIL OR SPOIL WITHIN THE WATERWAY.
6. PROVIDE A 10-FT. BUFFER BETWEEN STRIPPED AREA AND TOP OF STREAM BANK. STRIPPING WITHIN WATERCOURSE SHOULD BE LIMITED TO THE AREA OF TEMPORARY CROSSING. PROVIDE SEDIMENT CONTROLS WITHIN THE WATERCOURSE IN ACCORDANCE WITH STORMWATER MANAGEMENT PLAN.
7. INSTALL TEMPORARY CROSSING (OPTIONAL) OVER WATERWAY AS REQUIRED FOR SITE SPECIFIC CONDITIONS.
8. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.

**VANTAGE PIPELINE PROJECT
DETAIL 13 - FLOWING WATERCOURSE CROSSING**



FILE:VANTAGE_EPP_DETAILS.DWG DATE: JAN. 28, 2011 SCALE: NTS



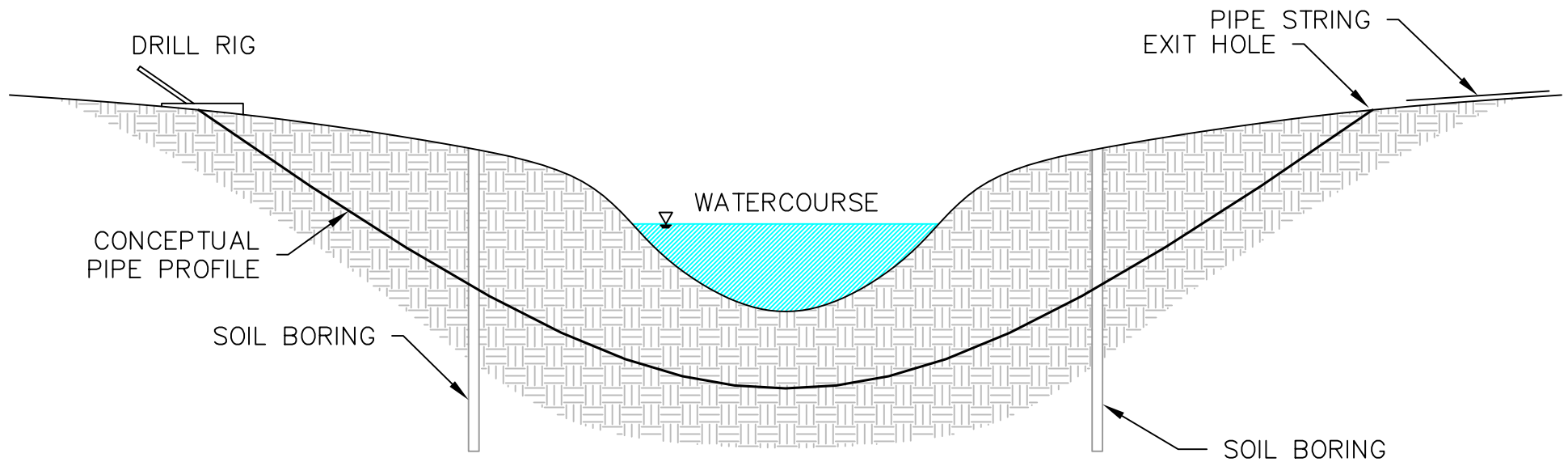
NOTES:

THIS METHOD APPLIES TO NON-FLOWING WATERWAYS.

1. INSTALL TEMPORARY CROSSING (OPTIONAL) OVER WATERWAY AS REQUIRED FOR SITE SPECIFIC CONDITIONS.
2. INSTALL SILT FENCE OR OTHER EROSION CONTROLS IN ACCORDANCE WITH THE STORMWATER MANAGEMENT PLAN. SEDIMENT CONTROLS TO BE INSTALLED ALONG STRIPPING LIMITS TO BE MAINTAINED UNTIL CONSTRUCTION OF THE CROSSING IS COMPLETED. UPON COMPLETION OF CROSSING RECLAMATION REINSTALL AND MAINTAIN SEDIMENT AND EROSION CONTROLS UNTIL CROSSING AREA IS STABILIZED.
3. PROVIDE A 10-FT. BUFFER BETWEEN STRIPPED AREA AND TOP OF STREAM BANK. STRIPPING WITHIN WATERCOURSE SHOULD BE LIMITED TO THE AREA OF TEMPORARY CROSSING. PROVIDE SEDIMENT CONTROLS WITHIN THE WATERCOURSE IN ACCORDANCE WITH STORMWATER MANAGEMENT PLAN.
4. PROVIDE ADDITIONAL WORKSPACE WHEN INDICATED ON THE CONSTRUCTION PLANS FOR STORAGE OF TOPSOIL AND SPOIL EXCAVATED FROM THE CROSSING. DO NOT STOCKPILE TOPSOIL OR SPOIL WITHIN THE WATERWAY.
5. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.

**VANTAGE PIPELINE PROJECT
DETAIL 14 - NON-FLOWING WATERCOURSE CROSSING**





NOTES:

USE DIRECTIONAL BORING METHOD FOR WATERCOURSES AND WETLANDS WHERE OPEN CUT METHOD IS NOT APPROVED. PIPELINE WOULD BE INSTALLED AT CROSSING BY DRILLING A PILOT HOLE, REAMING THE HOLE AND PIPE PULL BACK.

1. CONTRACTOR SHALL PERFORM GEOTECHNICAL INVESTIGATION TO CHARACTERIZE SUBSURFACE CONDITIONS AND DETERMINE FEASIBILITY FOR DIRECTIONAL BORING METHOD. DIRECTIONAL BORING MAY BE PROBLEMATIC IF UNCONSOLIDATED GRAVELS OCCUR.
2. CONTRACTOR SHALL PROVIDE BORE LOCATION PLAN TO PROJECT ENGINEER FOR APPROVAL. THE PLAN SHOULD PROVIDE LOCATIONS OF MUD CONTAINMENT AND STORMWATER BMPS. PLAN SHOULD IDENTIFY EQUIPEMENT AND CONTINGENCIES TO CONTAIN MUD IN THE EVENT OF A RELEASE.
3. MAINTAIN A BUFFER ZONE (10-FT MIN.) BETWEEN BOTH THE BORING LOCATION AND EXIT LOCATIONS AND THE STREAM BANK. PROVIDE STORMWATER BMPS IN ACCORDANCE WITH THE SWPP PLAN AS APPROVED. DO NOT STRIP TOPSOIL OR VEGETATION FROM THE BUFFER ZONE.
4. MANAGE DRILL MUD TO PREVENT DISCHARGE TO WATERCOURSE. PROVIDE MUD STOAGE IN TANKS OR PITS, FULL TIME MONITORING SHOULD BE PROVIDED TO DETECT RELEASE TO STREAM. DISCONTINUE BORING IF DISCHARGE IS DETECTED. DRILL MUD SHOULD CONSIST OF BENTONITE WITHOUT ANY ADDITIVES, UNLESS APPROVED.
5. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.

**VANTAGE PIPELINE PROJECT
DETAIL 15 - BORING UNDER A WATERCOURSE**



FILE:VANTAGE_EPP_DETAILS.DWG DATE: JAN. 28, 2011 SCALE: NTS

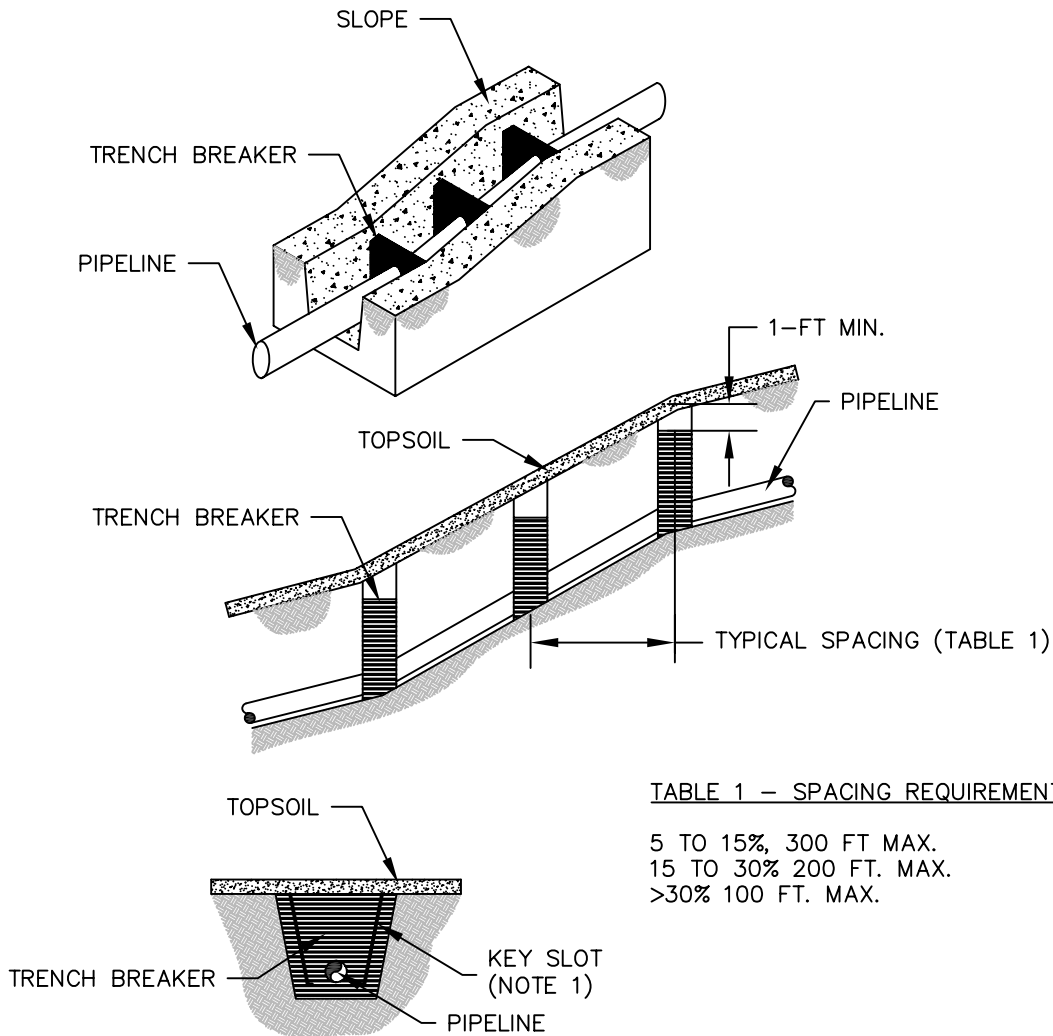
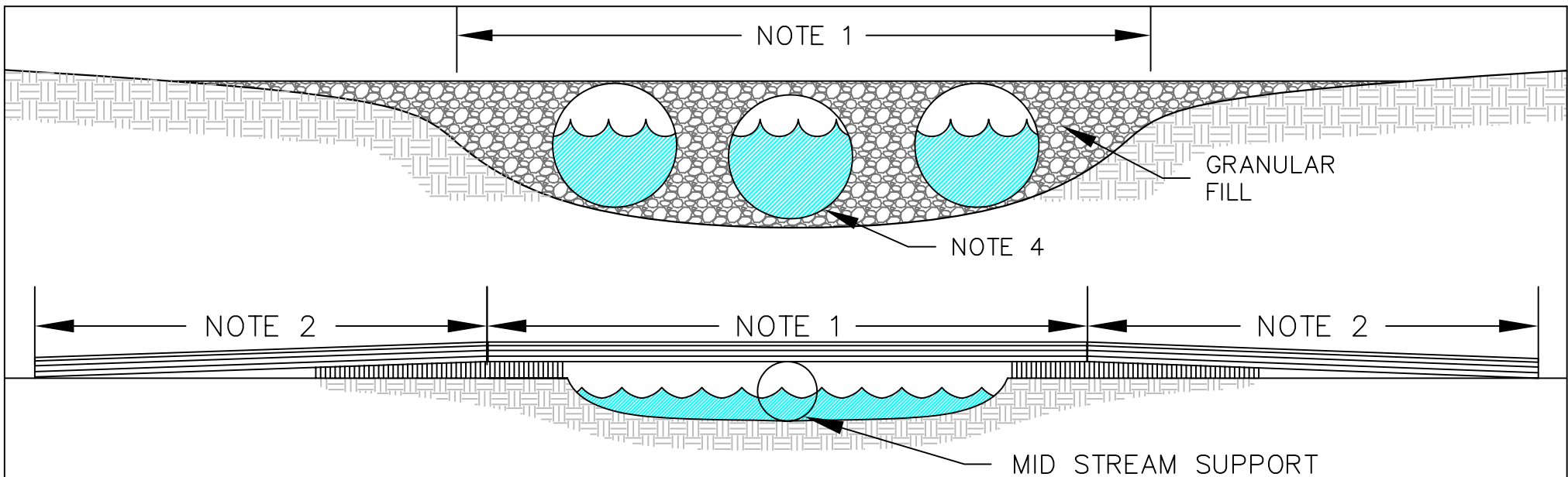


