Chapter 4 — Environmental Consequences

This chapter of the EIS provides an analysis of the effects or environmental impacts that would result from implementation of the Proposed Action or alternatives. Environmental effects include ecological, aesthetic, historic, cultural, economic, social, or health impacts. Effects can be direct, indirect, or cumulative and can be temporary (short-term) or permanent (long-term). Effects can vary in degree, ranging from only a slight discernable change to a drastic change in the environment. For this EIS, short-term effects are defined as occurring during the construction phase. Long-term effects are caused by operations that would remain longer.

This chapter combines the project proponent's proposed construction action (Alternative 1) with the proponent's proposed effluent discharge action (Alternative A) for purposes of analyzing the various environmental impacts associated with the combined proposal. This approach facilitates analysis and disclosure of the environmental impacts associated with all aspects of the proposed action. The remaining construction alternatives (Alternatives 2 through 5) and effluent discharge alternatives (Alternatives B through D) are discussed in comparison to the combined Alternatives 1 and A analysis for each section of this chapter.

4.1 Geology

4.1.1 Alternatives 1 and A — Original Proposed Actions

Under this alternative the site would be accepted into trust status for the purposes of constructing and operating the clean fuels refinery and producing forage for buffalo. The construction phase would begin with the stripping of topsoil, grading of the site and foundation excavations. Cut and fill and other standard construction techniques would be used to develop access roads and to install pipelines, power lines, water wells, and railroad spur. All of these construction activities would alter existing topography. In total, an estimated 190 acres would be affected by permanent surface-disturbing activities and alteration. There would be 78 acres of short term surface-disturbing activities (e.g. pipeline construction). Use of proper construction techniques, as described in Chapter 2, would reduce the effects associated with topographic alteration.

As discussed in Chapter 3, no major geologic hazards have been mapped in the project area. Seismic activity is very low (or non-existent) in the project area and no evidence of active faults or earthquakes of significant intensity have been documented. Although the landslide incidence is mapped as moderate in the general vicinity, it is not anticipated that the construction activities would activate any landslides. Identification of potentially suitable sites for the proposed refinery was performed using screening search criteria, including but not limited to suitable topography. The search criteria are described in Chapter 2.

Impacts to the geologic environment would be limited to near surface resources. No impacts would be anticipated to the subsurface geologic environment. Potential impacts related to geologic resources would be localized and limited to the time of construction.

4.1.2 Construction Alternatives

4.1.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the entire 468.39-acre site would be accepted into trust status, but construction and operation of the proposed refinery and production of buffalo forage would not proceed. Therefore, the 468.39-acre project site would most likely continue to be used for agricultural purposes, which have occurred for decades. Based on the foregoing, there would be no impacts to geologic resources related to refinery construction, operation, and maintenance.

4.1.2.2 Alternative 3 — No transfer to Trust, Refinery Constructed

Under this alternative, the entire 468.39-acre site would not be accepted into trust status, but construction and operation of the proposed refinery and production of buffalo forage would proceed. The impacts to geologic resources from the implementation of this alternative would be the same as described for Alternatives 1 and A. The MHA Nation would construct and operate the refinery and associated facilities and the same impacts would occur.

4.1.2.3 Alternative 4 — Modified Proposed Action

Under this alternative, the entire 468.39-acre site would be accepted into trust status for construction and operation of the proposed refinery with refinery design modifications and production of buffalo forage. Implementation of this alternative would result in the same effects as described in Alternatives 1 and A. The revised site refinery layout, pipelines and power lines would be constructed, so effects attributed to these facilities would be the same.

4.1.2.4 Alternative 5 — No Action

Under this alternative, the entire 468.39-acre site would not be accepted into trust status. The proposed refinery would not be constructed. Therefore, the 468.39-acre project site would continue to be used for agricultural purposes, which have occurred for decades. There would be no impacts to geologic resources related to refinery construction, operation, and maintenance.

4.1.3 Effluent Discharge Alternatives

4.1.3.1 Alternative B — Partial Discharge through an NPDES Permit and Some Storage and Irrigation

Under this alternative, wastewater would be treated and, then either discharged through a NPDES permit or stored and used for irrigation. These effluent discharges would have no effects to geologic resources.

4.1.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this Alternative, the effluent from the WWTP would be discharged to a Class I, Non-hazardous UIC well that would be drilled on the project site. This well would dispose of non-hazardous fluids into isolated formations beneath the lowermost existing or potential future underground source of drinking water. The proposed injection zone would likely be located at great depth; below the lowest potential underground source of drinking water. The injection formation would be tested to evaluate its suitability for disposal. Maximum pressure requirements to prevent initiation and propagation of fractures through overlying strata would be determined. The injectivity tests would be used to determine the fracture pressure limits on overlying material.

The above-described measures would aid in selection of a proper disposal formation; thus, minimizing the potential for effects to subsurface geological resources under this alternative.

4.1.3.3 Alternative D — No Action

Implementation of this alternative would have no effects to geologic resources. No effluent would be generated or discharged because the refinery would not be constructed. Continued use of the project site for agricultural purposes would not affect geologic resources.

4.1.4 Cumulative Impacts

Existing, proposed, and reasonably foreseeable future actions would be unlikely to trigger events such as landslides, mudslides, debris flows, or slumps. Therefore, no incremental increase in cumulative effects associated with geologic hazards would occur.

Because any project impacts related to geology would be localized and limited to the time of construction, cumulative impacts would occur only if another project is planned for construction in proximity or adjacent to the clean fuels refinery project. Currently, there are no other known projects planned in the project area, consequently, there are no anticipated cumulative impacts to geologic resources.

In the event of future new construction in the area, the cumulative effects to the surface geologic environment would be minimized through following proper techniques for facilities construction, operation, and reclamation. Proposed actions and future activities would require reclamation of disturbed lands and would minimize alterations to topography.

4.2 Ground Water Resources

4.2.1 Alternatives 1 and A — Original Proposed Actions

4.2.1.1 Water Quantity

In western North Dakota, the major aquifer groups are: bedrock aquifers, buried valley aquifers, and glacial till deposits that immediately underlie the ground surface. The bedrock aquifers include the Fox Hills-Hell Creek Formation, Tongue River and Sentinel Butte Members of Fort Union Formation. The buried valley aquifers consist of Pleistocene sand and gravel deposits of the Coleharbor Formation present in the major valleys in the general vicinity of the project area. The last aquifer group is represented by the surficial till deposits of the Coleharbor Formation.

Water Supply for the Project

The projected source of water for the refinery would be four water wells finished in the deeper Fox Hills-Hell Creek bedrock aquifer. The maximum projected withdrawal of water from the four on-site wells would be 10 gpm from each or 40 gpm total. Maximum withdrawal would only occur during refinery startup.

During operations, the facility anticipates using recycled water and stormwater runoff which would normally limit makeup water needed from the wells. Normal withdrawal from the wells with recycling of water would be 10 gpm. Ground water would be pumped from the wells to a 5,000-bbl raw water-holding tank and additional water would be stored in the evaporation and discharge ponds. The initial water requirement for startup would be approximately 10 acre-feet.

Water Well Drawdown

Water level changes in the aquifers are not expected to be significant. The proposed withdrawal of up to 40 gpm during startup and 10 gpm under the full recycling option would probably have minimal effects on depth to water or availability of water in the Fox Hills-Hell Creek aquifer because the withdrawal would be over a period of time and recharge to the aquifer is greater than discharge. Potential impacts to individual water wells would depend on proximity to the refinery, depth and completion interval of the water well, and the yield required to maintain the well as a usable source.

Impacts to the Fox Hills-Hell Creek aquifer in terms of well yield or availability would not be significant due to the small magnitude and duration of withdrawals. Approximately 51 million acre-feet of ground water is stored in that portion of the Fox Hills aquifer beneath the Reservation and 24 million acre-feet of ground water is stored in that portion of the Tongue River member beneath the Reservation (Cates and Macek-Rowland 1998). Well yields from the Fox Hills aquifer vary significantly. Wells within Mountrail County yield as little as 3 gpm of water (Armstrong 1971). In contrast, yields of 200 to 400 gpm have been reported in Dunn County (Klausing 1979 as cited in Cates and Macek-Rowland 1998). Only a few Fox Hills wells have been drilled within the Reservation and data on yields for these wells is not available.

The refinery would use the water recycling option following initial startup, thus reducing overall aquifer drawdown. The nearest well completed in the Fox Hills aquifer by the City of Plaza is located approximately four miles from the refinery site. There are no other users of this aquifer located in the immediate vicinity of the project area. The short-term drawdown of the aquifer for initial startup is not anticipated to have any effects on other proximate aquifers or water users. If the refinery does not recycle process wastewater, there would be a long-term water use of 40 gpm or 64.5 acre-feet/year. Depending on conditions in the Fox Hills-Hell Creek aquifer under the site, the no recycling of water option (or limited recycling) may cause greater than expected localized drawdown in the aquifer or additional wells may be needed for water supply.

The majority of the water supply wells used by individuals are finished in shallow glacial aquifers. Typically, the wells do not exceed 150 feet in depth and are usually finished in buried valley aquifers or in the glacial till. No impacts in terms of drawdown are expected to these shallow aquifers due to no direct water withdrawal from these units as well as hydraulic isolation from the deeper units.

4.2.1.2 Water Discharge

Under the Proposed Actions, process water from the refinery would first undergo treatment in the WWTU and then would be directed to holding ponds prior to recycling or discharge through a permitted NPDES outfall. The exact location of the NPDES outfall has not been determined. Potentially contaminated (oily) stormwater would be collected in the holding pond and depending on quality may be sent directly to the additional effluent holding ponds and recycled to the refinery process, discharged through a permitted NPDES outfall, or undergo further treatment in the WWTU.

The facility plans to recycle most wastewater. Under full recycling, Alternative 1 would discharge an average of 10 gpm of treated wastewater and potentially contaminated (oily) stormwater via NPDES permitted Outfall 002. Discharge rates could vary from 0 to a projected maximum of 24.4 gpm. Uncontaminated (non-oily) stormwater would be collected in lined holding ponds (evaporation pond) and used as makeup water for the fire water system or recycled back to the refinery processes, or discharged through NPDES permitted Outfall 001. The discharge from Outfall 001 would be dependent upon precipitation events. Discharge rates could vary from 0 to a projected maximum of 65 gpm.

If the refinery does not recycle wastewater, the facility would discharge an average of 20.4 gpm of treated wastewater and potentially contaminated (oily) stormwater via NPDES permitted Outfall 002. Discharge rates could vary from 0 to a projected maximum of 34.4 gpm. Uncontaminated (non-oily) stormwater would be discharged via NPDES permitted Outfall 001 at 30 gpm on an average with a projected maximum of 95 gpm during certain times of the year. Because of the more continuous nature of NPDES discharges under this option, there could be more recharge to ground water occurring than under the full recycle option.

The flow rates for each potential outfall scenario described above are summarized in Table 4-1.

Table 4-1 Estimated Flow Rates and NPDES Permit Outfalls for Proposed Refinery

	Alternatives 1 and A		**Alternative 4 and A**
	Full Recycling	**Without Recycling**	
Outfall 001 - uncontaminated stormwater	Generally no flow, water used to fill the fire water ponds or recycled up to 65 gpm	30 gpm average 0.0 – 95 gpm, flow range	Generally no flow, water used at refinery and to fill the firewater ponds. up to 55 gpm
Outfall 002 - treated waste-water oily stormwater for Alternative 1; treated wastewater only for Alternative 4.	10 gpm average 0.0 - 24.4 gpm, flow range	20.4 gpm average 0.0 – 34.4 gpm, flow range	16 gpm average 0.0 – 34.4 gpm
Outfall 002a - potentially contaminated (oily) stormwater	N/A, included in outfall 002	N/A, included in outfall 002	4.4 gpm average 0.0 – 18.4 gpm
Outfall 003 employee wastewater	N/A, septic tank	N/A, septic tank	3.5 gpm
Total flows from site	10 gpm average, maximum of 89 gpm	50 gpm average, maximum of 130 gpm	20 gpm average maximum of 108 gpm

Note:
1. N/A = not applicable.

Operation of the project septic system would discharge approximately 3.5 gpm into the shallow till in the area of the leach field. This would create a slight mounding of ground water within the till in the area, but it is not expected to result in seepage to the surface. The constant flow of this water would increase the seasonal water levels in the alluvium of the unnamed tributary that drains the site and may contribute to downstream flow during wet periods of the year. Minimal effects would be observed in the East Fork of Shell Creek aquifer. There is a concern whether soils and ground water conditions would accommodate this septic system. During final design, the MHA Nation would perform additional soils evaluation to determine if the septic system would accommodate the discharge. If not, sanitary wastewater may be collected in a tank and pumped into a truck for transport and disposal into the City of Minot Wastewater Treatment Facility or treated in a package wastewater facility and discharged through NPDES permitted Outfall 003 as described in Alternative 4.

Recharge to the upper water bearing zones of the Coleharbor Formation as well as underlying Fort Union Formation is primarily by direct precipitation and infiltration. There is a downward vertical gradient between the till and the underlying Fort Union Formation. Direct discharge into the surface stream would have insignificant effects on water levels in these shallow aquifers primarily due to the low volume of discharge and low hydraulic conductivity of the shallow till material. The hydraulic conductivity in the water table wells screened in the glacial till ranges from 5x10-5 cm/s to 3x10-6 cm/s (GeoTrans, Inc. 2005). Additionally, the majority of the discharge during the winter months would freeze and evaporate before it would infiltrate. During the summer months, a portion of the discharged water would either be used by plants or evaporate and only a small portion would infiltrate into underlying sediments.