TABLE 1 – SPACING REQUIREMENTS:

5 TO 15%, 300 FT. MAX.
 15 TO 30% 200 FT. MAX.
 >30% 100 FT. MAX.

NOTES:

1. INSTALL TRENCH BREAKERS AT LOCATIONS ALONG THE TRENCH WHERE THE PROFILE IS 5% SLOPE OR GREATER. INSTALL TRENCH BREAKERS AT LOCATIONS AT THE BASE OF SLOPE ADJACENT TO WATERBODIES AND WETLANDS WHERE NEEDED TO AVOID DRAINING OF WETLANDS INTO TRENCH.
2. TRENCH BREAKERS TO BE CONSTRUCTED OF EITHER SANDBAGS (MIXTURE OF SAND AND CEMENT 6:1) OR USING Polyurethane FOAM IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
3. KEY TRENCH BREAKERS A MINIMUM OF 1 FOOT INTO TRENCH WALL.
4. BACKFILL DOWNSLOPE SIDE OF TRENCH BREAKER PRIOR TO PLACING FILL ON UPSLOPE SIDE OF TRENCH BREAKER.
5. FINAL LOCATIONS FOR TRENCH BREAKERS TO BE DETERMINE BY PROJECT ENGINEER BASED ON SITE SPECIFIC CONDITIONS. TYPICAL SPACING REQUIREMENT ARE AS FOLLOWS:
 5 TO 15 % SLOPE – MINIMUM 300 FT SPACING
 15 TO 30 % SLOPE – MINIMUM 200 FT. SPACING
 GREATER THAN 30 % SLOPE – MINIMUM 100 FT SPACING.
6. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



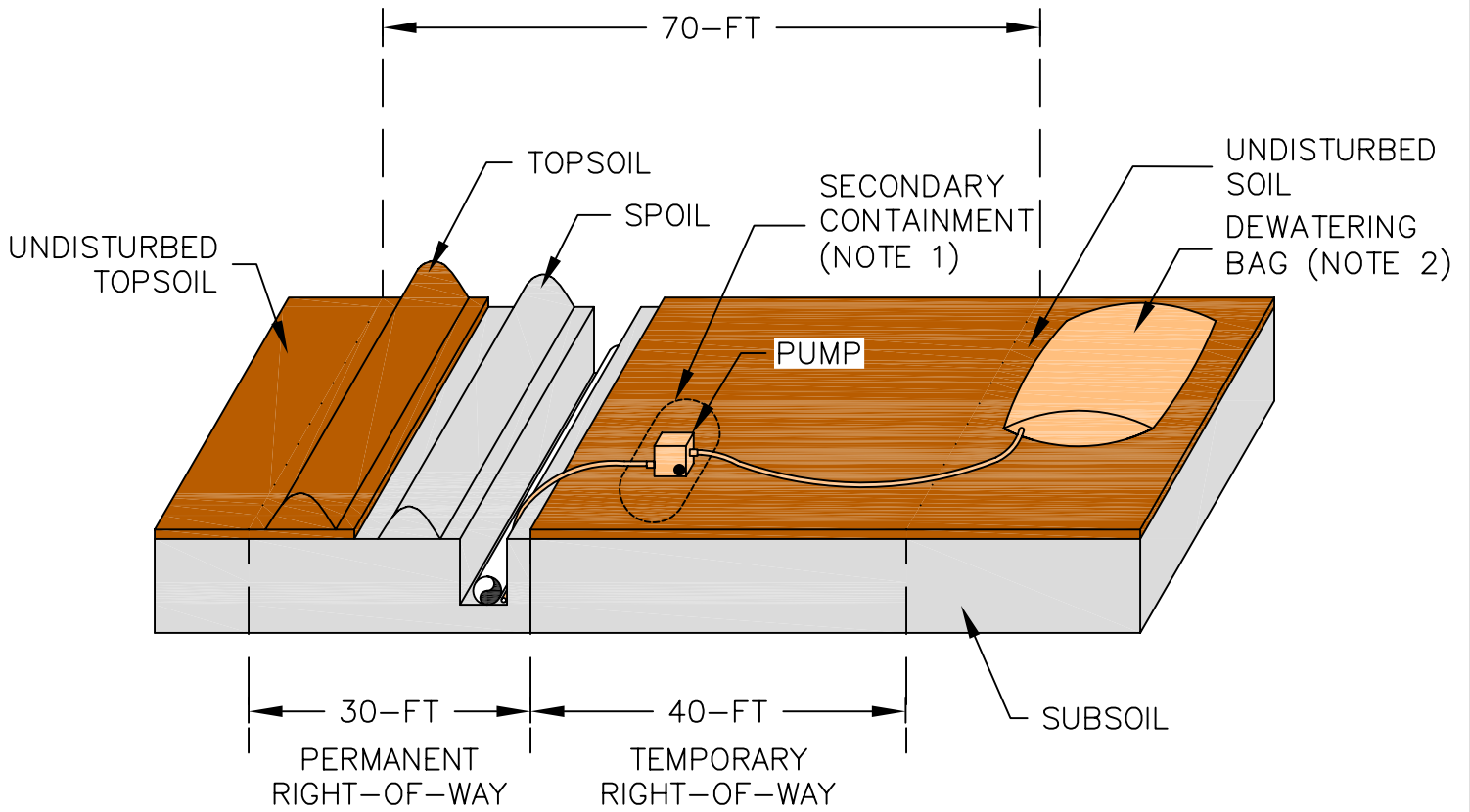
NOTES:

1. BRIDGE MUST SPAN FROM TOP OF BANK TO TOP OF BANK. CONSTRUCT BRIDGE IN ACCORDANCE WITH REQUIREMENTS IN EPP. THE CROSSING MAY BE CONSTRUCTED WITH EITHER A WOODEN TIMBER MAT OR USING IN-STREAM CULVERT AND GRANULAR FILL AS APPROVED BY THE PROJECT ENGINEER. THE BRIDGE MUST BE FIRMLY ANCHORED TO PREVENT IT FROM BEING TRANSPORTED OR ERODED DOWNSTREAM DURING HIGH FLOW.
2. CONSTRUCT BRIDGE RAMPS USING TIMBER MATS AND MATCH GRADE AT EDGE OF STREAM BANK BUFFER. IF CONDITIONS PROHIBIT WOOD OR METAL RAMPS, EARTHEN RAMPS MAY BE USED AS APPROVED. SUPPORT MUST BE PROVIDED AT TOP OF BANK AND UNDER SPAN IF SETTLEMENT OCCURS.
3. INSPECT BRIDGE OPENING PERIODICALLY AND FOLLOWING RAINFALLS OF OVER ½". REMOVE ANY DEBRIS RESTRICTING FLOW. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED IN ACCORDANCE WITH THE SWPPP.
4. IF GRANULAR FILL IS USED IN CHANNEL PROVIDE ADEQUATE CULVERT CAPACITY FOR ANTICIPATED FLOW. REMOVE ALL FILL FROM CHANNEL AND RESTORE TO ORIGINAL CONTOUR.
5. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.

**VANTAGE PIPELINE PROJECT
DETAIL 17 - TYPICAL BRIDGE DETAILS**

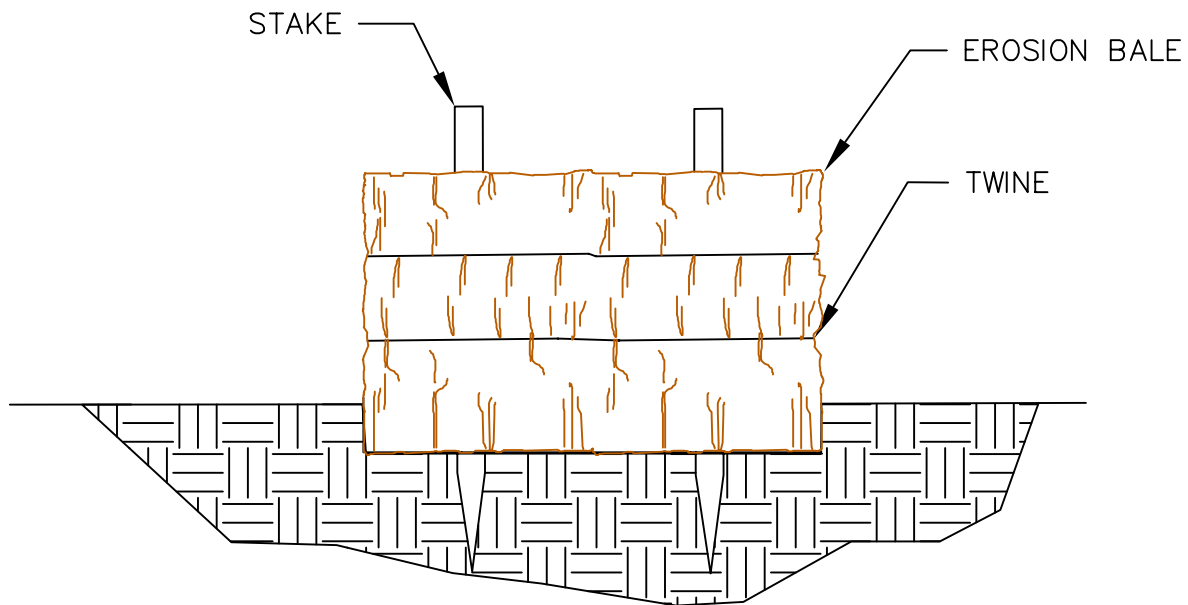
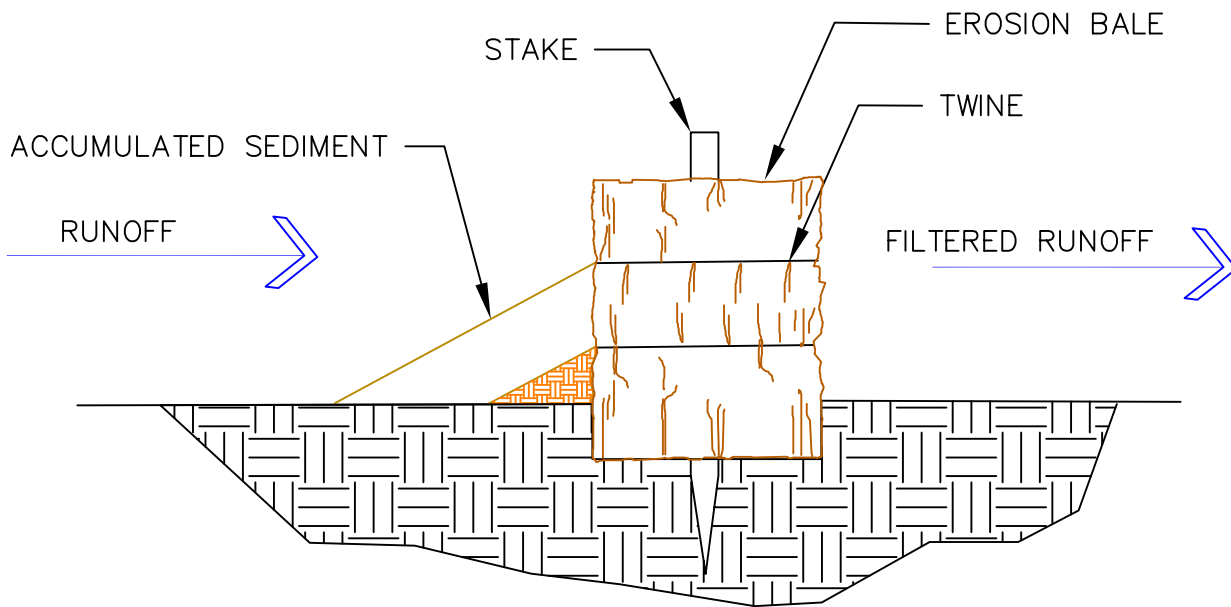