Recharge to the Fox Hills-Hell Creek aquifer would not be affected by the discharge as it is minimally recharged by leakage through overlying layers due to its depth (greater than 1,000 feet). Direct recharge of these aquifers occurs outside of the Reservation where the aquifer crops out in the extreme southwestern corner of North Dakota and in eastern Montana (Cates and Macek-Rowland 1998).

4.2.1.3 Construction

Water would be used for construction dust control and earthen compaction. The requirement would be minimal and the source would be runoff stored in the ponds. Construction activities are not expected to impact ground water quantity in any of the three major aquifer groups.

4.2.1.4 Operation

The impacts of daily operations on ground water quantity would be related to the water withdrawal and discharge. Ground water withdrawal from the Fox Hills-Hell Creek aquifer would have an insignificant effect on water table elevations in shallow aquifers. This is primarily because of the relatively small yields and the significant depths to the top of the Fox Hills aquifer. The anticipated withdrawals would not impact the wetland, PEMF#2, because the wetland is a prairie pothole wetland and does not rely significantly on ground water discharge. In addition, the withdrawal of water from the Fox Hills-Hell Creek would be limited to project startup and periods of operation when recycling is not possible.

Minimal impacts are anticipated from effluent discharge to the shallow till and buried valley aquifers primarily due to the low volume of discharge and low hydraulic conductivity of the overlying till material. No impacts to the Fox Hills-Hell Creek aquifer are anticipated from the effluent discharge due to its great depth and hydraulic isolation of the shallow and the deep aquifers.

Another potential impact that could result from ground water extraction is ground surface subsidence. The elevation of the ground surface has the potential to be reduced as the water table is lowered or as the pressure in a confined aquifer is reduced. However, due to the limited drawdown expected in the aquifer and recharge replacing the used water, no subsidence impacts are anticipated.

4.2.1.5 Water Quality

The proposed refinery site is underlain by glacial deposits called till. Based on geologic logs, the till layer ranges from 107 to more than 125 feet in thickness and overlies the Fort Union Formation across the proposed refinery site. The till is composed almost entirely of clay except for a 5- to 10-foot-thick sandy to sandy silt layer that occurs at a depth of about 95 to 105 feet below the surface. The first lignite deposit in the Fort Union Formation was encountered at about 105 to 110 feet. The relatively thick till deposits would retard the migration of contaminants to the underlying Fort Union Formation.

The potential impacts to ground water quality are primarily related to the effluent discharge and accidental spills and leaks.

4.2.1.6 Effluent Discharge

Under the Proposed Actions, all the water discharged through permitted NPDES outfalls would have to meet refinery's effluent discharge criteria. Because all the treated effluent discharged from the outfall would meet the refinery's NPDES permit effluent limits, it would likely be of higher quality than the formation water.

EPA has developed preliminary NPDES effluent limits for wastewater discharges anticipated at the refinery. The draft permit is in Appendix C. These limits have been developed in consideration of Tribally-adopted (Tribal Business Council adopted on May 11, 2000) surface water quality standards for the Reservation, as well as standards for the State of North Dakota and are discussed in more detail in Surface Water section of this Chapter. As stated in Chapter 3, EPA does not have the statutory authority to regulate ground water quality. In addition, the MHA Nation has not promulgated Tribal standards for ground water, does not have a ground water classification system, or a ground water discharge permit system in place.

Accidental Spills and Leaks

Normal refinery operations during the life of the refinery would result in some contamination of ground water and soils underneath the refinery. Ground water contamination could extend off-site if leaks and spills are not addressed properly or if a catastrophic spill occurred. Modern refinery design, construction, and operation practices would be more protective of ground water than historic construction practices at old refineries, such as paving and installing curbing in the loading area, segregating oily wastewater, spill containment and inspection requirements, and equipment and tank standards.

The potential exists for impacts to ground water quality from accidental spills and leaks that are inherent in any refinery operation. For more information on ground water impacts from spills, see the Spills section in this Chapter. Impacts to ground water in the till would be minimized by designing the refinery to prevent and contain leaks and spills. Holding ponds would be lined to prevent or minimize leakage into the ground water.

Measures to implement prompt cleanup and repair of leaks and spills would further minimize potential impacts to ground water underlying the site in the till. In the SWPPP, SPCC plan, and RCRA TSD permit as applicable, there would be requirements to implement prompt cleanup and repair of leaks and spills, and develop contingency planning and reporting, which would further minimize potential impacts to ground water quality underneath the refinery site. The low permeability of the till would also retard movement of contaminants. Ground water in the till is estimated to flow at a rate of 0.4 to 2.4 feet per year (GeoTrans, Inc. 2005). Over a period of 20 years using those flow rates, ground water contamination would be estimated to migrate 8 to 48 feet from the initial point of contamination.

4.2.1.7 Construction

Construction activities are not expected to impact ground water quality, even though there may be potential impacts to soils from inadvertent spills of hazardous materials such as fuel and oil. Protective measures, such as Best Management Practices (BMPs) and the SWPPP, required by the Stormwater Construction General NPDES permit and the SPCC plan would minimize introduction of undesired substances into soils and consequently shallow ground water at the site. No impacts to water quality in deeper aquifers are anticipated during construction activities.

4.2.1.8 Operation

The potential impacts of daily operations on ground water quality are primarily related to water discharge and oil spills and leaks. Contamination could result from the dissolution and mobilization of exposed oil and refined products by precipitation and subsequent infiltration into the surficial aquifers. By following design engineering and operating practices (e.g., promptly implementing spill response plans), impacts on ground water quality would be minimized. Protective measures, such as BMPs and the SWPPP required by the NPDES permit during operations, would also reduce the potential for unanticipated impacts to ground water from spills.

4.2.1.9 Impacts to Drinking Water

Adverse impacts to drinking water quality of individual well users and public supply systems are not anticipated under this alternative.

The nearest well completed in the Fox Hills-Hell Creek aquifer is by the City of Plaza and is located approximately four miles from the refinery site. Impacts to the Fox Hills-Hell Creek in terms of water quality would be insignificant due to its great depth and hydraulic isolation from the shallow aquifers. No other water users of this aquifer are located in the immediate vicinity of the project area.

Residents of Plaza use two additional ground water wells to meet the demand during high usage periods. These wells are completed at depths of 88 and 91 feet in Coleharbor Formation and are located approximately 5 miles northwest of the refinery. Water from these formations is of poor quality and requires treatment prior to distribution. Residents of Makoti obtain water from two ground water wells completed in the Vang aquifer (buried valley aquifer) at depths of 22 and 41 feet. These wells are located approximately 5 miles northeast of the project site. Impacts to water quality are not likely to occur due to the distance of these wells from the refinery site, the limited local extent of these buried valley aquifers, low hydraulic conductivity of the till, and poor formation water quality.

The majority of the domestic wells used by individuals are completed in surficial deposits, primarily the till. Six residences are located within 1 mile of the project area. Two of these residences include the O__ well just north of Highway 23 and the S__ well located south of the property. Wells are completed at depths of 103 and 189 feet respectively, and water has brownish-red appearance with high TDS values. Well water can be used for cattle and horses, although some people haul water for their livestock. These residences haul in water to fill their cisterns for domestic use. Drinking water is purchased separately. There are two water wells located at the east side of the property at the farmhouse. Neither of these wells is currently used, nor are they anticipated to be used in the future.

Impacts to water quality in the shallow till and valley aquifers from project discharges are not anticipated primarily because all the discharged water would be of better quality (meeting the NPDES requirements) than the formation water in the shallow aquifers. Additionally, low volume of discharges and low hydraulic conductivity of the overlying till material would minimize the infiltration rates and volumes.

Potential impacts to shallow ground water might occur because of inadvertent spills or leaks. Protective measures as provided in the SPCC plan, the SWPPP, FRP, and application of BMPs would minimize introduction of undesired substances into soils and consequently shallow ground water.

4.2.1.10 Recharge

Impacts to water quality from recharge to the Fox Hills-Hell Creek aquifer are not anticipated as it is minimally recharged by infiltration through overlying layers and is overlain by low permeability sedimentary rocks and till.

Impacts to water quality from recharge to the upper water bearing zones of the Fort Union Formation would be minimal, primarily because of the low infiltration rates through the overlying till. Impacts to shallow ground water in the till resulting from spills or leaks would be localized, generally underneath the refinery site. If a catastrophic spill occurred, plumes could extend off-site. However, the low permeability of the till would retard movement of contaminants. Ground water in the till is estimated to flow at a rate of 0.4 to 2.4 feet per year (GeoTrans, Inc. 2005). Over a period of 20 years using those flow rates, ground water contamination would be estimated to migrate 8 to 48 feet from the initial point of contamination. Protective measures as provided in the SPCC plan, FRP, the SWPPP, RCRA TSD permit, application of BMPs, and meeting NPDES requirements would minimize introduction of undesired substances into soils and consequently shallow ground water.

4.2.1.11 Reclamation/Closure Impacts

At some point in the life of the refinery, the decision would be made to cease refinery operations and permanently close the facility. The closure of the refinery would be expected to follow a process of decommissioning, decontamination, and demolition, followed by cleanup of any remaining soil and ground water contamination and final reclamation of the site. These activities would be carefully managed in order to minimize impacts to the environment and other receptors such as area residents. Under Alternatives 1 and A, the proposed refinery would be a TSD Facility, and thus part of the overall closure and reclamation planning would be outlined in the required RCRA “closure plan”. For more information about the RCRA “closure plan” see the Solid and Hazardous Waste section in this Chapter.

Over time, normal refinery operations would be expected to result in local (generally underneath the refinery site) contamination of soils and ground water. However, impacts should be minimized through effective design considerations, operating practices and environmental management systems, as well as adherence to the FRP, SPCC, and SWPP plans. As a RCRA TSD Facility monitoring would be required for ground water contamination throughout the life of the refinery and cleanup activities would have to commence at the time when any contamination was discovered. Depending on the constituents in the ground water and the extent of contamination, ground water cleanup activities can take a long time (years) delaying final closure and cleanup which can be very costly. The site would need to be cleaned up to levels that are protective of human health and the environment. If the hazardous waste surface impoundments are not clean-closed, a RCRA post-closure permit would be required.

4.2.2 Construction Alternatives

4.2.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the entire 468.39-acre site would be accepted into trust status, but construction and operation of the refinery project would not go forward. Therefore, the 468.39-acre project site would most likely continue to be used for agricultural purposes, which have occurred for decades. The MHA Nation could decide to use the entire project site to produce feed or forage hay for buffalo, or the land could be included in BIA’s leasing program. Based on the foregoing, impacts to ground water resources would be similar to the existing conditions.

4.2.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Under this alternative, the magnitude and type of effects would be similar to those presented under Alternative 1.

4.2.2.3 Alternative 4 — Modified Proposed Action

Under this alternative, the entire 468.39-acre site would be accepted into trust status for construction and operation of the proposed refinery with refinery design modifications and production of buffalo forage. The process water from the refinery would first undergo treatment in the WWTU and then would be directed to release tanks prior to discharge through the permitted NPDES Outfall 002 to the wetlands area and an unnamed tributary to the East Fork of Shell Creek. The main difference from the Proposed Action is that there would be no process wastewater recycling under this alternative.

Potentially contaminated (oily) stormwater would be directly conveyed to a group of surge tanks instead of the retention ponds described in Alternative 1. After testing, the water would be routed to WWTU or directed to release tanks and discharged through NPDES permitted Outfall 002a. The surge tanks would be underground and made of double wall steel or equivalent in compliance with 40 CFR 265 subpart J. Multiple surge tanks would be used to minimize the size and risk of potential leakage. Leak detection would be part of the tank design.

This alternative would discharge an average of 20.4 gpm via Outfalls 002 and 002a (Table 4-1). Discharge rates could however vary up to a maximum of 52.8 gpm. Impacts to ground water resources would be similar to those described in Alternative 1 with the following exceptions. There would be a potential for slightly higher recharge from the increased discharge under this alternative. However, storage in multiple double wall (including double floor) steel surge tanks with leak detection systems would provide some storage capacity and minimize risk and size of potential leaks.

Another difference between Alternatives 4 and A, and Alternatives 1 and A; is the level of reuse of contaminated (oily) stormwater. In replacing the holding ponds with tanks, storage volume would be reduced. For this alternative under the normal operation, up to 40 gpm would be recycled to the plant and any excess (up to 55 gpm) would be discharged via NPDES permitted Outfall 001. There is also a difference in that all of the recycle (makeup) water would be coming from the uncontaminated stormwater. Stormwater available for makeup water would be the runoff from normal precipitation, minus evaporative losses from the fire ponds and the quantity of water needed to maintain the integrity of the evaporation pond liner through dry spells.

Sanitary wastewater would either be collected in a holding tank and transferred by truck to a municipal wastewater treatment facility (i.e. City of Minot) or treated on site in a package WWTP. If the wastewater is trucked off site there would be no impact to ground water. If the package plant option is selected, an additional 3.5 gpm of flow of treated sanitary wastewater would be discharged via NPDES permitted Outfall 003. The effect of this additional flow on ground water quality and quantity is not anticipated to be significantly different from the impacts discussed for Alternatives 1 and A.