FILE: VANTAGE_EPP_DETAILS.DWG DATE: JAN.28, 2011 SCALE: NTS



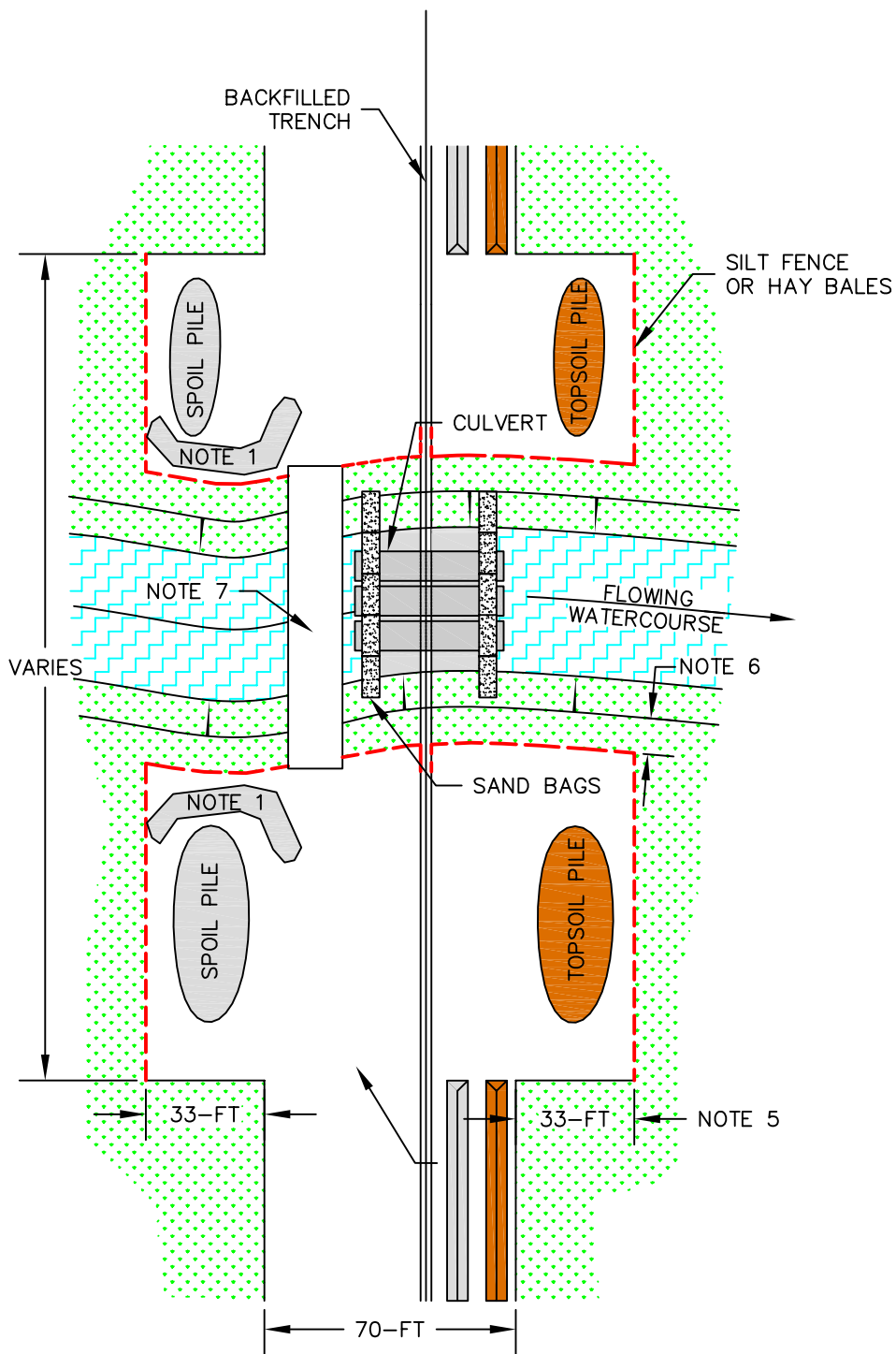
NOTES:

1. WATER PUMPS SHALL BE CONTAINED WITHIN SECONDARY CONTAINMENT DEVICES WHILE WORKING IN WETLAND AREAS.
2. WATER DISCHARGES SHOULD BE DIRECTED TO WELL VEGETATED UPLAND AREAS.
3. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



NOTES:

1. REMOVE ACCUMULATED SEDIMENT WHEN IT REACHES ONE HALF OF THE EXPOSED BALE HEIGHT.
2. CONSTRUCT BALE DITCH CHECKS OF WHEAT STRAW, OAT STRAW, PRAIRIE HAY OR BROMEGRASS HAY THAT IS FREE OF NOXIOUS WEEDS.
3. STAKES USED TO ANCHOR THE BALES SHOULD BE MADE OF A HARDWOOD MATERIAL WITH MINIMUM DIMENSIONS: 2 INCHES SQUARE BY 4 FEET LONG.
4. BIODEGRADABLE TWINE SHOULD BE USED TO BIND BALES.
5. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



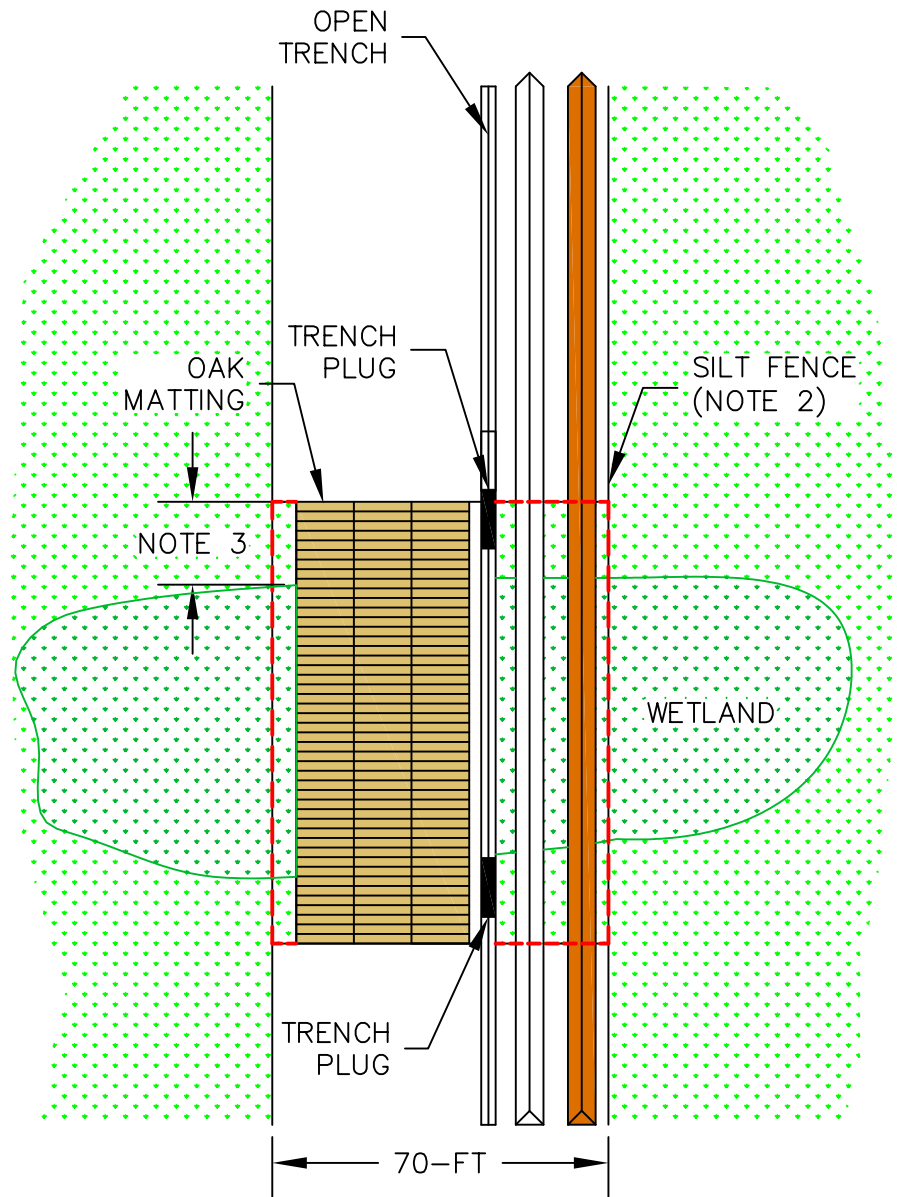
NOTES:

THIS METHOD APPLIES TO FLOWING WATERWAYS.

1. TOPSOIL AND SPOIL SHOULD BE STRIPPED FROM THE TRENCHLINE IN ALL WETLAND AND RIPARIAN AREAS. STOCKPILE WET MATERIALS IN TEMPORARY WORK AREA WITHIN SEDIMENT CONTAINMENT BERM CONSTRUCTED FROM SUBSOILS OBTAINED FROM THE STRIPPED ROW.
2. USE SANDBAGS TO RESTRICT WATER FLOW THROUGH CULVERTS.
3. NO HEAVY SILT LADEN WATER SHALL BE DISCHARGED TO THE WATERBODY. USE A STRAWBALE DEWATERING STRUCTURE OR A DEWATERING BAG TO TREAT WATER PUMPED FROM THE TRENCH.
4. CONTRACTOR SHALL RESTORE WATERBODY CHANNEL AND BANKS TO PRECONSTRUCTION CONTOUR, UNLESS OTHERWISE APPROVED BY THE PROJECT ENGINEER. INSTALL EROSION CONTROLS AT CROSSING AS PROVIDED IN THE SWPP PLAN. MAINTAIN STORMWATER BMPS UNTIL ADJACENT ROW IS STABILIZED.
5. PROVIDE ADDITIONAL WORKSPACE WHEN INDICATED ON THE CONSTRUCTION PLANS FOR STORAGE OF TOPSOIL AND SPOIL EXCAVATED FROM THE CROSSING. DO NOT STOCKPILE TOPSOIL OR SPOIL WITHIN THE WATERWAY.
6. PROVIDE A 10-FT. BUFFER BETWEEN STRIPPED AREA AND TOP OF STREAM BANK. STRIPPING WITHIN WATERCOURSE SHOULD BE LIMITED TO THE AREA OF TEMPORARY CROSSING. PROVIDE SEDIMENT CONTROLS WITHIN THE WATERCOURSE IN ACCORDANCE WITH STORMWATER MANAGEMENT PLAN.
7. INSTALL TEMPORARY CROSSING (OPTIONAL) OVER WATERWAY AS REQUIRED FOR SITE SPECIFIC CONDITIONS.
8. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.

**VANTAGE PIPELINE PROJECT
DETAIL 20 - FLUME METHOD**





NOTES:

THIS METHOD APPLIES TO WETLAND AREAS.

1. INSTALL OAK MATTING OVER WETLAND AREAS AS REQUIRED FOR SITE-SPECIFIC CONDITIONS.
2. FILED LOCATE STORMWATER RUNOFF AREAS AND INSTALL SILT FENCE OR OTHER EROSION CONTROLS IN ACCORDANCE WITH THE STORMWATER MANAGEMENT PLAN. SEDIMENT CONTROLS TO BE INSTALLED ALONG STRIPPING LIMITS ARE TO BE MAINTAINED UNTIL CONSTRUCTION OF THE CROSSING IS COMPLETED. UPON COMPLETION OF CROSSING RECLAMATION, REINSTALL AND MAINTAIN SEDIMENT AND EROSION CONTROLS UNTIL CROSSING AREA IS STABILIZED.
3. PROVIDE A 10-FT. BUFFER BETWEEN STRIPPED AREA AND WETLAND.
4. PROVIDE SEDIMENT CONTROLS IN ACCORDANCE WITH STORMWATER MANAGEMENT PLAN.
5. PROVIDE ADDITIONAL WORKSPACE WHEN INDICATED ON THE CONSTRUCTION PLANS FOR STORAGE OF TOPSOIL AND SPOIL EXCAVATED FROM THE CROSSING. DO NOT STOCKPILE TOPSOIL OR SPOIL WITHIN THE WETLAND AREA.
6. SEE DETAIL 5 FOR STRIPPING REQUIREMENTS IN WETLAND AREAS.
7. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.

**VANTAGE PIPELINE PROJECT
DETAIL 21- WETLAND CROSSING**



APPENDIX B TO ENVIRONMENTAL REPORT

REQUEST TO U.S. FISH AND WILDLIFE SERVICE
FOR REVIEW AND COMMENTS ON DRAFT SECTION OF THE
VANTAGE PIPELINE ENVIRONMENTAL ASSESSMENT



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
3425 Miriam Avenue
Bismarck, North Dakota 58501



OCT 1 2010

Mr. David P. Cameron, P.E.
KC Harvey Environmental, LLC
376 Gallatin Park Drive
Bozeman, Montana 59715

Re: Request for Coordination and
Consultation for the Proposed Vantage
Pipeline, Divide and Williams
Counties, North Dakota

Dear Mr. Cameron:

This is in response to your July 27, 2010, letter regarding the proposed 10-inch diameter ethane pipeline which would convey ethane from Tioga, North Dakota, and would be connected to an existing ethane pipeline system near Empress, Alberta, Canada. The proposed pipeline would be located in Divide and Williams Counties and would be constructed by Vantage Pipeline Company Inc. (Vantage).

We offer the following comments under the authority of and in accordance with the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.) (MBTA), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d, 54 Stat. 250) (BGEPA), the Endangered Species Act (16 U.S.C. 1531 et seq.) (ESA), the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), and the National Environmental Policy Act (NEPA).

Threatened and Endangered Species

If an action that may affect a federally-listed threatened or endangered species is carried out, funded, permitted, or licensed by a Federal agency (in this case the Department of State), the Federal agency may designate a non-Federal representative to conduct informal consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the ESA. The Federal agency is responsible to ensure that its actions comply with the ESA and other relevant wildlife protection laws, including obtaining concurrence from the Service for any action that may affect a threatened or endangered species, or result in the destruction or adverse modification of designated critical habitat. The Federal agency is also responsible for making a determination of effects for federally listed species, and should consult with the Service as appropriate.

Until such time as the Department of State designates Vantage and/or its consultants as its agent for purposes of informal Section 7 consultation, these comments should be considered as preliminary to assist in project planning. As the Federal action agency for this project, the Department of State has the responsibility under Section 7 of the ESA to conduct consultation with the Service. The Service expects to consult with the State Department or their designated agent on actions that may affect any listed species.

A list of federally endangered and threatened species that may be present within the proposed project's area of influence is enclosed. This list fulfills requirements of the Service under Section 7 of the ESA. This list remains valid for 90 days.

There is designated critical habitat for the piping plover in Divide and Williams Counties. The evaluation area includes known nesting sites and designated critical habitat. One critical habitat unit in Divide County falls within approximately 0.2 mile from the project center line. Piping plovers are protected wherever they occur, regardless of land ownership. In North Dakota, piping plovers begin arriving on their breeding grounds in early to mid-April and are typically gone by September 1. Disturbance from construction activities during this timeframe is possible depending on proximity to birds. The Service recommends that construction activities in these areas take place from September 1 – April 1. We can provide shapefiles for designated critical habitat for piping plover if desired; however, there are also other suitable wetlands in the project area where plovers may be nesting. Piping plovers nesting on one wetland could be feeding on another. The alkali soils on the census wetlands are soft and tracks are easily left behind. Piping plover chicks have been documented to be trapped and/or drowned in depressions as shallow as a few inches. Compaction of soil in dry or frozen conditions has the potential to impact piping plovers for many years after the activity. In order to avoid disturbing these birds and their habitat, we recommend the following precautions when working in potential or known piping plover habitat:

- Total avoidance of the documented and potential nesting wetlands from April 1 – September 1;
- On wetlands with potential or documented plover nesting, maintain a one-half mile no entry buffer around all shorelines during construction. (If the nesting season cannot be avoided, this may entail rerouting the pipeline route to maintain a minimum ½-mile buffer.);
- All vehicle use should be avoided on any wetland shoreline, including a 200 foot buffer, in the project area.

If you are unable to positively identify piping plover nesting areas, or to maintain a one-half mile no-entry construction buffer on all piping plover nesting wetlands, we recommend that you retain the services of a qualified biologist to survey your project area for these resources.

The Aransas Wood Buffalo Population (AWBP) of endangered whooping cranes is the only self-sustaining migratory population of whooping cranes remaining in the wild. These birds breed in the wetlands of Wood Buffalo National Park in Alberta and the

Northwest Territories of northern Canada, and overwinter on the Texas coast. Whooping cranes in the AWBP annually migrate through North Dakota during their spring and fall migrations. They make numerous stops along their migration route to feed and roost before moving on.

Whooping cranes in the AWBP annually migrate through North Dakota during their spring and fall migrations. The proposed project lies within a 90 mile corridor that includes approximately 75 percent of all reported whooping crane sightings in the State (enclosure). The presence of suitable roosting and feeding habitat for whooping cranes document the potential for whooping crane presence in the proposed project area. Whooping cranes are unlikely to spend more than a few days in any one spot during migration. The Service recommends that if a whooping crane is sighted within one mile of a pipeline or associated facilities while it is under construction, that all work cease within one mile of that part of the project and the Service be contacted immediately. In coordination with the Service, work may resume after the bird(s) leave the area.

Potential habitat for the Sprague's pipit exists in Divide and Williams Counties. In 2010, the Sprague's pipit was determined to be a candidate species under the ESA. No legal requirement exists to protect candidate species; however, it is within the spirit of the ESA to consider these species as having significant value and worth protecting.

The Sprague's pipit is a species which both breeds and winters on the North American prairie. Their breeding range includes parts of Montana, North Dakota, South Dakota, and Minnesota in the United States. Sprague's pipits require grassland habitat for both breeding and wintering. They also require relatively large patches of prairie for nesting (estimated at between 170-776 acres). They avoid intrusive human features on the landscape, so the impact of a development can be much larger than the actual footprint of the feature. If Sprague's pipit habitat is present near the proposed project, and you intend to take precautions to avoid impacts to the pipit, please notify the Service for further coordination.

Migratory Birds

The Migratory Bird Treaty Act prohibits the taking, killing, possession, and transportation, (among other actions) of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. While the MBTA has no provision for allowing unauthorized take, the Service realizes that some birds may be killed during construction even if all known reasonable and effective measures to protect birds are used. The Service's Office of Law Enforcement carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to avoid take of migratory birds, and by encouraging others to implement measures to avoid take of migratory birds. It is not possible to absolve individuals, companies, or agencies from liability even if they implement bird mortality avoidance or other similar protective measures. However, the Office of Law Enforcement focuses its resources on investigating and prosecuting individuals and companies that take migratory birds

without identifying and implementing all reasonable, prudent and effective measures to avoid that take. Companies are encouraged to work closely with Service biologists to identify available protective measures when developing project plans and/or avian protection plans, and to implement those measures prior to/during construction or similar activities.

The BGEPA, prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles, including their parts, nests, or eggs. The Act provides criminal and civil penalties for persons who take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The Act defines take as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. "Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.

Bald and/or golden eagles may use the project area where the pipeline will be located. Golden eagles inhabit a wide variety of habitat types, including open grassland areas. They are known to nest on cliffs, in trees, manmade structures, and on the ground (Kochert et al. 2002). While the bald eagle tends to be more closely associated with forested areas near water (Buehler 2000), they have been found nesting in single trees several miles from the nearest water body. Therefore, there may also be potential habitat for the bald eagle at the proposed project site. Especially early in the nesting season, eagles can be very sensitive to disturbance near the nest site and may abandon their nest as a result of low disturbance levels, even from foot traffic. A buffer of at least 1/2 mile should be maintained for golden and bald eagle nests. A permit is required for any take of bald or golden eagles or their nests. Permits to take golden eagles or their nests are available only for legitimate emergencies and as part of a program to protect golden eagles.

To the extent practicable, schedule construction for late summer or fall/early winter so as not to disrupt waterfowl or other wildlife during the breeding season (February 1 to July 15). If work is proposed to take place during the breeding season or at any other time which may result in the take of bald or golden eagles or other migratory birds, their eggs, or active nests, the Service recommends that the project proponent implement all practicable measures to avoid all take, such as suspending construction where necessary and/or maintaining adequate buffers to protect the birds until the young have fledged. The Service further recommends that if you choose to conduct field surveys for nesting

birds, including eagles, with the intent of avoiding take, that you maintain any documentation of the presence of eagles or other migratory birds, eggs, and active nests, along with information regarding the qualifications of the biologist(s) performing the survey(s), and any avoidance measures implemented at the project site. Should surveys or other available information indicate a potential for take of eagles or other migratory birds, their eggs, or active nests, the Service requests that you contact this office for further coordination on the extent of the impact and the long-term implications of the intended use of the project on eagles or other migratory bird populations.

High Value Habitat Avoidance

As part of the National Wildlife Refuge System, the U.S. Fish and Wildlife Service (Service) administers fee title Refuge and Waterfowl Production Areas, as well as wetland and grassland easements, throughout North Dakota. A review of our county plat maps indicates that Service property interests are located in the study area.

The Service recommends that all property interests within the National Wildlife Refuge System be avoided during project construction, when possible. Special Use or right-of-way permits will be necessary for construction affecting property interests administered by the Service. The issuance of Special Use or right-of-way permits is subject to the final determination of a refuge compatibility review process. This determination may add some time to the review process, so early coordination with the district is important. In your telephone conversation with Heidi Riddle of my staff on September 28, 2010, you indicated that you had contacted Crosby Wetland Management District and are coordinating with them for additional requirements and considerations on Service easements.

Cultural resource compliance requires coordination with the Zone Archeologist early in the NEPA process. Cultural Resource field investigations on USFWS easements and fee lands requires a permit issued by the Zone Archeologist. Contact Barry G. Williams, USFWS Dakotas Zone Archeologist (barry_williams@fws.gov, 701-355-8577).

According to the Service's National Wetland Inventory maps, the corridor and the study area intersect several wetlands. Wetlands are important for water quality as well as for a variety of wildlife species. The Service suggests that Vantage include a detailed plan to avoid or mitigate for unavoidable impacts to wetlands. This will also avoid impacts to threatened and endangered species as discussed above. If your project will result in unavoidable impacts to wetlands, we request to review a mitigation plan to compensate for all wetland losses. If a 404 permit is required, the Service will provide recommendations on this project to the Corps.

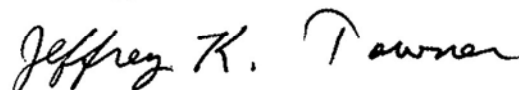
Construction activities should be conducted in a manner that will avoid/minimize impacts to the existing habitat in the project area. The following recommendations are intended to reduce construction related impacts:

- Make no stream channel alterations or changes in drainage patterns.

- Install and maintain appropriate erosion control measures to reduce sediment transport to adjacent wetlands and stream channels.
- Reseed disturbed areas with a mixture of native grass and forb species immediately after construction to reduce erosion. Parts of the proposed project area appear to be grassland habitat currently. If trenching is performed in these areas, post-construction reseeding of native prairie grasses, forbs and legumes should be completed. The Service suggests that Vantage consider planting a diverse mix of native species to reclaim the grassland areas. Recent research indicates that a diverse native species mix, including numerous forb species, is not only ecologically beneficial, but is also more weed resistant. A diverse planting of native grasses and forbs allows for less intensive management and chemical use. The more species included in a mixture, the higher the probability of providing competition to resist invasion by non-native plants.

Thank you for the opportunity to comment on this project. If you require further information or the project plans change, please contact me or Heidi Riddle of my staff at (701) 250-4481 or at the letterhead address.

Sincerely,



Jeffrey K. Towner
Field Supervisor
North Dakota Field Office

Enclosures

cc: Project Leader, Crosby WMD
Regulatory Office, Army Corps of Engineers, Bismarck
(Attn: D. Cimarosti)
U.S. Department of State, Washington DC
ND Game & Fish Department, Bismarck

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FEDERAL THREATENED AND ENDANGERED SPECIES
AND DESIGNATED CRITICAL HABITAT FOUND IN
DIVIDE COUNTY, NORTH DAKOTA
October 2010

ENDANGERED SPECIES

Birds

Whooping crane (Grus Americana): Aransas-Wood Buffalo Population (264 birds) occurs in North Dakota counties during spring and fall migration between breeding and wintering areas. Whooping cranes prefer to roost overnight in shallow open water wetland habitat with good visibility during migration stopovers.