Overall, under this alternative the impacts to ground water quantity and quality from recharge would be essentially the same as the no recycle option under the Alternatives 1 and A. Flows from this alternative would average 20 gpm and peak at 53 gpm from Outfalls 002 and 002a and 0 gpm average and 55 gpm from Outfall 001 for a total of 20 gpm average and 108 gpm maximum for all discharges (Table 4-1). Under the Alternatives 1 and A, flows were 10 gpm average and 89 gpm maximum (full recycle) and 50 gpm average and 130 gpm maximum (no recycle).

After the refinery ceases operations, the ground water cleanup could be delayed because the refinery would not be subject to RCRA requirements and thus a RCRA "closure plan" would not be in place nor would there be any funding set aside for implementing RCRA corrective action.

4.2.2.4 Alternative 5 — No Action

Under this alternative, the entire 468.39-acre site would not be accepted into trust status. The proposed refinery would not be constructed. Therefore, the 468.39-acre project site would continue to be used for agricultural purposes, which have occurred for decades. The types of direct and indirect effects occurring to ground water resources from agricultural practices would continue under existing conditions.

4.2.3 Effluent Discharge Alternatives

The effluent discharge alternative analysis addresses impacts to ground water resources from different water handling discharge alternatives. The effluent discharge alternatives include options to discharge treated wastewater to surface water through permitted NPDES outfalls, use in irrigation/land application, and disposal in an UIC well.

4.2.3.1 Alternative B — Partial Discharge through an NPDES Permit and Some Storage and Irrigation

Under this alternative, the wastewater, including treated process water, potentially contaminated (oily) stormwater, and uncontaminated (non-oily) stormwater, would be discharged into the wetland area and the unnamed tributary of the East Fork of Shell Creek through NPDES permitted outfalls or used for irrigation. Impacts to ground water resources under this alternative would be the same as those described in Alternative A when wastewater is discharged through the NPDES permitted outfalls. There would be less flow when water is used for irrigation.

Based on the shallow depth to ground water it is likely that some percentage of the wastewater applied as irrigation water would infiltrate vertically downward to the water table. The impacts from this recharge would depend on the degree of treatment prior to land application and whether or not agricultural chemicals would be used on the cropland to be irrigated.

4.2.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this alternative, all the wastewater including treated process water, potentially contaminated (oily) stormwater, and uncontaminated (non-oily) stormwater would be discharged to a Class I, Non-hazardous UIC well that would be drilled on the project site. This well would dispose of non-hazardous fluids into isolated formations beneath the lowermost existing or potential source of drinking water. Discharge through injection is controlled by the UIC Program administered by EPA that is designed to protect underground sources of drinking water.

The proposed injection zone would likely be located at a depth below the lowest potential underground source of drinking water. The injection formation would be tested to evaluate its suitability for disposal. Maximum pressure requirements to prevent initiation and propagation of fractures through overlying strata to any zones of fresh water would be determined. The injectivity tests would be used to determine the fracture pressure limits on overlying material.

Since the treated effluent would be non-hazardous, it is anticipated that it would be of equal or higher quality in regards to class of use than the water in the proposed injection formation. Injection of wastewater is not expected to cause any deterioration in ground water quality in the injection formation. The primary effect on the injection formation would be an increase in the hydraulic head emanating from the injection well, which would dissipate with distance away from the well bore. In terms of water quantity and quality, the effects on the injection formation would be minimal.

4.2.3.3 Alternative D — No Action

Implementation of this alternative would result in no effects to ground water resources. The refinery would not be constructed, thus no impacts due to effluent discharge would occur.

4.2.4 Cumulative Impacts

A number of foreseeable actions have been identified that could produce impacts to ground water resources on the Reservation. These actions could interact cumulatively with impacts from the Proposed Action. Impacts to ground water resources include reduced quantities of water available and degraded water quality.

Oil and gas exploration, development, production, and transportation; continued agricultural activities, and community use of ground water could cumulatively affect the quantity and quality of ground water. While ground water resources could be used for such activities as drilling, road construction, industrial construction, dust control, agricultural purposes, and human consumption, future water needs on the Reservation would most likely be met by using surface water resources or Lake Sakakawea water. Therefore, cumulative impacts to the available ground water supply for other reasonably foreseeable actions would be negligible.

The majority of cumulative impacts to ground water quality are from the direct and indirect impacts to shallow ground water from the proposed refinery. Ground water quality impacts will be localized, generally remaining underneath the refinery. Other existing and reasonably foreseeable actions in the area would be negligible or minor sources of additional ground water quality impacts.

4.3 Surface Water Resources

Surface water resources of the Reservation consist of many perennial, intermittent, and ephemeral streams and the Missouri River (Lake Sakakawea). The project site is located in the Shell Creek and the East Fork Shell Creek drainages. These streams are intermittent in the project area and have extended periods without flow. An unnamed tributary of the East Fork Shell Creek drains the project site. This tributary consists of a man modified wetland swale that connects two wetland areas on the western end of the site. The wetland swale is generally dry for most of the year.

4.3.1 Alternatives 1 and A — Original Proposed Actions

During construction of the project, all site runoff would be captured and routed to the retention ponds constructed at the beginning of construction activities. This measure would allow for the capture of surface runoff to reduce the discharge of sediments in the stormwater. The ponds would be sized to retain a 100-year, 24-hour storm event. Release of stormwater would be from the ponds after settling has occurred and the water meets NPDES permitted effluent limitations established for the site. Upon completion of construction activities, all sediment captured within the retention ponds would be dredged and disposed of within a properly permitted off-site disposal site. The retention ponds would be lined prior to operation of the refinery. This drainage control system would be established at the start of the construction phase of the project to minimize contributions of sediment to the wetland and the East Fork Shell Creek. Silt fences and/or straw bales would also be used to control runoff from areas outside of the drainage control system. Disturbed areas not used for operational facilities would be revegetated as soon as possible to reduce runoff and sedimentation. Specific controls would be established in a SWPPP for the construction phase of the project.

During operations of the project, all uncontaminated (non-oily) site runoff would continue to be captured and used to maintain the fire water system. Recycling of this wastewater would occur to the extent possible or wastewater would be discharged through NPDES permitted Outfall 001. Potentially contaminated (oily) wastewater would be treated in the WWTU and recycled to the extent possible as makeup water in the refinery process or discharged through NPDES permitted Outfall 002. Depending on the water balance at the facility, there would be periods of zero discharge except during major storm events. In all cases, any discharge from the site would meet NPDES permitted effluent limitations established for the project. The net effect of the project on surface water flow would be the reduction of 190 acres of drainage basin area from the East Fork of Shell Creek. This reduction of stream flow contribution would have minimal effects on the hydrologic characteristics of the onsite wetland swale or the East Fork Shell Creek. Any discharges from the WWTP effluent holding ponds or evaporation pond would offset a portion of the reduced flow.

Facilities would be placed and operations would be conducted on impermeable surfaces such as concrete, asphalt, or geotextile that are curbed and guttered. This would minimize the possibility of surface water contamination from spills. Spills or accidents that may jeopardize the integrity of the impermeable layers would be remediated and/or repaired as appropriate. Monitoring plans with appropriate contingencies mandated, as well as BMPs by various statutes are required for the operation of the facility.

4.3.1.1 Construction

Construction of the refinery, pipelines, and transmission lines would require disturbance of soils and could potentially result in transport of sediment during precipitation events. This potential transport of sediment could enter nearby drainages or wetlands and cause an adverse effect on surface water quality. The potential is somewhat limited because of the relative flatness of the terrain and existing vegetation, which would slow or stop sediment movement. However, in construction areas immediately adjacent to surface water drainages or wetlands, there would be increased potential for sediment in stormwater or degradation of stormwater quality.

Stormwater Management

Construction activities utilize vehicles, equipment, and petroleum products to conduct daily operations. The use of petroleum products could potentially result in leaks or spills to soils, which could cause surface water contamination. Surface waters are typically indirectly affected by receiving potentially contaminated (oily) runoff from construction sites. Stormwater runoff from these areas would be controlled by an NPDES stormwater permit and a SWPPP, which includes a stormwater management and sedimentation control plan designed to minimize the potential discharge of silt, solids, and other contaminants to surface water streams from the runoff. Provisions would be made to collect stormwater where appropriate to control silt and suspended solids before discharge to a surface stream, such as East Fork of Shell Creek.

The project would implement several programs to minimize the potential for construction activities to impact surface water quality. The project would be required to develop and implement a SWPPP for the construction phase. The SWPPP would identify all of the possible activities and incidents that could contaminate storm or surface water and would contain BMPs that would be implemented to prevent contamination. Examples of BMPs and related measures include installation of silt fences, installation of hay bales in drainages, installation of a stormwater retention pond to collect water generated on the project site, procedures for handling chemicals and oil spills, emergency response procedures and maintenance of spill response equipment. By following BMPs and requirements in the SWPPP (e.g., stockpiling materials away from surface drainage paths, covering construction materials with tarps, and containing and cleaning up spills), direct and indirect impacts to surface water quality would be minimized.

Pipeline Hydrostatic Test Water

It is envisioned that the proposed project may generate hydrostatic test water in the later phases of the construction schedule. Water is used to fill certain pipelines and tanks to confirm their structural integrity and to test for leaks. Raw water would be used for this purpose, and the resulting water, after testing, may have the potential to contain concentrations of oil and suspended solids. Depending on where and when the hydrostatic testing occurs, the water may be disposed of in the refinery's water treatment system and be recycled or discharged under an NPDES discharge permit, which would be a permit separate from the refinery's NPDES operational and stormwater construction permits. Discharge under the permit would require that the hydrostatic test water meet specific NPDES permitted discharge limits.

4.3.1.2 Operation

Effluent Discharge

As detailed in Chapter 2, the refinery would generate three types of wastewater: (1) sanitary waste water, (2) uncontaminated (non-oily) water, and (3) contaminated (process wastewater) and potentially contaminated (oily) water. Each of these streams of waste water would be handled separately. They would also receive different levels of treatment. Operation of the project would generate process waste water effluent which combined with potentially contaminated (oily) stormwater would generate an average of 10 gpm or about 5.1 million gallons of effluent per year. Discharge rates could however vary from 0 to a maximum of 24.4 gpm (wastewater treatment with full recycling). Uncontaminated (non-oily) stormwater would not normally be discharged, but at certain times as much as 65 gpm could be discharged. Under the no recycling option discharges through NPDES permitted Outfall 002 are expected to be 20 gpm on an average with a projected maximum of 34 gpm. Uncontaminated (non-oily) stormwater would be discharged via NPDES permitted Outfall 001 at an average rate of 30 gpm with a projected maximum of 95 gpm. The total flows for the full recycle option average 10 gpm with a maximum of 89 gpm and for the no recycle option average 50 gpm with a maximum of 130 gpm. The various discharge rates are summarized in Table 4-1. Because of minimal flow conditions in the wetland swale, discharge effluent would only be diluted during the spring runoff period and major precipitation events where runoff is generated. Some dilution is available at certain times of the year at the confluence with the East Fork of Shell Creek and additional dilution would occur year round at the confluence with the Missouri River (Lake Sakakawea).

Sanitary Waste Water

Because the project would be designed to operate with a small staff of operating personnel (86 employees), the volume of sanitary sewage generated daily would be relatively small, estimated at 3.5 gpm. Sanitary sewage would be treated using an on-site septic system and leach field. This septic system would be designed and installed according to the EPA's standards and regulations. Treated sewage from the septic system would slowly percolate into the ground and would not have a significant effect on surface water quality or quantity.

Uncontaminated Water

Uncontaminated (non-oily) water would consist of wastewater from certain isolated refinery processes, i.e. boiler blowdown. This wastewater would be routed to the WRP for treatment and recycling. Because uncontaminated (non-oily) water would be fully recycled, there would be no discharge to surface waters.

Uncontaminated (non-oily) stormwater would be collected from the maintenance facility, administration building, roads and parking lot areas. This stormwater would be collected in an evaporation pond and either recycled to the refinery process, or routed to the firewater reservoirs to maintain the levels of water in these facilities. Uncontaminated (non-oily) stormwater would not normally be discharged, but at certain times of the year or during high precipitation periods as much as 65 gpm could be discharged via NPDES permitted Outfall 001. Contribution to stream flow from these occasional discharges is not anticipated to have significant impact on East Fork of Shell Creek and downstream wetlands. Because uncontaminated (non-oily) stormwater would be recycled, evaporated, or discharged under the NPDES Permit, the effects on surface water quality would be minimal.

Process Wastewater and Potentially Contaminated Stormwater

The third stream of wastewater would consist of process wastewater that is collected from process units directly and potentially contaminated (oily) stormwater collected from the process area, product loading area, and tank farm. All process wastewater would be routed to the WWTU for treatment. There would be no direct discharge of untreated process wastewater to surface waters.