Mammals

Gray wolf (Canis lupus): Occasional visitor in North Dakota. Most frequently observed in the Turtle Mountains area.

THREATENED SPECIES

Birds

Piping plover (Charadrius melodus): Nests on midstream sandbars of the Missouri and Yellowstone Rivers and along shorelines of saline wetlands. More nest in North Dakota than any other state.

DESIGNATED CRITICAL HABITAT

Birds

Piping Plover - Alkali Lakes and Wetlands - Critical habitat includes: (1) shallow, seasonally to permanently flooded, mixosaline to hypersaline wetlands with sandy to gravelly, sparsely vegetated beaches, salt-encrusted mud flats, and/or gravelly salt flats; (2) springs and fens along edges of alkali lakes and wetlands; and (3) adjacent uplands 200 feet (61 meters) above the high water mark of the alkali lake or wetland.

FEDERAL THREATENED AND ENDANGERED SPECIES
AND DESIGNATED CRITICAL HABITAT FOUND IN
WILLIAMS COUNTY, NORTH DAKOTA
October 2010

ENDANGERED SPECIES

Birds

Interior least tern (*Sterna antillarum*): Nests along midstream sandbars of the Missouri and Yellowstone Rivers.

Whooping crane (*Grus Americana*): Aransas-Wood Buffalo Population (264 birds) occurs in North Dakota counties during spring and fall migration between breeding and wintering areas. Whooping cranes prefer to roost overnight in shallow open water wetland habitat with good visibility during migration stopovers.

Fish

Pallid sturgeon (*Scaphirhynchus albus*): Known only from the Missouri and Yellowstone Rivers. No reproduction has been documented in 15 years.

Mammals

Gray wolf (*Canis lupus*): Occasional visitor in North Dakota. Most frequently observed in the Turtle Mountains area.

THREATENED SPECIES

Birds

Piping plover (*Charadrius melodus*): Nests on midstream sandbars of the Missouri and Yellowstone Rivers and along shorelines of saline wetlands. More nest in North Dakota than any other state.

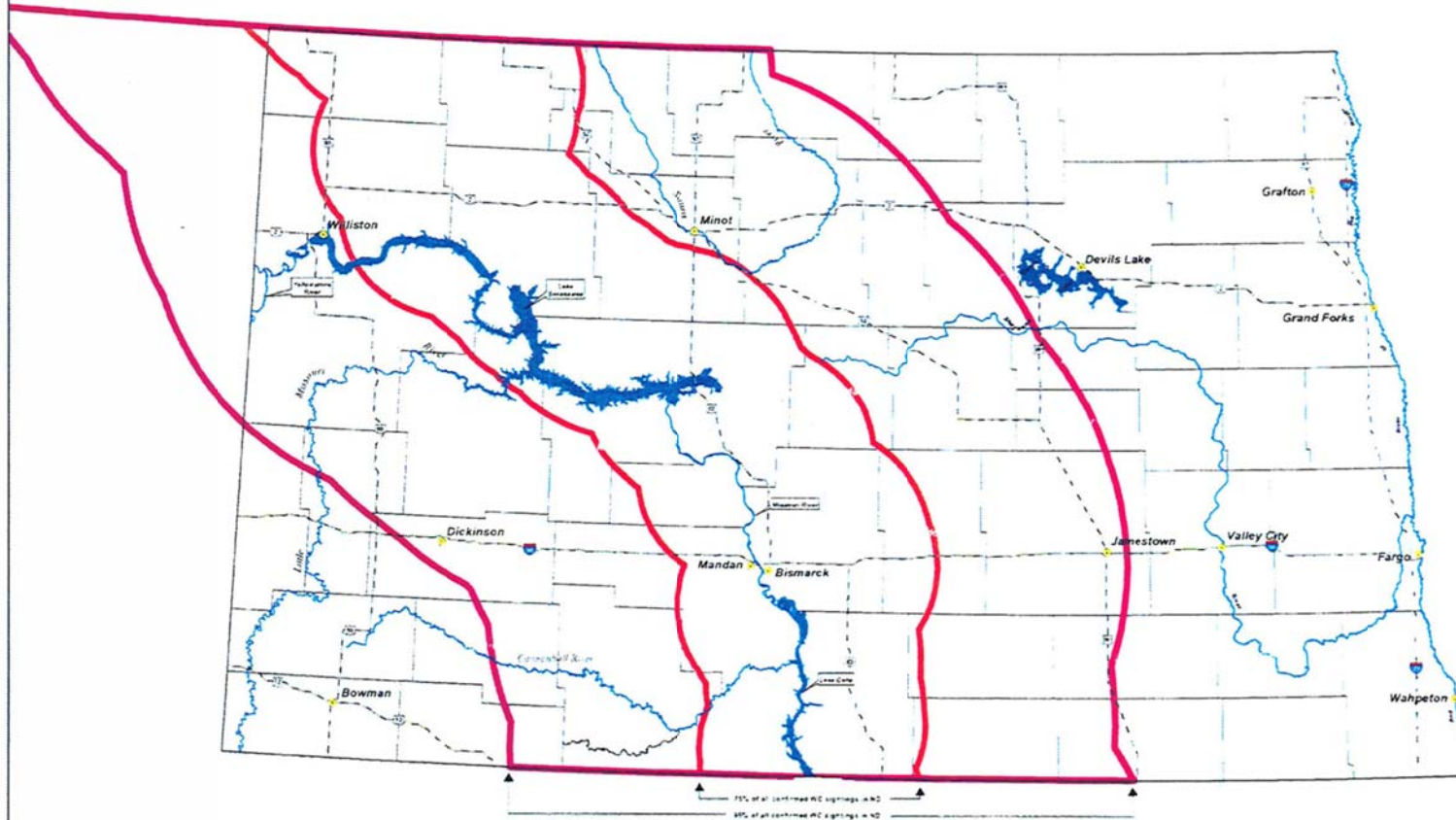
DESIGNATED CRITICAL HABITAT

Birds

Piping Plover - Lake Sakakawea - Critical habitat includes sparsely vegetated shoreline beaches, peninsulas, islands composed of sand, gravel, or shale, and their interface with the water bodies.



North Dakota Whooping Crane Migration Corridor



DISCLAIMER:
 The USFWS makes no claim as to the accuracy or completeness of the displayed information. Species occurrence and habitat information is provided for illustrative purposes only. Federal action agencies and project proponents should contact the USFWS North Dakota Field Office for more detailed species information and technical assistance in evaluating potential project impacts to fish and wildlife resources.
 Map produced 04/21/2010 by USFWS Ecological Services, Bismarck, ND.

- 75% Whooping Crane Migration Corridor
- 95% Whooping Crane Migration Corridor



APPENDIX C TO ENVIRONMENTAL REPORT

ETHANE SUPPLY AND DEMAND FOR THE VANTAGE PIPELINE

ETHANE SUPPLY AND DEMAND FOR THE VANTAGE PIPELINE

Prepared for:

Vantage Pipeline Canada Inc.

Prepared by:

PURVIN
& GERTZ
INC.

*Buenos Aires – Calgary – Dubai – Houston
London – Moscow – Singapore*

February 2, 2011

G.I. Goobie, P.Eng.

C2805/smu

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I. DISCLAIMER

Purvin & Gertz, Inc. was engaged by Vantage Pipeline Canada Inc. to provide a forecast of ethane supply and demand for the Vantage Pipeline for the period 2008 through 2025.

This report has been prepared for the sole benefit of Vantage Pipeline Canada Inc. with certain conditions pertaining to third party distribution. Neither the report nor any part of the report shall be provided to third parties without the written consent of Purvin & Gertz. This report may be provided to the National Energy Board of Canada and to the United States Department of State as part of Vantage's regulatory applications for the Vantage Pipeline. Any third party in possession of the report may not rely upon its conclusions without the written consent of Purvin & Gertz. Possession of the report does not carry with it the right of publication.

Some of the information on which this report is based has been provided by others including the client. Purvin & Gertz has utilized such information without verification unless specifically noted otherwise. Purvin & Gertz accepts no liability for errors or inaccuracies in information provided by others.

Purvin & Gertz conducted this analysis and prepared this report utilizing reasonable care and skill in applying methods of analysis consistent with normal industry practice. All results are based on information available at the time of review. Changes in factors upon which the review is based could affect the results. Forecasts are inherently uncertain because of events or combinations of events that cannot reasonably be foreseen including the actions of government, individuals, third parties and competitors. **NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY.**

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II. EXECUTIVE SUMMARY

INTRODUCTION

Purvin & Gertz was engaged to provide a forecast of ethane supply and demand for the proposed Vantage Pipeline. The supply for the Vantage Pipeline will be ethane produced in North Dakota and the demand for ethane delivered from the Vantage Pipeline will be the petrochemical industry in Alberta.

This report looks first at Alberta ethane supply and demand and then North Dakota ethane supply. Current ethane supply for the petrochemical industry in Alberta is produced from natural gas processing in Western Canada. Therefore Section III discusses the outlook for natural gas supply in Western Canada and Section IV discusses the outlook for ethane supply and demand in Alberta. Section V discusses oil and natural gas production as well as natural gas processing, NGL production and potential ethane supply in North Dakota.

WESTERN CANADIAN NATURAL GAS SUPPLY

Virtually all of Western Canada's ethane supply is derived from processing natural gas. Therefore, forecasts of ethane supply are contingent on the outlook for natural gas supply. Gas directed drilling has declined sharply in recent years in Western Canada largely as a result of low prices and high costs. The development of unconventional gas resources in North America has been a significant contributing factor to the decline in gas directed drilling in Western Canada. The outlook for Canadian gas supply depends to a large extent on the outlook for drilling activity and estimates of the average productivity of future wells.

Purvin & Gertz' outlook for Western Canadian natural gas supply is a steady decline until the 2016/17 period when increased drilling activity, improved productivity and unconventional production eventually overcomes the overall decline. Drilling activity and production plateau in the later part of this decade and into the next decade.

Exports of natural gas from Western Canada have declined in recent years as a result of the drilling and production decline. Purvin & Gertz estimates that ongoing decline of gas supplies and increasing Western Canadian demand will further reduce gas exports.

North American gas processing margins have been very high in recent years. This has encouraged industry participants to recover all available Natural Gas Liquids (NGL) including ethane. In the future, Purvin & Gertz expects that in Western Canada all available rich gas will be processed for NGL recovery and that a relatively higher proportion of NGL will be produced from field plants than from straddle plants.

ALBERTA ETHANE DEMAND AND SUPPLY

Alberta ethane supply is directly related to gas production and gas exports. The majority of the ethane is provided by the straddle plant system which processes natural gas exports from the province. Petrochemical consumption in Alberta is the primary driver of ethane demand in Canada and Purvin & Gertz expects that the Western Canadian petrochemical industry will continue to consume all available ethane over the forecast period.

In recent years, ethane supply has declined with reductions in natural gas supply and exports. Declining ethane supply has constrained demand and a continued shortfall is expected for the foreseeable future. Virtually all economically recoverable ethane supplies are already being recovered in Western Canada. Nevertheless, Purvin & Gertz forecasts a conventional ethane supply shortfall of more than 76,000 bpd below potential petrochemical demand by 2014 resulting in a significant potential loss of value added upgrading within Alberta.

There are potential ethane supplies in Western Canada above existing production levels. However, to recover those supplies, significant new investments would be required in gas processing and NGL infrastructure. The costs of these potential incremental supplies are expected to be well above existing production cost levels and are generally considered to be uneconomic.

The Vantage Pipeline will likely be the first to deliver a large volume of incremental ethane supply to the Western Canadian Petrochemical industry. Purvin & Gertz believes that there will be adequate demand to consume this volume of incremental ethane.

NORTH DAKOTA ETHANE SUPPLY

NGL is produced at fourteen gas processing plants in North Dakota. The facilities produce propane, butane, natural gasoline and Y-Grade mix. No material amounts of specification ethane are currently produced. Virtually all ethane produced with natural gas is currently left in the gas stream.