Potentially contaminated (oily) stormwater collected from the process area, product loading area, and tank farm would be collected and routed to a holding pond designed to store water from a 100-year, 24-hour storm event. Depending on the quality of the holding pond water, it would either be routed directly to additional effluent holding ponds prior to recycle or discharge to surface water or to the WWTU for further treatment. Accumulated potentially contaminated (oily) stormwater that is to be directed to the WWTU would first pass through an API separator. From the API separator, the water would be routed to a DAF system. Wastewater effluent from the DAF system would then be directed to the bio-treatment plant. Wastewater effluent from the bio-treatment plant would be held in the two holding ponds and tested. If testing suggests that additional treatment is needed, the water would be rerouted back through the WWTU. The effluent would then be recycled back to the refinery process as much as possible. If the water meets the refinery's criteria for discharge, it would be released through NPDES permitted Outfall 002.

The project would be required to develop and implement a SWPPP under the NPDES permit for the operations at the facility. The SWPPP would identify areas that have a potential for pollutants entering into the stormwater systems at the facility and BMPs to minimize pollutant introductions from those identified sources. These areas at the proposed facility include raw material, intermediate and final product storage facilities, loading and unloading operations and refinery process areas.

This alternative would discharge an average of 10 gpm via Outfall 002. Discharge rates could however vary from 0 to a maximum of 24.4 gpm (wastewater treatment with full recycling). The discharged water would likely flow from the on-site wetland into the wetland north of the project site and continue to the East Fork of Shell Creek. Quantitative impacts to stream flows are not anticipated to be significant and are discussed in more detail under the Wetland section of this Chapter. Because all contaminated (oily) wastewater and potentially contaminated (oily) stormwater would be treated prior to discharge under the NPDES permit, the effects on surface water quality would be minimal.

Recharge

Near-surface water tables would likely experience increases in water levels from operation-produced water discharges. The increase in water level may be exhibited as standing or flowing water in areas not previously displaying these conditions and additional wetland development. A portion of the water released to the local surface drainage may recharge shallow aquifers, however, this recharge would be minimal due to the low permeability of the till and presence of the clay layer underlying the site.

Flow Alterations

Construction of project facilities including stormwater diversion ditches would result in alteration of surface water flow across the site. Runoff flow from upslope would be diverted and flow onsite from precipitation events would be directed to the stormwater collection system, thus reducing the direct runoff to wetland PEMF#2. Any discharges from the WWTP effluent holding ponds or stormwater holding ponds would offset a portion of the reduced flow.

The primary potential impact to surface water would be related to diversion of the section of the unnamed tributary wetland to East Fork Shell Creek. The unnamed tributary is characterized as an intermittent stream, primarily regulated by periods of snowmelt, direct precipitation, and surface runoff. Diversion of the stream channel could potentially increase sedimentation due to lack of vegetative cover and channel slope erosion. BMPs would be implemented to prevent these impacts. A SWPPP detailing the sediment and erosion control measures and any BMPs would be developed in accordance with the construction General Stormwater NPDES permit.

As with other facilities, any access/maintenance roads and pipelines would result in immediate alteration of surface water flows in the immediate vicinity of the roads and pipeline. BMPs would be implemented to mitigate these impacts.

Water Quality

Water quality of the unnamed tributary to the East Fork Shell Creek would be affected by the discharges from the refinery operations. Contribution of treated effluent and stormwater from the refinery would substitute a portion of the runoff from the agricultural lands. Refinery wastewater and potentially contaminated (oily) storm water would be treated extensively prior to discharge, however there would be some changes in water quality from existing conditions.

EPA has developed NPDES effluent limitations for wastewater discharges anticipated at the refinery (see draft NPDES permit in Appendix C). These limitations have been developed in consideration of Tribal water quality standards for the Reservation, as well as standards for the State of North Dakota. All water discharged from the refinery outfalls would meet the effluent limits, thus would have no adverse impacts on surface water quality.

Table 4-2 lists the EPA Effluent Limitations and the Monitoring Schedule is provided in Table 4-3. In addition to the requirements shown in Table 4-3, monitoring would be required at 90 and 270 days after startup of the facility for total metals found on Table III of 40 CFR §122, Appendix D and volatile, acid, and base/neutral compounds found on Table II of 40 CFR §122, Appendix D.

Additionally, the uncontaminated (non-oily) stormwater discharges would also be covered under the permitted NPDES outfall with effluent limits developed in consideration of Tribal and State water quality standards as well as EPA water quality criteria. Specific effluent limitations applicable to each potential outfall are contained in the NPDES permit in Appendix C.

The potential exists for impacts to water quality either from sediment loading during the construction phase or from accidental spills and leaks during construction and operation. A SWPPP and any additional BMPs needed would be developed in accordance with the construction stormwater NPDES permit and operational NPDES permit. The SWPPPs and BMPs would detail the sediment and erosion control measures and prevent/limit clean water becoming contaminated with spilt synthetic crude oil, product or oily waste. The SPCC plan and FRP require containment of petroleum-based products and require prompt and effective cleanups if spills occur.

Wetlands

Under this alternative discharge effluent from the refinery would flow into wetland PEMF#2. This wetland is on the western side of the site next to Highway 23 in the NW ¼ of Section 19. The total area including the ponded wetland and swale is approximately 11.7 acres. The wetland connects to an unnamed tributary of the East Fork of Shell Creek, located about a mile downstream of the proposed outfalls. The wetland has been classified as a palustrine emergent semi-permanently flooded (PEMF#2) (Wetlands Technical Report, BIA, November, 2005). Wetland PEMF#2 is an ephemeral prairie pothole wetland that has been altered by road construction and construction of a drainage system in the 1970’s. The wetland is fed by surface runoff from precipitation. Field inspection and water quality data indicate that the wetland is in a healthy, functioning condition.

Table 4-2 Preliminary Draft Effluent Limitation for Refinery Process Wastewater and Oily Stormwater

Effluent Characteristic	30-day Average	Daily Maximum
Flow (million gallons/day)	0.02	0.05
Biochemical Oxygen Demand (BOD) (lbs/day)[a]	43	81
Total Suspended Solids (lbs/day)[a]	35	55
Chemical Oxygen Demand (lbs/day)[a]	255	500
Oil and Grease (lbs/day)[a]	13.8	25.4
Phenolic Compounds (lbs/day)[a]	0.29	0.59
Total Chromium (lbs/day)[a]	0.35	0.99
Hexavalent Chromium (lbs/day)[b]	0.0018	0.0067
Ammonia as N (mg/L)[b,e]	1.1	3.2
Benzene (μg/L)[b]	2.2	NA
Ethyl Benzene (μg/L)[b]	530	NA
Toluene (μg/L)[b]	1,300	NA
Phenol (μg/L)[b]	300	NA
Sulfide (μg/L)[b]	2	NA
Fluoride (μg/L)[c]	4,000	NA
Nitrate (μg/L)[b]	10,000	NA
Nitrite (μg/L)[b]	1,000	NA
Aluminum (tr) (μg/L)[b,h]	87	750
Barium (tr) (μg/L)[b,h]	1,000	NA
Chromium VI (d) (μg/L)[b,h]	11	16
Iron (tr) (μg/L)[b,h]	300	NA
Manganese (tr) (μg/L)[b,h]	50	NA
Mercury (T) (μg/L)[b,h]	0.012[f]	1.4
Nickel (d) (μg/L) [b,g,h]	132	1,186
Selenium (μg/L)[b,h]	5	20

The pH of the effluent shall not be less than 7.0 standard units or greater than 9.0 standard units in any single sample or analysis

From April 1 through September 30, the concentration of dissolved oxygen in the effluent shall be greater than 8.0 mg/L (1-day minimum), 9.5 mg/L (7-day mean), and 6.5 mg/L (30-day mean).

From October 1 through March 31, the concentration of dissolved oxygen in the effluent shall be greater than 4.0 mg/L (1-day minimum), 5.0 mg/L (7-day mean), and 6.5 mg/L (30-day mean).[c]

There shall be no Acute Toxicity in 100% effluent. The LC_{50} shall be > 100%.[d]

There shall be no Chronic Toxicity in 100% effluent. The IC_{25} shall be > 100%.[d]

Notes:

a. The limits are based on 40 CFR §419, Effluent Guidelines for the Petroleum Refining Point Source Category.
b. The limits are based on EPA recommended §304(a) water quality criteria, November 2002 and December 2003.
c. The limits are based on Three Affiliated Tribes adopted Water Quality Standards.
d. The limits are based on 1997 EPA Region 8 WET Policy.
e. Ammonia limits are based on an estimated effluent pH of 8.5 standard units and temperature 15ºC.
f. Limit is based on Region 8 recommended criteria for protection of fish tissue.
g. Limit is calculated using an estimated hardness value of 300 mg/L as $CaCO_3$.
h. (d) = dissolved, (T) = total, (tr) = total recoverable, NA = not applicable.

Table 4-3 Preliminary Draft Monitoring Schedule for Refinery Process Wastewater and Oily Stormwater

Parameter	Monitoring Frequency	Sample Type
Flow (million gallons/day)	Daily	Continuous
Biochemical Oxygen Demand (BOD) (lbs/day)	2 times per week	Composite
Total Suspended Solids (lbs/day)	2 times per week	Composite
Chemical Oxygen Demand (lbs/day)	Monthly	Composite
Oil and Grease (lbs/day)	Weekly	Grab
Phenolic Compounds (lbs/day)	Monthly	Grab
Total Chromium (lbs/day)	Monthly	Composite
Hexavalent Chromium (lbs/day)	Monthly	Grab
Ammonia as N (mg/L)	Weekly	Composite
Benzene (µg/L)	Monthly	Grab
Ethyl Benzene (µg/L)	Monthly	Grab
Toluene (µg/L)	Monthly	Grab
Phenol (µg/L)	Monthly	Grab
Sulfide (µg/L)	Weekly	Grab
Fluoride (µg/L)	Monthly	Composite
Nitrate (µg/L)	Monthly	Composite
Nitrite (µg/L)	Monthly	Composite
Aluminum (tr) (µg/L)	Monthly	Composite
Barium (tr) (µg/L)	Monthly	Composite
Chromium VI (d) (µg/L)	Monthly	Composite
Iron (tr) (µg/L)	Monthly	Composite
Manganese (tr) (µg/L)	Monthly	Composite
Mercury (T) (µg/L)	Monthly	Composite
Nickel (d) (µg/L)	Monthly	Composite
Selenium (µg/L)	Monthly	Composite
pH (standard units)	Daily	Continuous or Grab
Dissolved Oxygen (mg/L)	Daily	Grab
Whole Effluent Toxicity (Chronic)	Quarterly	Composite
Whole Effluent Toxicity (Acute)	Quarterly	Grab

The proposed refinery would change flow conditions in the wetland PEMF#2 and the unnamed tributary to the East Fork of Shell Creek. Flow would be discharged more continuously throughout the year, depending on the how much water is being recycled at the refinery. When the refinery is recycling water, the average discharge rate would be 10 gpm (5.1 million gallons per year or 16 acre feet) with a peak discharge rate of 89 gpm. If water is not being recycled, the average discharge rate would be 50 gpm (26 million gallons per year or 80 acre feet) and the peak discharge rate would be 130 gpm.

Under a full recycle scenario it is expected that much of the runoff water would be used by the refinery. This would reduce the volume that flows into wetland PEMF#2 from the refinery site.

If the refinery does not recycle process water or use runoff, the additional water to wetland PEMF#2 would likely cause the wetland area to become more permanently flooded. This would result in changes to wetland characteristics such as increasing obligate vegetation (cattails) within the wetland or increasing open water areas. The size of the wetland would be controlled by discharge through the culvert under Highway 23. The wetlands to the north of Highway 23 would also be impacted by the additional water. As a result of the development of the refinery, the amount of surface runoff and/or shallow subsurface water discharge to the wetland would likely increase. This would contribute to the likelihood of a shift from a semi-permanent wetland with periodic drying to permanent wetland type for PEMF#2. This would change typical conditions in the wetland. The upper areas of the wetland have been observed to dry out periodically. Most prairie pothole wetlands periodically dry out or partially dry out. There would be a similar shift to the unnamed tributary of the East Fork of Shell Creek.

Erosion and sedimentation impacts would not be anticipated to the wetlands and the unnamed tributary from increased average discharge flows rates. However, erosion and sedimentation would be greater during peak flows, which are estimated to be as high as 130 gpm. The drainage channels would adjust to changes that result from erosion and sedimentation from peak flows. A SWPPP detailing sediment and erosion control measures and any BMPs would be developed in accordance with the facility's NPDES permit.

4.3.2 Construction Alternatives

4.3.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the entire 468.39-acre site would be accepted into trust status, but construction and operation of the refinery project would not go forward. Therefore, the 468.39-acre project site would most likely continue to be used for agricultural purposes, which have occurred for decades. The MHA Nation could decide to use the entire project site to produce feed for forage for buffalo or the land could be included in BIA's leasing program. Based on the foregoing, impacts to surface water resources would be similar to the existing conditions.

4.3.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Under this alternative, the magnitude and type of effects would be the same as those presented under Alternatives 1 and A.

4.3.2.3 Alternative 4 — Modified Proposed Action

Under this alternative, the refinery layout would be reconfigured such that the final design would impact less than 0.1 acre of the PEMF#2 wetland reducing direct wetland impacts. The wetland swale would not be diverted and reconstructed around the refinery units as proposed in Alternative 1, reducing construction disturbance and wetland impacts.

As in Alternatives 1 and A, effluent from the refinery would flow into the PEMF#2 wetland connecting to an unnamed tributary of the East Fork of Shell Creek. Flow would be discharged more continuously throughout the year similar to Alternative A under the no recycle option as there would be no process wastewater recycling under this alternative. The average discharge rate would be from all of the outfalls would be 24 gpm (12.6 million gallons per year) and the peak discharge rate would be 111 gpm (58 million gallons per year).

The individual outfalls would undergo different treatments and have different flow amounts. The process water from the refinery would first undergo treatment in the WWTU and then would be directed to release tanks prior to discharge through permitted NPDES Outfall 002 to the PEMF#2 wetland. The flow from this outfall would be from 0 to 34.4 gpm with an average of 16 gpm.

Potentially contaminated (oily) stormwater would be directly conveyed to a group of surge tanks, which would replace the retention ponds from the Proposed Action alternative (Alternative 1). After testing, the water would be recycled to WWTU or directed to Release Tanks and discharged through Outfall 002a at a rate range of 0 to 18.4 gpm with an average discharge of 4.4 gpm. The surge tanks would be underground shallow tanks made of double walled steel or equivalent in compliance with 40 CFR 265, Subpart J. The advantage of multiple surge tanks is that individual tanks can be removed from use for repair or cleaning without interrupting the entire facility operation.

The sanitary waste handling has not been determined for Alternative 4. There are two options being considered: capturing employee wastewater in a holding tank to be trucked off-site or treating the wastewater on-site with the commercial package treatment plant that would discharge at the rate of approximately 3.5 gpm through Outfall 003.

The difference between this alternative and Alternatives 1 and A is that there is a slightly smaller footprint for the facility, therefore, less stormwater capture from uncontaminated areas of the facility. There would still be recycling of the captured stormwater to the fire ponds and plant processes. The discharge rate from Outfall 001 ranges from 0 to 55 gpm with an average of 0 gpm

4.3.2.4 Alternative 5 — No Action

Under this alternative, the entire 468.39-acre site would not be accepted into trust status. The proposed refinery would not be constructed. Therefore, the 468.39-acre project site would continue to be used for agricultural purposes, which have occurred for decades. The types of direct and indirect effects occurring to surface water resources from agricultural practices would continue under existing conditions.

4.3.3 Effluent Discharge Alternatives

4.3.3.1 Alternative B — Partial Discharge through an NPDES permit and Some Storage and Irrigation

Under this alternative, all the wastewater including process water and potentially contaminated (oily) and uncontaminated (non-oily) stormwater would be discharged through NPDES permitted outfalls or used for irrigation. Thus, surface water impacts related to this alternative would be slightly less than those described for Alternative A. The land application site would be designed and operated to prevent runoff of land applied wastewater into surface waters.

4.3.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this Alternative, all the wastewater including process water and potentially contaminated (oily) and uncontaminated (non-oily) stormwater would be discharged to a Class I, Non-hazardous UIC well that would be drilled on the project site. This well would dispose of non-hazardous fluids into isolated formations beneath the lowermost existing or potential future source of drinking water. Discharge through injection is controlled by the UIC Program that is designed to protect underground sources of drinking water. Because all of the wastewater would be disposed through injection into a deep underground formation, no impacts to surface water quality would be anticipated under this alternative. The water would be lost for surface uses such as irrigation or water additions to the East Fork of Shell Creek drainage.

4.3.3.3 Alternative D — No Action

Implementation of this alternative would result in no effects to surface water resources. The refinery would not be constructed and no effluent would be discharged. Sheet flow from precipitation events would continue to affect surface water on the project side just as it does now.

4.3.4 Cumulative Impacts

Cumulative impacts to surface water could occur from any ongoing and reasonably foreseeable future activities. The majority of activities contributing to surface water cumulative impacts would be related to historic and ongoing agricultural activities. These activities could interact cumulatively with impacts from the proposed action and the no-action alternatives. Impacting factors related to these foreseeable activities include water discharges; erosion and sedimentation; bank and channel modifications; water use and accidental spills. Potential impacts of these factors on surface water resources include reduced quantities of water and degraded water quality.

Regional agricultural practices (including runoff) are the primary source of impacts to surface water quality. By following guidelines established by the appropriate discharge permits, meeting restrictions on the storage of toxic construction and operation materials, and meeting requirements for cleanup of toxic materials as part of construction and normal operations, cumulative impacts on water quality would be minimized.

4.4 Spills

4.4.1 Alternatives 1 and A — Original Proposed Actions

Chemicals, raw crude oil, and refined products would be stored at the refinery facility in aboveground storage tanks, containers, or drums. The movement and storage of raw crude oil and processed product within the tank farm, processing area, and product loading area is part of the complex bulk product distribution, refining, and storage system on the refinery. The complexity of the refining process and amount of stored oil, product, and chemicals moving through the system provides opportunities for accidents, spills, leaks, and losses from simple volatilization.

Petroleum products are released to the environment through accidents, as managed releases, or as unintended by-products of industrial, commercial, or private actions or accidents. Most spills involve either crude or bulk fuels (e.g., distillates) such as fuel oils. Consistent national statistics are lacking for many stages in the overall oil refining and distribution system. The main exceptions involve larger leaks and spills, especially those in coastal areas or on larger rivers and streams.

Because many releases of petroleum to environmental resources involve unintentional leakage or spillage, it can be helpful to present some rough estimates of release from various categories of activities or components within the overall petroleum production and distribution system. The ATSDR (1999) estimated the total amount of leakage or spillage related to petroleum product production, processing, and distribution to end users at around 134 million bbl per year. Table 4-4 details the estimated releases from the petroleum industry.

As detailed on Table 4-4, the major components from the oil production and distribution system that cause releases include: above ground tanks (47 percent), tank bottoms and refinery waste (18 percent), evaporative losses (14 percent), and used motor oil (10 percent). Also, Table 4-4 shows that the total amount of leakage or spillage related to the petroleum product production, processing, and distribution was estimated to be around 134 million bbl per year.

Yoshioka and Carpenter (2002) analyzed Oil Spill Intelligence Report (OSIR) and Emergency Response Notification System (ERNS) data on reported oil spills on inland and coastal spill characteristics such as the number of spills, spill sizes, spill sources, and the types of oil spilled. Previous studies indicated that vessels are a major source of inland oil spills and that refined petroleum products dominate inland spills whereas crude oil spills are common in coastal areas.

However, their examination of data on large spills indicates that pipelines are the most significant spill source in inland waters. In addition, recent reports indicated that large spills of crude oil often occur in inland areas. Their analysis found that while coastal spills tend to be highly publicized, the majority of large oil spills in the United States occur in inland areas.

Yoshioka and Carpenter (2002) also concluded that most reported oil spills are small. ERNS data showed that more than 95 percent of inland spills were less than 1,000 gallons. API data, which emphasize spills from vessels because those are most often reported to the U.S. Coast Guard, showed an even larger fraction of spills below 1,000 gallons. However, it is important to note that each year the OSIR summaries contained several dozen spills of more than 10,000 gallons in the United States. Their study also found that larger spills were caused by pipelines, crude oil, and inland spills.

Table 4-4 Estimated Releases from Components of the Oil System

Type of release	Size of release (millions of bbl/year)	Major Media Impacted	Description of Category
Oilfield spills	1.1 (<1%)	Soil Surface Water Ground Water	Producing wells and tank batteries.
Leaking of wells	3.6 (2.7%)	Soil Surface Water Ground Water	Older "abandoned" wells never capped. Up to 1.2 million wells in the U.S.
Oil in waste pits or produced water	1.2 (<1%)	Soil Ground Water	Buried or land applied wastes from producing wells or exploration activities.
Aboveground tanks	63.8 (47.4%)	Soil Air Ground Water	Usually larger tank batteries, often part of interstate pipeline systems.
Existing underground plumes	1.2 (<1%)	Ground Water Soil	Tank farms, transshipment terminals with large amounts of "free product" beneath the facilities. At least 356 facilities currently pump from the largest plumes.
Pipelines	0.7 (<1%)	Surface Water Soil	Larger interstate pipelines and low pressure gathering systems from smaller tank batteries.
Leaks from gas stations	5.2 (3.9%)	Soil Ground Water	At least 25% of the nation's filling stations may face remediation under the UST program.
Tank bottoms and refinery waste	24.2 (17.9%)	Soil	Heavier residuals and sludges from refineries.
Used motor oil	14.0 (10.4%)	Water Soil	The U.S. generates about 1.4 billion gallons of used motor oil per year. Less than half is re-refined. Much "home fix-it" oil is not disposed of properly.
Oil spills in Waters of the U.S.	1.1 (<1%)	Surface Water	Tankers, barge, and pipeline accidents, mostly during vessel loading or unloading operations.
Oil and grease discharge	0.1 (<1%)	Surface Water	Mostly from offshore drilling in near coastal waters.
Operational discharges from tankers	0.2 (<1%)	Surface Water	Discharge of cargo and bilge oil in near coastal waters.
Evaporative losses	18.4 (13.7%)	Air	Transfers at refineries or tankers, losses at storage facilities, and during vehicle fueling. Up to 18 grams of hydrocarbons vented to air for each gallon of gasoline used.
Total	**134.8**		

Source: Agency for Toxic Substances and Disease Registry 1999

Table 4-5 Number of Spills that Exceed 10,000 Gallons by EPA Region (1995–1999)

	Number of Spills by Size and Location				Total
	10,000 to 99,000 gallons		100,000 gallons		Number
EPA Region	Inland	Coastal	Inland	Coastal	of Spills
1	6	0	0	2	8
2	18	4	1	1	24
3	15	3	2	1	21
4	34	6	4	0	44
5	30	0	11	0	41
6	129	16	41	5	191
7	29	0	4	0	33
8	28	0	2	0	30
9	37	10	7	0	54
10	10	7	2	0	19
Total	**336**	**46**	**74**	**9**	**465**

Source: Yoshioka and Carpenter 2002

Table 4-5 shows that 41 percent of the total number of spills of more than 10,000 gallons reported in the United States occurred in EPA Region 6 located in the Southern Plains region. In contrast, Region 8 had 30 reported spills of more than 10,000 gallons between 1995 and 1999 (6 percent of the total), where the proposed project is located.

In addition, the ATSDR (1999) summarizes releases from facilities using data from API (American Petroleum Institute 1996). The results of reported spills from facilities for the reporting period between 1984 and 1996 are presented on Table 4-6.

The average annual number of spills reported between 1984 and 1996 was 4,043 (Table 4-6). Most of these (70 percent) involved less than 10 gallons. The distribution of spills by size suggests that because most of the spills involved less than 10 gallons, a majority of the reported spills were caused by human error or mechanical failure.

In 2001, the EPA updated the information collected under its Sector Facility Indexing Project (SFIP). The petroleum refining industry sector data summarizes spill and pollution release information reported to the federal government by individual facilities. The refinery sector data shows that nearly 77 percent of the petroleum refineries (129 of 168) in the United States reported spills between January 1997 and November 1998. Furthermore, at the 129 refineries reporting spills, an average of almost 18 spills occurred during this period, which is nearly nine per year.

4.4.1.1 Spills — Fate and Transport Processes

Petroleum products released to the environment migrate through soil via two general pathways: (1) as bulk oil flow infiltrating the soil under the forces of gravity and capillary action, and (2) as individual compounds separating from the bulk petroleum mixture and dissolving in air or water. When bulk oil flow occurs, it results in little or no separation of the individual compounds from the product mixture, and the infiltration rate is usually fast relative to the dissolution rate. Many compounds that are insoluble and immobile in water are soluble in bulk oil and would migrate along with the bulk oil flow. Factors affecting the rate of bulk oil infiltration include soil moisture content, vegetation, terrain, climate, rate of release (catastrophic versus slow leakage), soil particle size (sand versus clay), and oil viscosity (gasoline versus motor oil).

Table 4-6 Total Number of Oil Spills from Facilities, 1984–1996

Year	Number of Spills by Size < 10 gal	10–999 gal	1,000–9,999 gal	10,000–99,999 gal	> 100,000 gal	Total
1984	4,113	2,194	288	53	3	6,651
1985	3,032	1,619	252	39	2	4,944
1986	2,076	1,025	54	10	3	3,168
1987	1,821	1,022	66	10	1	2,920
1988	1,730	939	68	6	4	2,747
1989	2,827	1,140	70	12	2	4,051
1990	3,904	1,187	72	15	4	5,182
1991	4,102	1,174	68	13	1	5,358
1992	2,412	869	56	16	2	3,355
1993	2,799	796	53	8	1	3,657
1994	2,900	831	76	10	6	3,823
1995	2,716	800	31	3	0	3,550
1996	2,460	642	45	6	2	3,155
Average	**2,838**	**1,095**	**92**	**15**	**2**	**4,043**

Source: Agency for Toxic Substances and Disease Registry 1999

As bulk oil migrates through the soil column, a small amount of the product mass is retained by soil particles. The bulk product retained by the soil particles is known as "residual saturation." Depending on the persistence of the bulk oil, residual saturation can potentially reside in the soil for years. Residual saturation is important, as it determines the degree of soil contamination and can act as a continuing source of contamination for individual compounds to separate from the bulk product and migrate independently in air or ground water. If the release is persistent in the environment, there can be impacts to extensive areas as the individual compounds continue to separate and migrate away from the spill area via air or ground water.