Purvin & Gertz believes that there will be enough ethane supply in North Dakota to supply the Vantage Pipeline. Purvin & Gertz estimates that there will be approximately 40,000 to 50,000 bpd of ethane volumes in reasonable proximity to the Vantage Pipeline. Given the scope for future development in the Northwestern quadrant of North Dakota, there is a reasonable probability that the existing facilities could be expanded or new facilities could be built to process more gas and to produce more NGL including ethane. Other industry participants have much higher crude oil and natural gas production forecasts than Purvin & Gertz. Under those more optimistic outlooks, it is possible that ethane production in North Dakota could reach 75,000 bpd to 100,000 bpd.

III. WESTERN CANADIAN NATURAL GAS

WESTERN CANADA NATURAL GAS SUPPLY OVERVIEW

Western Canada is a large producer of natural gas. Virtually all of Western Canada's ethane supply is derived from processing natural gas. Therefore, forecasts of ethane supply are contingent on the outlook for natural gas supply. The following discussion of gas supply and flow forecasts is provided as the basis for the ethane forecast in this report.

Over the last decade, Western Canadian natural gas markets have been characterized by flat to declining production coupled with rising domestic demand, especially in Alberta. In the Western Canada Sedimentary Basin (WCSB), natural gas directed drilling surged in the 2003 through 2007 period in response to higher demand and prices. Drilling and production costs surged as well. Natural gas well completions exceeded 15,000 wells per year in each of 2004, 2005 and 2006. Production remained relatively flat through the period of increased drilling activity indicating that high levels of drilling activity are required to maintain the productive capacity of the basin.

In the 2007/08 period, drilling declined as a result of relatively weak prices and high costs. There were approximately 12,000 gas well completions in each of 2007 and 2008. Natural gas production and exports declined in 2008. In the fall and winter of 2008/09, natural gas directed drilling throughout North America declined sharply as a result of very weak natural gas prices and the worsening economic conditions. The low level of drilling activity continued in Western Canada throughout 2009. Gas well completions totaled just over 5,000. Through the winter of 2009/10 and into the first half of 2010, gas directed drilling activity was at roughly half the 2009 rate. Gas well completions picked up in the later half of the year and total completions were a little under 5,000 for the year. The outlook for 2011 is similar to 2009 and 2010.

The development of unconventional gas resources in North America has been a significant contributing factor to the decline in gas directed drilling in Western Canada. The rapid increase in shale gas reserves and production in recent years has been described as a "Game Changer" for the entire North American natural gas business. A combination of innovative techniques including horizontal wells, hydraulic fracturing, and seismic imaging technologies helped to drive significant reserves and production increases in unconventional areas throughout North America. Expectations are that there will be adequate natural gas supplies close to the large demand centers in North America for many years to come. These areas are traditional markets for Western Canadian natural gas exports and therefore, demand for Western Canadian natural gas is expected to decline in these areas. At the same time, large amounts of Liquefied Natural Gas (LNG) are coming onto the world market. It can reasonably be expected that any price increases in North America will attract flexible LNG volumes or cause increased domestic production or both. The implication is that North American gas prices should stay relatively low for the foreseeable future. This does not bode well for natural gas in Western Canada. Since Western Canadian prices are typically priced at a discount from U.S. prices, then low prices in the U.S. means lower prices in Western Canada. The low price environment has been a major factor in the decline in natural gas drilling in Western Canada since

2007. Furthermore, natural gas directed drilling activity is expected to remain relatively low over the next several years.

One consequence of lower drilling activity is that conventional natural gas production is now clearly in decline in Alberta and the prospects for long-term conventional production from the WCSB look less promising than once thought. However, the outlook for unconventional gas production is more encouraging, similar to the U.S. Currently, there is no large scale production of shale gas in Western Canada but there has been considerable speculation and interest in the Montney and Horn River shale gas plays in Northeastern B.C as well as the Duvernay shale in Alberta. The limited history makes forecasting production from these plays difficult. Nevertheless, unconventional gas production is expected to increase fairly rapidly over the next decade. This should slow, but not reverse, the overall production decline in Western Canada at least until the middle or latter part of this decade.

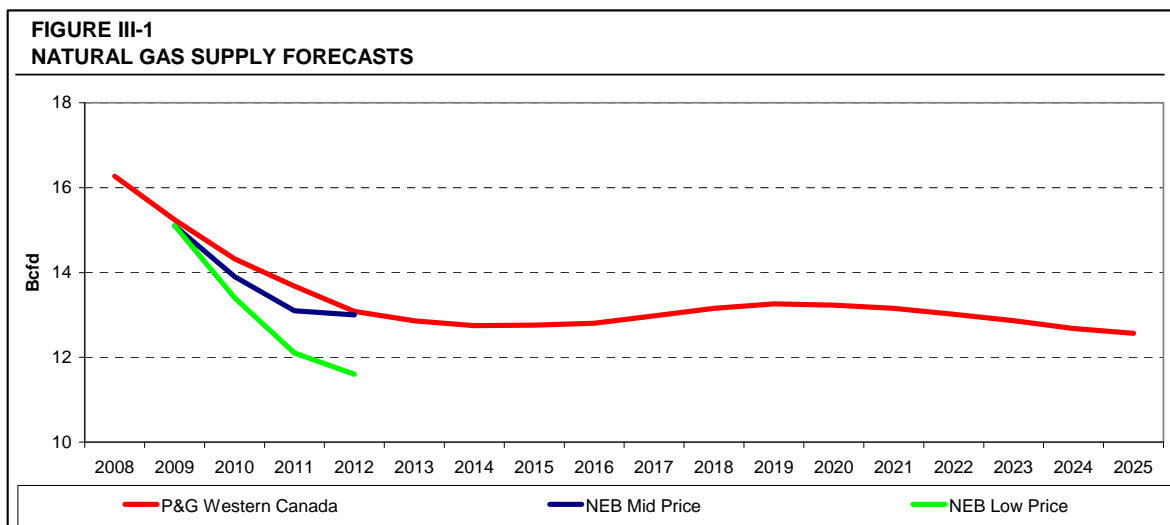
One positive factor affecting the outlook for natural gas is increased average well productivity. As drilling numbers decline, producers pursue higher potential targets. This high-grading of drilling targets combined with improved drilling techniques has led to an increase in average well productivities in Western Canada in recent years. On the other hand, if drilling numbers increase in the future, then the recent productivity gains may be moderated somewhat as less promising targets are drilled. Nevertheless, Purvin & Gertz expects that fewer wells will be required in the future to replace production declines.

The outlook for Canadian gas supply depends to a large extent on the outlook for drilling activity and estimates of the average productivity of future wells. The resumption of drilling activity depends on higher market prices and the ability of producers to control costs and improve netbacks. While costs have declined from the peaks in 2006 and 2007, in general Western Canada remains a relatively high cost area.

The resolution of all these factors is that Purvin & Gertz' outlook for Western Canadian natural gas supply is a steady decline until the 2016/17 period when increased drilling activity, improved productivity and unconventional production eventually overcomes the overall decline. Drilling activity and production plateau in the later part of this decade. Beyond 2020 production begins to decline. It should be noted that there is considerable downside risk in this outlook. If economic conditions worsen or North American demand falters, then it is likely that gas prices will remain very low which could severely constrain drilling activity and production in Western Canada.

Arctic gas may also be a significant source of gas supply in Western Canada in the future. Several significant challenges must be overcome before flows of Arctic gas to southern markets become a reality. The extent and timing of potential frontier gas from the Mackenzie Delta/Beaufort Sea and Alaska remains uncertain. Given the magnitude of the challenges to be overcome, it is possible that the Mackenzie and Alaska projects may not proceed at all. Purvin & Gertz does not expect that Arctic gas production will be delivered to Western Canada prior to 2020. For this report, Arctic gas production is assumed to not occur prior to 2025.

Figure III-1 illustrates gas supply forecasts from Purvin & Gertz and the National Energy Board¹. It must be noted that these forecasts are based on different forecasting methodologies and assumptions and therefore the forecasts are not directly comparable. Nevertheless, similar trends are apparent in the forecasts especially the expectation that Western Canadian natural gas production will decline over the next several years.



ALBERTA NATURAL GAS DEMAND

Purvin & Gertz expects that domestic demand for natural gas in Alberta will continue to grow over the next decade. Low prices will make natural gas a very competitive fuel.

Residential and commercial sector gas demand is primarily for space and water heating. The main short-term driver is weather-related whereas the principal long-term determinant is population growth. Purvin & Gertz expects relatively slow, but steady, growth in residential and commercial demand in Alberta.

Many factors impact natural gas demand in the industrial sector. The market share of natural gas is determined by its relative competitiveness to other fuels. Natural gas consumption is expected to grow substantially for the next decade in the production of oil sands bitumen. The production, extraction and upgrading of bitumen is a very energy-intensive process requiring large amounts of steam for thermal production, hot water for oil sands extraction and hydrogen for upgrading. To date, natural gas had been the uncontested fuel of choice for oil sands projects and we believe that natural gas will continue to be the fuel of choice for many of the future oil sands and upgrader operations. The gas consumption potential from future oil sands and upgrader operations is likely to be a significant contributor to future incremental gas demand in Alberta.

¹ Short-term Canadian Natural Gas Deliverability 2010 – 2012, National Energy Board, Table 3.1

The other industrial components of Alberta natural demand grow at different rates. The primary driver is based on economic activity with some consideration given to conservation/efficiency gains. The overall outlook for industrial demand growth in Alberta remains strong.

EXPORT GAS FLOWS

Exports of natural gas from Western Canada have declined in recent years. Purvin & Gertz estimates that declining gas supplies and increasing demand in Western Canada combined with unconventional gas developments in the U.S. will further reduce gas exports. As gas exports decline, the volumes available for processing at the Cochrane and Empress straddle plants² are also expected to decrease and consequently, ethane production volumes will decrease.

Several developments are expected to reduce Western Canadian pipeline gas exports. In particular, shale gas development in the Appalachian Basin of the US Northeast is displacing WCSB natural gas from traditional markets in the Upper Midwest and New England, causing exports flows to decline. The decline is expected to continue over the near and medium term.

Two pipeline developments in the U.S. Rocky Mountain area will have an impact on gas flows out of Western Canada. The first is the Bison Pipeline which came on stream in January 2011³. The Bison Pipeline was built by a subsidiary of TransCanada Pipelines and extends from Gillette, Wyoming through Montana and North Dakota where it interconnects with The Northern Border Pipeline system. Bison's design capacity is approximately 477 mmcf/d, expandable to 1.0 Bcf/d. The second pipeline is El Paso Corporation's Ruby Pipeline which will be a 1.5 Bcfd line beginning at the Opal Hub in Wyoming and terminating at interconnects near Malin, Oregon. Ruby is under construction with an estimated in-service date in spring 2011⁴. Ruby has secured long term firm shipping commitments of approximately 1.1 Bcfd. Natural gas volumes flowing on both the Bison and Ruby pipelines are expected to have a direct negative impact on Alberta export flows.

Finally, developments in the LNG business will have an influence on gas exports from Western Canada. On December 9, 2010, KM LNG Operating General Partnership, an affiliate of Apache Corporation, applied to the National Energy Board of Canada for a 20 year natural gas export license for the proposed 700 mmcf/d Kitimat LNG project. KM LNG is targeting a 2015 start up for the Kitimat facility. The majority of the gas supply for Kitimat is expected to come from unconventional sources in Western Canada. Exports through Kitimat are expected to reduce the availability of gas for export to the U.S. through existing pipeline facilities⁵.

² The straddle plants are large deep cut gas processing facilities that "straddle" gas export pipelines and process gas leaving Alberta. The largest straddle plants are located at Empress on the Alberta/Saskatchewan border and at Cochrane which straddles gas destined for export to California and the Pacific Northwest. Smaller straddle plants are located in Edmonton and at Joffre and process gas consumed within Alberta.

³ TransCanada website, January 18, 2011

⁴ Ruby Pipeline website, November 19, 2010.

⁵ Three other LNG projects could impact export gas flows from Western Canada. Two LNG import projects are proposed to be built in Oregon to import gas into the Pacific Northwest and another is proposed to be built on Texada Island, B.C. Currently, Purvin & Gertz does not include any LNG imports into the Pacific Northwest in its gas flow forecast. However, if either of these projects does go ahead, then it can be expected that Western Canadian gas exports would be reduced accordingly.