When the amount of product released to the environment is small relative to the volume of available soil, most if not all of the product is converted to residual saturation and downward migration of the bulk product usually ceases prior to affecting ground water resources. Adverse impacts to ground water may still occur if rainwater infiltrates through soil containing residual saturation and initiates the downward migration of individual compounds.

When the amount of product released is large relative to the volume of available soil, the downward migration of bulk product ceases as water-saturated pore spaces are encountered. If the density of the bulk product is less than that of water, the product tends to "float" along the interface between the water saturated and unsaturated zones and spread horizontally in a pancake-like layer, usually in the direction of ground water flow. Conversely, if the density of the bulk product is greater than that of water, the product would continue to migrate downward through the water table aquifer under the continued influence of gravity. Downward migration ceases when the product is converted to residual saturation or when an impermeable surface is encountered.

In reality, bulk oil flow is affected by numerous product-specific and site-specific factors. Consequently, product distribution in the subsurface can be quite complex.

Compound Migration

As the bulk product migrates through the soil column, individual compounds may separate from the mixture and migrate independently. Chemical transport properties such as volatility, solubility, and sorption potential are often used to evaluate and predict which compounds would likely separate from the mixture.

Volatility

Volatility is defined as the propensity of a chemical to partition to air and migrate as a vapor. It is primarily a function of the vapor pressure of the compound. Vapor pressure is defined as the pressure of a chemical exerted by its vapor when in equilibrium with the solid or liquid form of that chemical.

Because petroleum products are complex mixtures of numerous compounds, the compounds characterized by relatively high vapor pressures tend to volatilize and enter the vapor phase. The exact composition of these vapors depends on the composition of the original product. Because volatility represents transfer of the compound from the product or liquid phase to the air phase, it is expected that the concentration of that compound in the product or liquid phase would decrease as the concentration in the air phase increases.

Although volatility is a function of vapor pressure, environmental factors affect the rate of volatilization. For example, higher summer temperatures enhance volatilization. The rate of volatilization is also a function of air and soil temperature, humidity, wind speed, soil type, moisture content, oil composition, solar radiation, and thickness of the oil layer.

Solubility

Solubility is one of the key factors in determining compound behavior, and thus the impact of a chemical in the environment. Solubility is expressed in terms of the number of milligrams of pure chemical that can be dissolved in 1 liter of water under standard conditions of 25ºC and one atmosphere of pressure. The solubility of an organic compound determines its propensity to dissolve into water. The greater the compound's solubility, the greater the likelihood the chemical would dissolve into infiltrating rain water or ground water and migrate away from the release area. Stated another way, solubility generally decreases with increasing molecular weight of the hydrocarbon compounds.

In summary, the environmental fate of petroleum products is based on the environmental partitioning of the major hydrocarbon fractions. However, the environmental fate of chemicals in mixtures and/or bulk oil releases may be different from that observed for releases of individual petroleum chemicals. The more soluble and volatile fractions (such as, the low molecular weight aliphatic and aromatic fractions) are more likely to leach to ground water, volatilize to the air, or biodegrade than the larger petroleum product compounds. Conversely, the higher molecular weight compounds tend to be held in soil and persist at the site of release.

Organic Carbon-Water Partition Coefficient

The organic carbon-water partition coefficient (Koc) describes the propensity for an organic compound to partition between water and organic carbon in the soil. Chemical mobility can be determined based on the likelihood of a chemical to partition more strongly to either the organic carbon in the substrate or the water. If the chemical is strongly associated with the substrate, the chemical is relatively immobile and would not be leached or transported great distances from the area of the release. In contrast, if the chemical is weakly held by the substrate, the chemical has the potential to be transported greater distances and has a greater chance to contact human receptors. The degree of sorption not only affects the mobility of the compound, it can also affect other transport and transformation reactions.

In general, lighter petroleum products such as gasoline contain constituents with higher water solubility and volatility and lower sorption potential than heavier petroleum products such as fuel oil. In contrast, petroleum products with heavier molecular weight constituents, such as fuel oil, are generally more persistent in soils because of their relatively low water solubility and volatility and high sorption capacity.

Biodegradation

Indigenous microbes found in many natural settings (such as, soils, ground water, ponds) have been shown to be capable of degrading organic compounds. Biodegradation occurs as microbes use organic compounds as a source of energy. Unlike other fate processes that disperse contaminants in the environment, biodegradation can eliminate the contaminants without transferring them across media. The final products of microbial degradation are carbon dioxide, water, and microbial biomass.

The rate of hydrocarbon degradation depends on the chemical composition of the product released to the environment as well as site-specific environmental factors. Environmental factors such as oxygen content, pH, moisture content, temperature, nutrient concentrations, and the microbiota also affect the rate of biodegradation. In almost all cases, the presence of oxygen is essential for effective biodegradation of oil.

The moisture content of the contaminated soil would also affect biodegradation of oils caused by dissolution of the residual compounds, dispersive actions, and the need for microbial metabolism to sustain high activity. The moisture content in soil affects microbial locomotion, solute diffusion, substrate supply, and the removal of metabolic by-products.

All biological transformations are affected by temperature. Generally, as the temperature increases, biological activity tends to increase up to a temperature where enzyme denaturation occurs. The presence of oil should increase soil temperature, particularly at the surface. The darker color increases the heat capacity by adsorbing more radiation.

At least 11 essential macronutrient and micronutrient elements must be present in the soil in proper amounts, forms, and ratios to sustain microbe growth. These 11 elements are nitrogen, phosphorus, potassium, sodium, sulfur, calcium, magnesium, iron, manganese, zinc, and copper. Nitrogen is usually the main limiting nutrient governing the rate of decomposition of petroleum hydrocarbons.

Biodegradation rates in soils are also affected by the volume of product released to the environment. At lower concentrations of oil by volume, the degradation rate in soil is fairly independent of oil concentrations. However, as oil concentration rises, the first order degradation rate decreases and the oil degradation half-life increases. Ultimately, when the oil reaches saturation conditions in the soil, biodegradation virtually ceases.

4.4.1.2 Spill Scenarios

The prevention of a release[4] or spill of petroleum products is inherent to the engineered design of the refinery. All storage containers would be located within constructed containment features or within secondary containment tanks. Secondary containment structures have been designed to hold the entire contents of the container if a spill or leak occurred plus precipitation. If a spill or leak occurred outside secondary containment during transport of the container or filling of a tank, the spill would flow into the storm water collection system. The holding ponds in Alternative 1 and A would contain the spill until cleanup measures could be implemented. The refinery would also have spill response equipment on hand to be able to contain and clean up spills immediately. Spills to the impervious ground surface would be cleaned up immediately by trained plant personnel.

Additional controls would also be implemented once the refinery is operating, and may include monitoring fluid flow parameters, instituting operational procedures and controls, and performing periodic maintenance procedures, which are typically used as industry spill prevention best practices. As with all engineered systems, process or material failures and human error leading to material loss are anticipated. The environmental consequences from these occurrences, such as an accidental spill, cannot be evaluated without reference to a known or expected release of a specific size, location, and duration. Therefore, spill scenarios have been developed in a spill analysis that represent credible potential events for use in assessing impacts from accidental releases or spills during refinery operations.

The spill scenario environmental impacts assessed under the proposed action in this analysis do not imply that these spills are expected refinery events. A spill event that actually occurs may or may not occur in the same sequence or combination of events as detailed in the assessed spill scenarios. An underlying principle in this spills analysis is that conditions would constantly change over the life of the refinery. The spill volume and frequency vary because of (1) varying conditions such as climate and changing seasons, soil conditions, potential for damaging storm systems, and potential for third-party damages; and (2) varying refinery system characteristics, operating and production yields, and maintenance practices.

This spill analysis focuses on potential spills associated with the operation and maintenance of the refinery. The potential environmental impacts of the various types of petroleum products, such as crude oil stock, and finished products including gasoline and diesel fuel are the primary products included in the spills analysis.

The severity and overall risk to the environment from petroleum product spills are direct functions of the following factors:

- Type of petroleum product spilled;
- Location, duration, and size of the spill;
- Frequency of spill events;
- Time of the year or the season in which the spill occurs;

[4] The term release used in the context of an oil spill or petroleum spill has specific regulatory meaning and triggers reporting requirements. Therefore, any spill of oil must be reported if the petroleum product or oil seeps or overflows from the process area following the SPCC plan and FRP. If a material that has been identified as a hazardous substance is spilled anywhere on the site and the spill is greater than the reportable quantity, then additional reporting requirements apply.

- Local environmental conditions (e.g., wind or river speed, surface roughness, and porosity) at the time and place of the spill;
- Location and susceptibility of downstream or downwind receptors; and
- Effectiveness of emergency response and cleanup measures.

The developed spill scenarios attempt to take into account spill location, duration, magnitude, and frequency. Sensitive receptor locations and environmental media, such as the unnamed tributary, which serve as spill transport-enhancing media to a sensitive receptor were identified as affecting factors near the proposed refinery site. The spill magnitude and duration were computed when defining each spill scenario.

Frequency of occurrence allows the estimated environmental consequences from spill events to be put into perspective relative to likelihood of occurrence. The various spill scenarios developed for assessment in this EIS are forecast to occur at frequencies ranging from several times a year to once in 1 million years. In general, the greater the volume of material released and the greater the expected consequences, the more unlikely it would be for a spill to occur (the lower its probability). Each spill scenario was assigned to one of the following four frequency categories:

- Anticipated: Spills estimated to occur one or more times every 2 years of operations (frequency $\geq$ 0.5 per year).
- Likely: Spills estimated to occur between once in 2 years and once in 30 years of operations (frequency = from 0.5 per year to 0.03 per year).
- Unlikely: Spills estimated to occur between once in 30 years and once in 1,000 years of operations (frequency = from 0.03 per year to 1 × 10-3 per year).
- Very Unlikely: Spills estimated to occur between once in 1,000 years and once in 1 million years of operations (frequency = from 1 × 10-3 per year to 1 × 10-6 per year).

In addition, one of three spill release duration ranges is assigned to each spill scenario identified in the tables.

- Instantaneous release: if a release is estimated to occur very quickly, with duration on the order of 1 hour or less;
- Short duration: releases are assumed to occur over periods of a few hours up to a couple of days; and
- Prolonged releases are assumed to take place over several days to several months.

Leaks resulting in spills may range from a small leak, where chemicals, oil, or product escapes for an extended period of time until detected, to a large rupture, where chemicals, oil, or product is released into the environment over a relatively short time but in potentially large quantities. The volume of a leak depends on the size of the opening in the pipe or storage tank, the crude oil or product density, topography, seasonal timing, and leak duration. The spill volumes for each scenario were determined by the duration of the release multiplied by the flow rate through an assumed hole size (bbl or gallons per hour), and the line drain-down volume subsequent to shutdown of the pipeline or storage tank. The spill duration accounts for the time required to detect a leak, locate it if it is not immediately obvious, and shut down the pipeline or storage tank. The drain-down volume is the estimated quantity of chemical, oil, or product that could be released from a pipeline or storage tank rupture based on valve location and response time.

Spills that occur very frequently (because of incorrect hose placement or equipment or human error) result in liquid releases in less than 1 hour. For example, a valve that is incorrectly turned could cause a leak, but it is assumed that the operator would notice the liquid on the ground and manually close the valve. Such a leak typically occurs in a period of less than 1 hour. Short-duration releases could include the complete break or rupture (a guillotine break) scenarios. Conversely, a release from events such as an underground corrosion crack leak could occur over several days before it was noticed.

Although each of these spill scenarios poses an environmental risk, the larger potential volume of released material would likely result in the largest environmental consequences. This observation, however, does not necessarily imply that these spills would represent the largest risk events for the refinery project. In this analysis, risk is represented by the product of the annual frequency of a spill event and its severity consequences. Therefore, if a particular postulated event is calculated to potentially cause large consequences but occurs with low frequency, the calculated risk would be small.

Table 4-7 details spill scenarios that were originally developed for the Valdez Marine Terminal within the FEIS: Renewal of the Federal Grant for the Trans-Alaska Pipeline System ROW and subsequently revised for this analysis. All spill scenarios were modeled after the Valdez Marine Terminal (VMT) EIS probable spill scenarios. A major assumption for this analysis was that all of the MHA Nation scenarios would be comparable on both a scenario description and estimated frequency of occurrence. In addition to giving the release duration, the spill scenarios provide (1) a brief description of the spill scenario, (2) frequency range, (3) type of material spilled, (4) range in spill volume, (5) release point (above and/or below ground), and (6) release duration.

4.4.1.3 Emergency Response Plan

A SPCC plan, FRP, HWCP, Superfund Amendments Reauthorization Act (SARA) Emergency Plan and, as applicable, a CAA Risk Management Plan and HMTA Response Plan, would be an integral part of the refinery's Emergency Response Plan in responding to releases of oil and hazardous substances. The plan would provide for an organized response to incidents and emergencies to protect the environment, employees, and public. Emergency Response Team members, as well as other designated refinery staff members, would be properly trained in the plan requirements and spill/release response and cleanup techniques and procedures.

On-Site Incidents

Minor spills and releases would typically be contained and managed by refinery personnel assigned to a specific work area, as long as they were not exposed to significant risks, (e.g., hydraulic fluid leak from machinery). Such actions typically would not require the assistance of emergency response personnel. For major spills or releases, such as a significant release of crude oil or product material such as diesel, the refinery's Emergency Response Plan would be activated, with the Emergency Response Team responding. These team members would be trained in spill response measures. As required, the Emergency Response Team would obtain the assistance of refinery operations and maintenance staff in obtaining information on the type and quantity of spilled material, shutting down or moving equipment as needed, acquisition of equipment and supplies, and providing access to areas where entry is needed to respond to the spill or release. If an emergency release exceeded the capability of the response team, or posed as an unacceptable safety risk, assistance would be requested from professional spill response specialists and contractors and the appropriate state and/or federal environmental agencies, such as, EPA and the NDDH. This would be documented in the Emergency Response Plan.

Table 4-7 Spill Scenarios Developed for the Valdez Marine Terminal

Event No.	VMT Scenario Description	MHA Nation Scenario Description	Estimated Frequency (per year)	Anticipated (>0.5/yr)	Likely (0.03 to 0.5/yr)	Unlikely (10^{-3} to 0.03/yr)	Very Unlikely (10^{-6} to 10^{-3}/yr)	Crude/ Oil Products	Spill Volume (bbl)	Release Duration	Release Point/Environmental Media	Spill Reaches Water?
1[a]	Small leak of crude oil VMT operations	Small leak of crude oil supply MHA operations	~0.5	X				Crude Oil	50	Short	Land, outside containment	No
2[a]	Small leak of diesel fuel during VMT operations	Small leak of diesel, jet or regular fuel during MHA operations	~0.5	X				Diesel, Jet, or Regular Fuel	15	Short	Land, outside containment	No
3[a]	Moderate leak of crude oil during VMT operations	Moderate leak of crude oil supply during MHA operations	3.0×10^{-2}		X			Crude Oil	5,000	Short	Land, outside containment	No
4[a]	Moderate leak of diesel fuel during VMT operations	Moderate leak of diesel, jet or regular fuel during MHA operations	4.7×10^{-2}		X			Diesel, Jet, or Regular Fuel	300	Short	Land, outside containment	No
5[b]	Cargo tank vessel cracks discovered while loading crude oil	Storage tank vessel cracks discovered while loading crude oil	4.7×10^{-2}		X			Crude Oil	500	Short	Land, outside containment	Yes
6[b]	Failure of loading system between terminal dock and ship	Failure of loading system between product fuel station and truck or train	1.7×10^{-3}			X		Crude Oil	80	Instantaneous	Land, outside containment	Yes
7[b]	Diesel fuel line rupture	Diesel, jet or regular fuel line rupture	1.0×10^{-4}			X		Diesel, Jet, or Regular Fuel	450	Short	Land	No
8[c]	Pipeline failure between the east tank farm and the west manifold	Pipeline failure between the process area and tank farm	1.3×10^{-5}				X	Crude Oil	5,000	Short	Land	No
9[c]	Pipeline failure between west metering and Berth 5	Pipeline failure between the tank farm and product loading area	1.3×10^{-5}				X	Crude Oil	5,000	Short	Land	No
10[d]	Aircraft crash into crude oil tank at East Tank Farm, w/fire	Aircraft crash into tank farm with fire	2.1×10^{-5}				X	Crude Oil	100,000	Prolonged	Air (dike fire)	No
11[d]	Catastrophic rupture of a crude oil storage tank (e.g., foundation or weld failure)	Catastrophic rupture of a crude oil storage tank (e.g., foundation or weld failure)	1.8×10^{-6}				X	Crude Oil	50,000	Instantaneous	Land, outside containment; Water	Yes
12[d]	Catastrophic rupture of a diesel fuel tank	Catastrophic rupture of a diesel, jet, or regular fuel tank	2.2×10^{-6}				X	Diesel, Jet, or Regular Fuel	25,000	Short	Land	No

Table 4-7 Spill Scenarios Developed for the Valdez Marine Terminal

Event No.	VMT Scenario Description	MHA Nation Scenario Description	Estimated Frequency (per year)	Anticipated (>0.5/yr)	Likely (0.03 to 0.5/yr)	Unlikely (10^{-3} to 0.03/yr)	Very Unlikely (10^{-6} to 10^{-3}/yr)	Crude/ Oil Products	Spill Volume (bbl)	Release Duration	Release Point/Environmental Media	Spill Reaches Water?

Notes:

a. VMT Scenarios 1 - 4 were developed from more than 250 documented spills at the terminal during the first 25 years of operation of the pipeline. The scenarios covered spills of North Slope crude oil and diesel fuel. The spill volumes for these scenarios ranged from about 15 bbl of diesel fuel to 3,200 bbl of crude oil, all of short spill duration. Spill initiators or causes and spill size ranged from relatively small fuel line ruptures to large valve leaks at storage tanks.

b. VMT Scenarios 5 - 7 were developed from data reported in previously identified Valdez Marine Terminal specific spill analyses or risk assessments and historical data compiled by Department of Transportation (DOT) for other marine terminals. Scenario 5 is in the likely category, whereas Scenarios 6 and 7 have frequencies in the unlikely category, with spill totals ranging from 80 to 500 bbl of oil.

c. VMT Scenarios 8 - 9 are over-pressurization pipeline ruptures caused by inadvertent valve closure.

d. VMT Scenarios 10 - 12 were developed from statistical data for potential spill event initiating activities at the Valdez Marine Terminal and data or guidance from DOT, Department of Energy (DOE), and the Federal Aviation Administration (FAA). These types of events would generally be considered to lead to catastrophic spills. A total of three scenarios were developed as very unlikely events, including (1) aircraft crash with subsequent fire followed by a prolonged secondary containment area fire in the east tank farm, (2) a failure of a 510,000-bbl crude oil tank, and (3) a rupture of a diesel fuel tank.

Source: Bureau of Land Management 2002

Off-Site Incidents

Typically all minor or major off-site spills or releases would be responded to by the local Emergency Response Teams within its geographic jurisdiction. Assistance from the Refinery Emergency Response Team may be required for providing information on the spilled material, acquisition of equipment and supplies, and assisting with containment at the source of the spill or release. Only trained personnel would be allowed to participate in any cleanup activities with the potential for exposure. If any spill or release is significant enough that it exceeded the capability of the Emergency Response Teams to adequately respond, assistance would be requested from professional spill response specialists and contractors and the appropriate state and federal environmental agencies.

4.4.1.4 Spill Analysis — Ground Water

Ground water resources in proximity to the refinery could be affected by spills, particularly if a spill occurred directly or close to an underlying aquifer. Generally, ground water could be impacted if this type of spill occurred within the process area, tank farm, and product loading area and traveled off the impervious surfaces or a leak occurred within a buried pipeline.

The spill scenarios detailed on Table 4-7 were grouped into four spill event frequency scenarios and were analyzed for their effects on ground water resources. The spill event frequency categories are:

- Anticipated Spill Events – Scenarios 1 and 2: This category consists of spills that are anticipated. This spill would result from a small leak and would involve a maximum oil release of 50 bbl.
- Likely Spill Events – Scenarios 3, 4, and 5: This category involves spills considered to be likely. These spill scenarios include a moderate, instantaneous leak of crude oil; a very short-duration leak caused by maintenance-related damage; a short-duration (e.g., 8 hours) leak caused by over-pressurization from inadvertent remote gate valve closure; and a prolonged (2 days) leak resulting from corrosion-related damage.
- Unlikely Spill Events – Scenarios 6 and 7: This category was performed for spill scenarios that are considered to be unlikely. These scenarios consist of a leak resulting from pipeline settling; or a crack resulting from tank corrosion or failure.
- Very Unlikely Spill Events – Scenarios 8, 9, 10, 11, and 12: This category was performed for a very unlikely spill scenario. It consists of an above ground guillotine break caused by a major storm event (e.g., tornado), an aircraft collision, pipeline failure, and catastrophic ruptures of tanks. This spill would release the greatest amount of chemical, oil, or product.

Anticipated Spills — Scenarios 1 and 2

An anticipated spill event would discharge chemicals, oil, or product either above or below the ground surface from a small leak. The volume of oil released is assumed to be 50 bbl, and the release period is assumed to be instantaneous. An underground release could occur along buried sections of pipeline or from valve leaks in storage containers and the spill volume infiltrates the soil.

If the leak occurs above ground, it is assumes that in most cases the leak would occur on an impervious surface and in a containment structure, and the leak would be detected and spill response plans would be implemented to contain and mitigate the spill. Therefore, the spill should not result in any localized impacts to ground water. For leaks on pervious surfaces, the spill volume would infiltrate into the soil.

If a buried section of pipeline results in a leak, the volume of oil released for the anticipated scenario would be very small (50 bbl). Therefore, it is unlikely that any of the oil would emerge at the surface, although it would be released under pressure and under some conditions could migrate to the surface. If the leak occurs during the winter or spring season, the oil released could be within the soil layer where the soil is frozen. Because of the presence of frozen soil, the oil would probably stay within the pipeline's gravel pack or disturbed trench area and affect the quality of water contained in thaw areas present at the location of the leak. Impacts would thus be localized. For this case, the released oil could migrate downward under the influence of gravity and contaminate the local ground water system. Because of the small volume of oil released, impacts to the ground water system should be localized.

Likely Spills — Scenarios 3, 4, and 5

For the likely category of spills, a prolonged leak resulting from corrosion-related damage was selected for analysis because it would release a significant volume of oil (up to 5,000 bbl over a 2-day period). Because this type of leak could occur anywhere within the tank farm, process, or product loading area, evaluations of the impacts to ground water were made for the 190 acre proposed refinery footprint. If the spill occurred within the project footprint, impacts to the ground water system should be localized because of the presence of impervious surfaces and containment structures that would slow and in some cases prevent oil from migrating to local ground water systems.

Conversely, if the volume of oil, chemical or product migrated off or under the impervious surface, impacts would occur when the spill volume infiltrated the soil column and reached the underlying ground water. The 2-day duration of the spill should allow some response activities to commence and limit the amount of oil, chemical, or product available for infiltration. These impacts would, however, be potentially very large because of the volume of oil, chemical, or product released. For scenario 5, some of the spill would be expected to reach surface waters, impacting water quality.

Unlikely Spill Events — Scenarios 6 and 7

The third analysis was for a release of oil through a pipeline failure resulting in a short-term spill scenario. This spill is considered unlikely because the frequency of occurrence is estimated as once in 1,000 years to once in about 30 years. Because the most likely scenario would occur with buried pipelines, it is assumed that the spill would occur in areas of the refinery that are not likely to be detected. The release would result in a spill of up to 5,000 bbl of oil over a short period (hours to several days).

Because these scenarios are primarily associated with pipeline failures, crude oil or product released from a crack would be under pressure. Because of the volume of oil released and the system pressure, it is probable that the released oil would rapidly migrate to the surface and contaminate the land. Even with losses to the land surface, the underlying ground water system could experience severe water quality impacts because of the large volume of oil released. There is presently a risk of pipeline failure in the project area. The refinery would increase the existing pipeline system by 4 miles.

Very Unlikely Spill Events — Scenarios 8, 9, 10, 11, and 12

An instantaneous, guillotine break resulting from a catastrophic rupture, tornado, or plane crash was analyzed for the very unlikely spill scenarios. This type of event would be expected to occur only between once in 1 million years to once in 1,000 years. A 1989 API survey indicated that there were approximately 700,000 aboveground diesel fuel storage tanks in the United States. Tank rupture accounted for only 5.4 percent of the 132 releases that occurred worldwide between

1970 and 1988. However, tank rupture accounted for almost 19 percent of the released material. This analysis considers a spill scenario involving a catastrophic rupture of tanks containing fuel at the refinery. The frequency of such an event is estimated to be 1.1 × 10-6 per tank-year. Two tanks, each with a shell storage capacity of 25,000 bbl, store fuel at the refinery.

These scenarios are associated with catastrophic pipeline and tank failures, releasing large volumes of crude oil or product. Because of the volume of oil released and the system pressure, it is probable that the released oil would rapidly migrate to the surface and contaminate the land. The underlying ground water system could experience severe water quality impacts because of the large volume of oil or product released.

4.4.1.5 Surface Water

Anticipated Spills — Scenarios 1 and 2

Scenarios 1 and 2 could affect surface waters. However, because these spills would occur only at pump stations or at valves, it is highly unlikely that they would affect surface waters. If the leak occurs above ground, it is assumed that in most cases the leak would occur on an impervious surface and in a containment structure, and the leak would be detected and spill response plans would be implemented to contain and mitigate the spill. Therefore, the spill should not result in any localized impacts to surface water.

Likely Spills — Scenarios 3, 4, and 5

For the likely category of spills, Scenario 3 (up to 3,200 bbl over a 2-day period) would result in a prolonged leak caused by corrosion-related damage that could potentially result in a significant volume of oil released into a surface water feature. Because the release would occur from the crude oil supply pipeline, it is assumed that the spill would occur outside of the refinery boundary.

Because the released oil would occur outside spill containment areas, the spill volume would infiltrate the soil column. The ability to reach a surface drainage or wetland feature would depend on numerous variables. The 2-day duration of the spill would allow some response activities to commence and limit the amount of crude oil available for infiltration. These impacts would, however, be potentially very large because of the volume of oil released.