Natural gas exports from Western Canada will be constrained by the factors described above. Gas that is exported will flow on pipelines which provide the highest netback or lowest net-forward prices and markets will adjust accordingly. In the near term, it is likely that Alliance will be loaded first because of the sunk cost nature of the Alliance tolls. The TCPL mainline, Northern Border and GTN will take the remainder. This situation will persist until 2015. After that point, it is assumed that Alliance flows are reduced and all the export pipelines become more or less competitive with each other. Alliance volumes fall to approximately 1.0 bcf/d and Empress/McNeill and A/BC pick up the balance. At that time, ethane volumes actually increase slightly as the Empress/McNeill and A/BC volumes increase, but overall, total available ethane supply decreases over the forecast period.

GAS QUALITY

The composition of natural gas is required in order to determine the potential supply of Natural Gas Liquids (NGL).

The limited production history of Western Canadian shale gas provides an element of uncertainty regarding its quality. Horn River gas appears to be quite lean but with high CO₂ content. Montney gas appears to have recoverable NGL. NOVA Gas Transmission Ltd. has provided an estimate for the aggregate gas composition for the Groundbirch area⁶ which is relatively rich for gas on the NGTL system.

In recent years, throughout North America, NGL prices have been relatively high and natural gas prices have been relatively low. Therefore, gas processing margins⁷ have been high which has encouraged industry participants to recover all available NGL including ethane. Purvin & Gertz anticipates that this situation will persist until at least the middle of this decade. In Western Canada, this implies that field processing facilities will process all available rich gas before it enters the NGTL system.

In the recent Alberta Energy and Utilities Board NGL Inquiry and North Central Corridor Pipeline Hearing, the issue of streaming of lean gas to intra-Alberta markets was explored. In the future, NGL recovery at straddle plants could be negatively impacted by lean natural gas volumes originating from coal bed methane and shale gas production in Alberta and B.C. With the growth of lean production and intra-Alberta industrial gas demand, it is expected that considerable effort will be dedicated to streaming lean gas to intra-Alberta markets in the next few years. If streaming efforts are successful, it is likely that gas compositions at border straddle plants will either remain similar to current levels or could even increase slightly. Alternatively, if significant volumes of rich gas are consumed within Alberta or if more gas is processed for liquids recovery upstream of the straddle plants, then the straddle plants at export points could see a decline in feedgas composition. Purvin & Gertz expects that in the future, a relatively higher proportion of NGL will be produced from field plants than from straddle plants and therefore it is likely that the composition of gas on the NGTL system will decline leading to reduced NGL production from the straddle plants.

⁶ NOVA Gas Transmission Ltd., Groundbirch Pipeline Section 52 Application, Appendix 7-2: Hydraulic Design, Section 1.10, Page 7 of 8. C1=89.45%, C2=6.74%, C3+=2.70%. Presumably, the composition results from a combination of shale and conventional gas sources.

⁷ Often called "frac spreads"

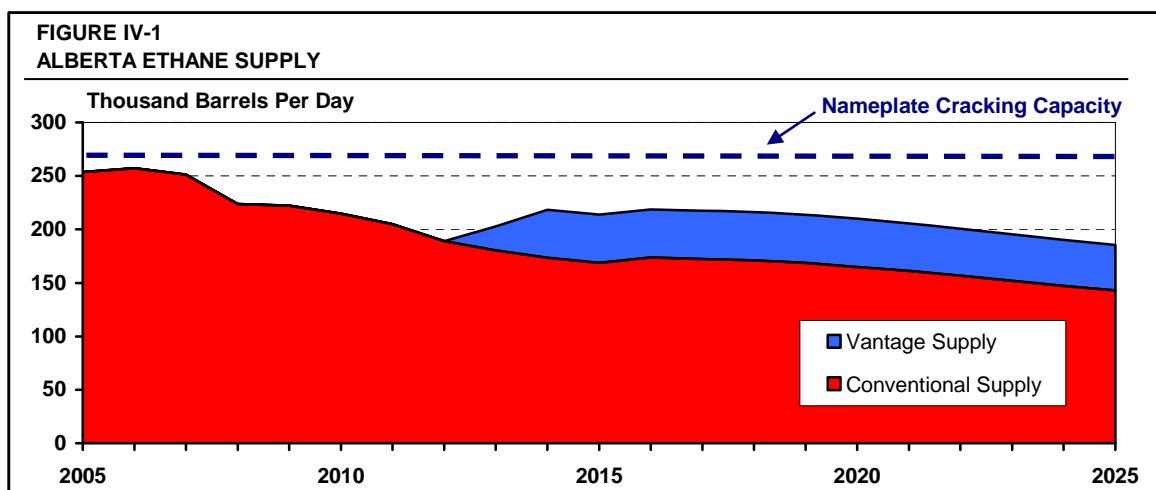
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IV. ALBERTA ETHANE SUPPLY AND DEMAND

ETHANE SUPPLY

Alberta ethane supply is directly related to gas production and gas exports. The majority of the ethane is provided by the straddle plant system in Alberta, which processes natural gas export flows at Empress and Cochrane. In addition to straddle plant supply, ethane sources include field plants producing specification ethane, field plants producing ethane as a constituent of ethane plus mixes, and miscellaneous sources of ethane which are constituents of NGL mix destined to miscible flood projects. Ethane supply has not kept pace with potential demand and a continued shortfall is expected for the foreseeable future.

The forecast of Western Canadian ethane supply is summarized in Figure IV-1 below. The forecast is based on Purvin & Gertz' forecasts of gas supply, gas processing, gas exports and recovery factors. Conventional ethane supply declines with natural gas supply until the 2015-2016 period when incremental supplies of unconventional gas overcome conventional production declines. In addition, post 2015, it is assumed that some gas volumes leave the Alliance system and are processed in the straddle plants on the NGTL system leading to a small rise in total ethane production. In the later part of the decade, ethane production begins to decline as gas production plateaus and becomes leaner.



ETHANE DEMAND

Petrochemical consumption in Alberta is the primary driver of ethane demand in Canada. Virtually all of the ethane produced in Alberta is consumed by the local petrochemical industry. There are two large ethylene production complexes, one operated by Dow Chemical Canada Inc. in Fort Saskatchewan and the other operated by NOVA Chemicals Corporation in Joffre. There was a

significant increase in ethane demand with the expansions of the Dow facility in 1999 and the NOVA Chemicals facility in 2000.

In recent years, ethane demand has been constrained by declining ethane supplies and the Alberta ethane market has tightened. All economically available ethane is already being produced from the existing gas supply yet a shortfall still exists. The exact magnitude of the shortfall depends on the actual ethane consumption capacity of the Alberta petrochemical industry and that is difficult to quantify. The current nameplate ethane cracking capacity is approximately 270,000 barrels per day (bpd). However, ethylene derivative capacity is somewhat below ethane cracking capacity and therefore the exact ethane consumption capacity is not clear. Purvin & Gertz estimates that at full utilization, current ethane consumption capacity is approximately 250,000 bpd. Current average petrochemical consumption in Alberta is approximately 215,000 bpd¹ and therefore the petrochemical facilities currently have about 35,000 bpd of excess ethane consumption capacity. This unutilized capacity figure is expected to increase as ethane supplies continue to decline.

Ongoing unutilized capacity represents a significant lost opportunity for value added upgrading within Alberta. Further aggravating this problem is that relatively inexpensive debottlenecking opportunities exist to increase capacity at the Alberta petrochemical facilities. These opportunities could be captured if sufficient ethane supply were available. However, it is unlikely that any capacity expansions will occur until new and large ethane supplies materialize.

Historic ethane demand also includes petrochemical markets in Eastern Canada and exports to the United States. Flexible feed crackers in the Ontario ethylene facilities used to consume a relatively small volume of ethane from imports or from ethane delivered via the Cochin pipeline. Cochin deliveries of ethane have been suspended indefinitely and are not expected to resume. Ethane exports no longer occur and miscible flood requirements have fallen. Miscible flood markets in Alberta presently account for less than 5% of demand and this volume has been declining for several years.

The Alliance pipeline exports ethane in the gas stream for recovery and use in the U.S. Midwest. This rich gas export has reduced the availability of ethane in Alberta and has contributed to the tightened supply/demand balance.

ETHANE SUPPLY AND DEMAND OVERVIEW

The Western Canadian petrochemical industry remains competitive as a result of economies of scale and relatively low gas costs. Purvin & Gertz expects that potential ethane demand will exceed ethane supply and that the Western Canadian petrochemical industry will continue to consume all available ethane over the forecast period.

Purvin & Gertz has analyzed the ethane supply/demand balance for Alberta based on petrochemical and other demands. Purvin & Gertz reviewed historical petrochemical demand data as well as historical ethane and ethylene export data. Ethane and ethylene export shipments on the

¹ 2010 ERCB data - October year to date

Cochin pipeline have been suspended indefinitely and therefore it is assumed that there will be no ethane and ethylene exports in the future.

Purvin & Gertz' Ethane Supply and Demand forecast is shown in Table IV-1.

	2007 - 09 Average	2010	2012	2014	2016	2018	2020	2022	2024
Consumption Capacity	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Ethane Supply	232,400	214,800	189,100	173,500	173,600	171,100	164,900	156,700	147,200
Supply Shortfall	17,600	35,200	60,900	76,500	76,400	78,900	85,100	93,300	102,800
Vantage Pipeline Supply				45,000	45,000	45,000	45,000	44,000	43,000

OTHER FEEDSTOCKS

The Western Canadian petrochemical facilities were designed to crack ethane. The facilities can crack small amounts of propane and/or butane, however Purvin & Gertz does not anticipate that significant quantities of propane will be cracked in Western Canada since Canadian propane markets are expected to tighten with declining gas production and steady demand in most of the traditional propane market areas.

POTENTIAL FUTURE ETHANE SUPPLIES

As can be seen from the table and charts above, conventional ethane supplies have been well below ethane consumption capacity for several years. The supply shortfall is expected to be more than 76,000 bpd below potential petrochemical demand by 2014. In 2007 and 2008, the Alberta Government implemented the Incremental Ethane Extraction Policy (IEEP) to encourage production of incremental ethane within the province in order to mitigate the supply shortfall. The IEEP program provides royalty funds to offset some of the capital and operating expenses of new ethane production facilities. Several relatively small projects have been developed to take advantage of the program however, to date only a small portion of the available program funds have been utilized by industry².

Potentially significant volumes of incremental ethane supplies exist and several sources are discussed below. Capturing these incremental supplies would require significant new investments in gas processing and NGL infrastructure. However, in spite of available incentives, no large scale incremental ethane supply projects have been developed to address the supply shortfall. This is a strong indication that the costs of these incremental supplies are so high that they are currently uneconomic to produce.

² Purvin & Gertz understands that the Alberta Government is reviewing the IEEP program to determine whether modifications can be made to encourage more incremental ethane developments.

The potential ethane supply from the Bakken area of North Dakota is discussed in Section V of this report. The Vantage Pipeline will likely be the first to deliver a large volume of incremental ethane supply to the Western Canadian Petrochemical industry. Purvin & Gertz believes that there will be adequate demand to consume this volume of incremental ethane. Figure IV-1 and Table IV-1 show imports through the proposed Vantage Pipeline starting in 2012 and growing to 45,000 bpd.

The next biggest tranche of ethane is on Alliance Pipeline. A significant issue for Alliance is the security of gas supply post 2015. As of December 1, 2010, shippers representing only 8% of Alliance's capacity elected to extend their shipping contracts beyond 2015³. It is unlikely that a gas processing facility on the Alberta end of Alliance will be seriously considered until the uncertainties surrounding long term gas supply are resolved.

Purvin & Gertz expects that there will be incremental ethane production from field processing plants in Western Canada. As discussed in Section III, strong frac spreads will encourage exploration for rich gas and it follows that there will be strong incentive to process any available rich gas at existing or new facilities throughout Western Canada. Not all of the NGL production from these facilities can be considered to be incremental since most of these field facilities effectively upstream existing straddle plant facilities. At the same time, the gas processing industry in Western Canada is suffering from a large excess capacity problem. Nevertheless, the incentive to process rich gas remains. Purvin & Gertz expects that incremental ethane volumes from field plant processing will remain relatively small over the forecast period.

Upgrader or refinery offgas streams represent a potentially significant new source of NGL volumes in Western Canada. However, these volumes are dependant on future upgrader developments and will be very costly to recover. The offgas streams contain mixed paraffinic and olefinic products. Considerable industry effort is being dedicated to develop new offgas projects. If all current upgrader offgas volumes in the Fort McMurray area were to be captured and processed, then potential ethane volumes would be in the 30,000 to 40,000 bpd range.

Williams Energy (Canada) Inc. currently extracts an olefinic propane plus NGL mix at the Suncor facility in Fort McMurray and processes the mix at a fractionation facility in Redwater near Edmonton. Williams has begun construction on a new ethane plus NGL pipeline from Fort McMurray to the Redwater processing facility. The expected in service date is in 2012 with an initial capacity of 43,000 bpd and an ultimate capacity of up to 125,000 bpd.

AuxSable Canada LP recently announced a new feedstock arrangement for the Heartland Offgas Project (HOP) facility. Shell Canada Products will provide up to 20 mmcf of offgas and HOP will produce hydrogen, ethane and propane plus products which will be delivered to Shell's Scotford Refinery. Total liquid volumes are expected to be in the 2,000 to 2,500 bpd range.

Due to the cost of offgas liquids, Purvin & Gertz expects ethane volumes from offgas sources will remain relatively small for the forecast period.

³ Alliance Pipeline Press Release December 3, 2010.

For this report, Purvin & Gertz assumes that Arctic gas will not arrive in Western Canada before 2025 and therefore no contribution from Mackenzie or Alaska is included in this outlook.

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V. NORTH DAKOTA ETHANE SUPPLY

NORTH DAKOTA OIL AND GAS SUPPLY

The Williston Basin, which covers parts of western North Dakota, eastern Montana and parts of Saskatchewan and Manitoba, is primarily an oil play. In contrast to most producing areas in the rest of the lower 48 states, the Williston Basin has seen rapid production increases in recent years due largely to high oil prices and technological improvements such as horizontal drilling and multi-stage fracturing. Not surprisingly, associated gas production has increased coincident with the oil production increases.

The growth in Williston Basin crude oil and natural gas production may be attributed to several factors. The Williston Basin is estimated to contain several hundred billion barrels of oil in place. Of the estimated oil in place, about 4 billion barrels of oil is considered recoverable with existing technology, based on US Geological Survey reports. Recent developments in horizontal drilling and multi-stage fracturing technology have facilitated access to reserves contained within the shale formations of the Williston Basin. The shale formations are characterized by low porosity and typical shale wells are characterized by high initial productivity followed by a very steep decline rate. The Bakken geological formation has been the most significant target of Williston Basin exploration activity, but the Three Forks formation (which lies below the Bakken) has also seen significant exploration and development activity.

Higher oil prices since about 2003 have provided a greater incentive to apply the advanced drilling and fracturing techniques to the exploitation of previously uneconomic reservoirs. This is particularly true in the Williston Basin, where the oil recovered from the Bakken and Three Forks formations is typically of very high quality, and therefore of higher inherent value in the oil market. The associated gas from the Bakken and Three Forks formations is also very rich, containing high proportions of Natural Gas Liquids (NGL).

Crude oil and natural gas production in North Dakota is concentrated in several counties, generally as defined by the extent of the Bakken and Three Forks formations in the Williston Basin. The highest production in recent years (and the most rapid growth) has occurred in the Mountrail, Bowman, and McKenzie Counties.

Montana crude oil production more than doubled between 2002 and 2006, to peak at about 100,000 bpd. Currently, production is around 81,000 bpd and declining. In North Dakota, gains in production have been similarly impressive, but materialized later. Production in 2009 was approximately 220,000 bpd, compared to only 80,000 bpd in 2003. North Dakota natural gas production was relatively flat at 150 mmcf from 2000 through 2005. From early 2006 to late 2010, gas production has more than doubled to approximately 340 mmcf. A number of producers have significant development plans for the area and production is anticipated to continue to grow.

It is clear that production growth from the Williston Basin has accelerated as operators have gained experience with the application of horizontal drilling and advanced fracturing technology to the Bakken shale. Several of the major producers in the region, including EOG Resources, Continental, Hess Corporation and Whiting Oil & Gas, have indicated their plans to increase investment and production activity in 2011 and beyond.

Many factors influence production forecasts. Estimates of oil production from the U.S. Northern Tier vary widely. PGI reviewed available forecasts of production, and prepared its own forecast based on an independent assessment. We currently expect crude oil production from North Dakota to peak between 400,000 bpd and 450,000 bpd in the near term, with a relatively stable outlook through the later part of the decade, and then a subsequent slow decline of between 2.5 and 3 percent per year through the end of the forecast period. Similarly, natural gas production should grow to around 500 mmcf by 2015, remain near that level for several years and then decline slowly thereafter. A similar forecast is provided by the North Dakota Department of Mineral Resources (ND-DMR). Their Bakken - Three Forks P50 forecast of crude oil production rises quickly to 450,000 bpd, remains at that level through 2020 and then follows by a steady decline to 2055¹. ND-DMR's P10 forecast rises to a 700,000 bpd plateau followed by a decline after 2025. It should be noted that several producers have very optimistic outlooks for North Dakota similar to ND-DMR's P10 forecast. If those more optimistic outlooks prove to be correct, then oil and natural gas production will be correspondingly higher.

GAS PROCESSING PLANTS

The ND-DMR indicates that total planned gas processing capacity for the state is 513 mmcf as well as 350 mmcf of total new and proposed gas pipeline capacity².

NGL is currently produced at fourteen gas processing plants in North Dakota. The facilities produce propane, butane, natural gasoline and Y-Grade mix. In late 2009 and early 2010, approximately 22,000 bpd of NGL were produced. No material amounts of specification ethane are currently produced. Virtually all ethane produced with natural gas is currently left in the gas stream.

North Dakota gas processing and NGL production is dominated by three plants, namely Hess Corporation's Tioga facility (120 mmcf), Bear Paw Energy/Oneok's Grasslands facility (100 mmcf) and Hiland Partners Badlands facility (40 mmcf) which together produce approximately 75% of the state's total NGL production. The associated natural gas processed at the North Dakota gas processing facilities is very rich in NGL. Current deliveries to the Williston Basin Interstate Pipeline from the Tioga area typically contain in excess of 20% ethane.

In September 2010, Hess Corporation was granted permission by the North Dakota Public Service Commission to expand the Tioga gas plant to a total capacity of 250 mmcf. Cost estimates range from US\$325 to US\$500 million. Expected onstream date is late 2012 or early 2013. Assuming a 20% ethane composition in the inlet gas stream and high ethane recovery, the Tioga

¹ ND House Appropriations Committee Hearing 01-07-2011, <https://www.dmr.nd.gov/oilgas/presentations/HouseApprop2011-01-07.pdf>

² ND Oil, Gas, and Coal Producing Counties 09-30-2010, <https://www.dmr.nd.gov/oilgas/presentations/NDOGCCPC2010-09-30.pdf>

facility should be able to produce in the range of 25,000 to 30,000 bpd of ethane as well as up to approximately 20,000 bpd of propane plus at full plant capacity.

In November 2010, Hess Corporation announced that it has agreed to acquire 167,000 net acres in the Bakken oil shale play in North Dakota from TRZ Energy, LLC for US\$1.05 billion in cash. The properties being acquired are located near Hess' existing acreage and have current net production of approximately 4,400 boe/d. It appears that Hess will control adequate reserves to supply the Tioga facility for the foreseeable future.

In April 2010, ONEOK Partners announced plans for a new gas processing plant called "Garden Creek" in McKenzie County. The facility will have capacity to process up to 100 mmcf/d of gas and produce up to 25,000 bpd of NGL including ethane. ONEOK estimates that the new facility will require an investment of US\$150 to \$210 million and that an additional US\$200 to \$205 million will be invested in 2010 and 2011 for new gathering infrastructure to supply ONEOK's gas processing facilities. ONEOK has also announced plans for the Bakken Pipeline which will be a 525 to 615 mile Y-Grade NGL pipeline from the Bakken Shale area to the Overland Pass Pipeline in Colorado. The project will include an expansion to the Overland Pass Pipeline and an expansion to the Bushton, Kansas fractionator from 150,000 bpd to 210,000 bpd. Total cost for the related projects will be in the US\$595 to \$730 million range.

In October 2010, ONEOK announced plans to invest \$180 million to \$205 million to construct the new 100 mmcf/d Stateline I gas processing facility in western Williams County. In January 2011, ONEOK announced plans to invest a further \$135 million to \$150 million to construct the 100 mmcf/d Stateline II gas processing facility. The Stateline I plant is expected to be in service in 2012 and the Stateline II plant is expected to be in service in 2013. ONEOK also expects further investments to expand and upgrade existing gathering and compression infrastructure.

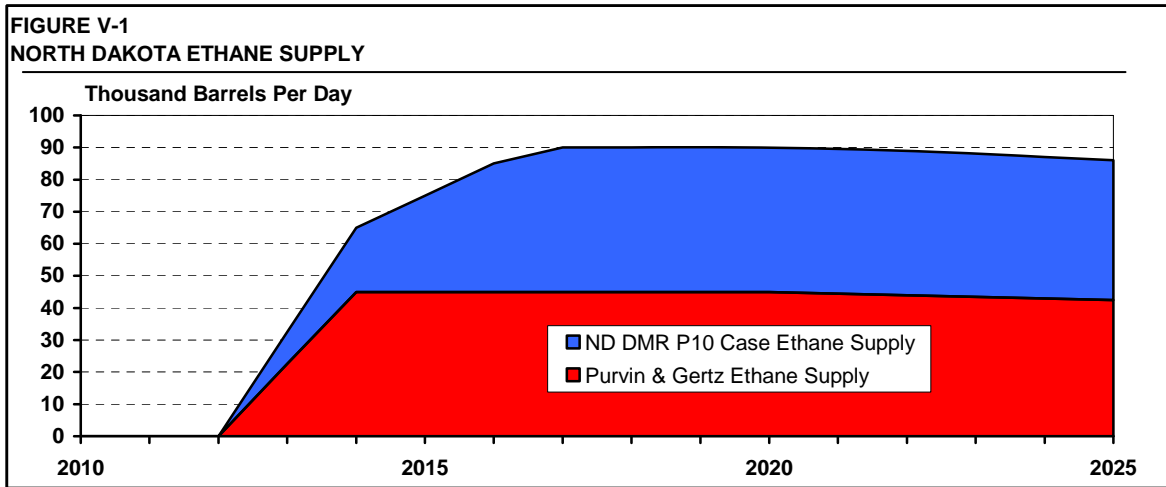
There is approximately 60 mmcf/d of processing capacity in other facilities in the Williams, Mountrail and McKenzie counties (approximately 45 mmcf/d is operated by Whiting Oil & Gas Ltd in the Robinson Lake (35 mmcf/d) and Ray (10 mmcf/d) facilities). The facilities in the three counties are currently producing approximately 2,500 bpd of propane, 1,000 bpd of butane and 500 bpd of natural gasoline.

Ethane Outlook

When the Tioga and Garden Creek expansions are completed, total gas processing capacity in the area will exceed 400 mmcf/d. Based on our crude oil and natural gas production forecasts, Purvin & Gertz believes that the existing and proposed gas processing facilities in Northwestern North Dakota will enjoy high utilization rates until at least 2020.

Assuming that the composition of raw gas remains similar to what is being currently produced, then Purvin & Gertz estimates that there will be approximately 40,000 to 50,000 bpd of potential ethane volumes in reasonable proximity to the Vantage Pipeline. This includes 25,000 to 30,000 bpd from Tioga, and 15,000 bpd to 20,000 bpd from other area facilities. These volumes will remain relatively stable through the later part of the decade and will begin to decline around 2020 and beyond.

As discussed above, Purvin & Gertz expects total North Dakota gas production to grow to approximately 500 mscfd in the near term. Purvin & Gertz does not forecast gas production volumes above that level at this time. However, there is scope for future oil and natural gas development above the Purvin & Gertz forecast in the Northwestern quadrant of North Dakota. If such developments occur, it is reasonable to expect that further processing capacity would be built to process more gas and to produce more natural gas liquids including ethane. Under the ND-DMR Bakken – Three Forks P10 forecast of 700,000 bpd through 2025, and assuming similar gas/oil ratios and that all of the gas is of similarly high NGL content, then there could potentially be 75,000 bpd to 100,000 bpd of ethane production. Figure V-1 illustrates Purvin & Gertz' estimate of ethane supply as well as the potential ethane supply in the ND-DMR P10 case.



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