Even under ideal conditions, it is unlikely that 100 percent of the oil in the surface water feature at a containment site would be removed by a remedial activity, even if the response team were able to arrive at the containment site and set up its equipment prior to the arrival of the leading edge of the oil spill. Therefore, the release of up to 3,200 bbl of oil in the local surface waters would be a significant, but not irreparable impact.

Unlikely Spill Events — Scenarios 6 and 7

Scenarios 6 and 7 are estimated as accidents that are unlikely (frequency of occurrence of 1 × 10-3 to 0.03/yr). Both scenarios could affect surface water resources. Of these scenarios, scenario 7 would cause the greatest impact to surface water resources because it would release the largest volume of oil. However, the chance of either of these scenarios reaching the unnamed tributary is extremely remote because there is no large source of runoff water upstream of the project storage areas, and secondary containment drainage would be well controlled.

Very Unlikely Spill Events — Scenarios 8, 9, 10, 11, and 12

The last frequency range of spill scenarios is described as very unlikely to occur (frequency of occurrence of 1 × 10-6 to 1 × 10-3/yr). Five scenarios are included in this frequency range that could affect surface waters. Of these scenarios, Scenario 11 would produce the largest impact to surface water resources because it would release the largest volume of oil (about 50,000 bbl).

The analyses performed to determine the impacts of the spill scenarios mentioned above depend on a number of estimated and measured quantities: the volume of fluid spilled during an event, the time needed for the fluid to discharge to the environment, the velocity of the current in the receiving river that would transport the fluid downstream, and the response time required to initiate appropriate contingency measures.

The potential exists for a large release of oil or refined product contaminants because of a catastrophic rupture of crude oil storage tanks at the refinery. These tanks, with individual tank storage capacities of around 460,000 bbl, are located in two primary areas, the tank farm and process area.

Catastrophic storage tank failure or rupture is extremely rare. Eight cases of crude oil tank rupture are known from around the world: three caused by foundation failure, one caused by weld failure, one caused by impact of a rail truck, and three caused by flooding (Bureau of Land Management 2002).

The chance of a guillotine break reaching the unnamed tributary is extremely remote because the storm water design of the refinery would contain a 5-inch precipitation event. In addition, the engineered secondary containments are designed to contain the entire contents of the storage containers, and the subsequent site drainage is well controlled. For the present purpose, however, the possibility is considered. If a tank were to rupture, the most likely consequence would be a major flow of oil to the secondary containment. In the case of a very large rupture, it may be likely that the oil would follow the refinery surface, drain into the containment structures, overflow, and wash into the unnamed surface tributary.

Based on the estimated frequency of a storage tank failure spill event at the Valdez Marine Terminal (Bureau of Land Management 2002), the same probability for the refinery is assumed, which was 1.8 × 10-6. Based on the probability, such tank failures were determined to be very unlikely events that could produce spill magnitudes ranging from approximately a 5,000-bbl spill on land outside secondary containment to a spill of about 25,000 bbl of crude oil into the unnamed tributary. This analysis considers a spill scenario involving a catastrophic rupture of tanks containing either gasoline or diesel fuel at the refinery. Three tanks, each with a storage capacity of 25,000 bbl, store gasoline at the refinery. Two tanks with an 8,000-bbl capacity each would store diesel at the refinery.

It is assumed that both the crude oil and refined products would be less dense than water (1.0 g/cm3 for water), and any oil or product spilled into surface waters would tend to float on the surface and spread. If the surface water is moving or flowing, the oil would be transported downstream by the surface flow. The combined motions of spreading and surface flow would produce an elongated oil slick. The slick would, in general, move downstream at the speed of the surface current; however, winds may alter the direction of transport. In addition, some light hydrocarbons in the crude oil may dissolve or evaporate.

It is assumed that once the crude oil or refined product reaches the unnamed tributary, it would move downstream with distinct leading and trailing edges (plug flow) and a slick length that remained constant in time. During low flow conditions, the spill would pond in the wetland. During an oil spill into water, a sheen is likely to develop. An oil sheen is a very thin layer of oil that floats on the water surface and is transported downstream with the surface flow. In general, the color of the sheen corresponds with its thickness. While moving as an oil slick, crude oil can be affected by a number of physical processes. These include advection (moving along with the current); mechanical spreading because of the balance among gravitational, viscous (viscosity is a measure of a fluid's internal resistance to flow), and surface-tension forces; horizontal turbulent diffusion (spreading driven by a difference in concentration); evaporation; dissolution; and shoreline deposition. Photochemical reactions and microbial biodegradation are also possible. The effect of these processes depends on the properties of the oil and environmental conditions. Spreading, dissolution, evaporation, and photochemical reactions of the crude oil usually occur within hours after the spill. Evaporation and dissolution are particularly important processes for the light hydrocarbon components of the crude oil.

The difference in surface flow (i.e., current) speed and the resulting shearing forces between water layers is typically the major mixing mechanism that spreads oil as it moves downstream. The leading edge of the slick may move as a relatively sharp front; however, mixing would continuously exchange water and oil between the slower, near-bank regions and the faster-flowing regions of the stream or river. Many river channel profiles are highly irregular, with rapids at one extreme and quiet bays at the other. These features either accelerate or decelerate the average flow in the stream or river and contribute to the shear in the current pattern, thus increasing the along-channel spreading of the oil. Oil would reach a shoreline and be deposited sometime after the spill event. In sands and gravels, the lighter-weight crude oil components may then penetrate the surface, contaminating deeper layers of soil and possibly the underlying ground water. Some of this deposited oil would be re-entrained by the water and transported farther downstream. Oil is expected to continue to be released from soil and gravel and the stream or riverbed itself for years to come, causing potential contamination problems.

4.4.1.6 Spill Analysis — Soils

Soil contamination could occur during the construction and operation of the refinery. Contaminated soils would typically include natural materials such as soils, subsoils, overburden, or gravel that have been contaminated with crude oil; refined petroleum products, such as gasoline, diesel, and jet fuel; lubricating oils; hydraulic oils or sludge contained in storage tanks or equipment. The immediate potential effect would be direct contamination of the soil, which could result from the release of fuels and crude oil at the refinery site, along the pipeline corridor, or accidents during delivery of product. The anticipated causes of spills on land could include traffic accidents, operational errors, corrosion, mechanical failures, and vandalism.

Several factors control the spread of spilled crude oil on land. Once a spill occurs, the light components in the crude oil evaporate. The rate of evaporation can be affected by weather. Low temperatures reduce the evaporation rate, whereas high winds increase it. The terrain and the surface features of a spill site, as well as human response to a spill, control the spreading of the rest of the spilled oil or product. It should be noted that cleanup responses immediately after the releases can significantly reduce the number of contaminated sites that require long-term cleanup.

On a sloped terrain, part of the spilled oil would flow down slope; while the remainder infiltrates to the subsurface or is absorbed by or coats vegetation or snow. The down slope spreading of the oil is partly restrained by the viscous drag on the crude oil from contact with the ground surface and vegetation, liquid surface tension, and local depressions. Downward infiltration of the oil into the soil depends on the permeability of the ground surface, which, in turn, is controlled by the texture of local soil, the presence of snow, and the water table. A frozen soil has a low permeability that limits downward infiltration. Down slope spreading dominates the spreading process until the oil is intercepted by either human intervention or natural features, such as depressions, rivers, streams, ponds, or lakes. If an anthropogenic structure, such as a work-pad, access road, or highway, is in the path of a migrating oil plume, it can divert the flow. In addition, spilled oil can spread laterally as it moves down slope. Therefore, the magnitude of the lateral spreading increases with decreasing slope.

On flat terrain, the slope is of less importance in controlling the spreading of a spill. Local surface features, such as depressions on patterned ground and vegetative cover, would control the extent of a spill.

It is anticipated that the extent of soil contamination on a spill site would be localized, and limited at a maximum to a few acres. However, contaminants could spread to subsurface water at sites where there is a shallow ground water table. These sites may require additional cleanup and monitoring.

In general, the management of all spill debris and contaminated media first involves their characterization as hazardous or non-hazardous wastes. This is carried out by the application of circumstantial factors (i.e., the material spilled) or as a result of sampling and analyses when process knowledge is insufficient to support a complete waste evaluation. Waste determined to be hazardous would be incorporated into the hazardous waste management program as dictated by logistics of the spill. Waste determined to be non-hazardous would be evaluated against the soil cleanup levels contained in the specified tribal and federal regulations. Case-by-case decisions would be made regarding the management of non-hazardous wastes after this evaluation is completed. Options may include incineration, in-situ remediation through the application of such technologies as biological treatment or soil venting, stockpiling for later thermal treatment, or placement in municipal landfills.

Finally, within the context of any approved remediation and restoration plan for each spill event, special provisions may also be included for the interim storage of spill debris or contaminated media at or near the spill site. Acceptable levels of treatment would be determined by specified regulations and are specific to material spilled, potential for migration, potential receptors, and various other site-specific parameters. These levels define the allowable residual levels of specific chemical constituents that would be allowed to remain at the location where a release has occurred. Options for disposition of successfully treated soils include returning them to the spill location, sending them to a landfill to be used as clean cover material, or using them in other circumstances as fill.

The spill scenarios detailed on Table 4-7 were grouped into four spill event frequency scenarios and were analyzed for their effects on soil resources. The spill event frequency categories are:

- Anticipated Spill Events – Scenarios 1, and 2: This category consists of spills that are anticipated. This spill would result from a small leak and would involve a maximum oil release of 50 bbl.
- Likely Spill Events – Scenarios 3, 4, and 5: This category involves spills considered likely. These spill scenarios include a moderate, instantaneous leak of crude oil; a very short-duration leak caused by maintenance-related damage; a short-duration (e.g., 8 hours) leak caused by over-pressurization from inadvertent remote gate valve closure; and a prolonged (2 days) leak resulting from corrosion-related damage.
- Unlikely Spill Events – Scenarios 6 and 7: This category was performed for spill scenarios that are considered unlikely. These scenarios consist of a leak resulting from pipeline settling; or a crack resulting from tank corrosion or failure.
- Very Unlikely Spill Events – Scenarios 8, 9, 10, 11, and 12: This category was performed for a very unlikely spill scenario. It consists of an above ground guillotine break caused by a major storm event (such as, tornado), an aircraft collision, pipeline failure, and catastrophic ruptures of tanks. This spill would release the most amount of chemical, oil, or product.

Anticipated Spills

Anticipated spills are defined as spills caused by events with an expected frequency range of 0.5 per year or more (Table 4-7). The scenarios include two types of small leaks that could cause a land-based release of 0 to 50 bbl (0 to 2,100 gallons) of crude oil or 0 to 50 bbl of diesel fuel, gasoline, or jet fuel. The worst event among the anticipated spill scenarios would be an instantaneous leak of 100 bbl of diesel fuel during pipeline or pump station operations. On the basis of the parametric method (e.g., the size of the contaminated area created by the spill is estimated by dividing the volume of the spill by an assumed depth of the spilled liquid pool of one inch), the maximum size of the potentially contaminated area would be about 0.1 acre at an assumed oil pool depth of one inch. This level of impact on soils would be very small and local. Prompt cleanup would reduce the impacts to negligible.

Likely Spills

Likely spills are defined as spills caused by events with an expected frequency range of 0.03 to 0.5 per year (Table 4-7). The scenarios evaluated represent three types of events that could cause a land-based release of up to 5,000 bbl (210,000 gallons) of crude oil or up to 300 bbl (12,600 gallons) of diesel, regular, or jet fuel. The worst event in this category would be a leak that might cause the release of 5,000 bbl of crude oil over a period of 48 hours. This event is used to evaluate the maximum impact in the likely spill category. To ensure that the evaluation results would not underestimate the consequences, a release of 5,000 bbl of oil onto the ground was assumed. The maximum extent of spreading would be expected if no interceptor was present near a spill site. Based on the parametric method, the maximum potentially contaminated area would be about 7.7 acres at an assumed oil pool depth of one inch. Because of the small size, this impact on soils would be small and localized if prompt cleanup occurred after the spill.

Unlikely Spills

Unlikely spills are defined as spills caused by events with expected frequencies of 10-3 (0.001) to 0.03 per year (Table 4-7). The scenarios evaluated include two types of events that could cause a land-based release of crude oil ranging from 80 to about 450 bbl (3,360 to 18,900 gallons). The worst event in this category would be a spill caused by a rupture in the fuel line. Up to 450 bbl of diesel, regular, or jet fuel could be released in a short period. This scenario was used to evaluate the maximum impact for the unlikely spill category. Therefore, the maximum size of a potentially contaminated area of 450 bbl would be expected to be about 0.7 acre at an assumed oil pool depth of one inch.

Very Unlikely Spills

Very unlikely spills are defined as spills caused by events with an expected frequency range of 10-6 (0.000001) to 10-3 per year. The scenarios evaluated for this category of spill include nine types of events that could cause a land-based release of a volume of crude oil ranging from 5,000 to about 100,000 bbl (210,000 to 4,200,000 gallons), depending on both the location of the spill and the amount of storage volume used at the time of the spill. The worst event in the very unlikely spill category would be a guillotine break of the pipeline from the impact of an airplane or helicopter. Up to 100,000 bbl of crude oil could be released in a short period. This scenario is used to evaluate the maximum impact in the very unlikely spill category.

Based on the parametric method of calculation, the estimated size of a potentially contaminated area would be 155 acres for the 4.2 million gallon spill at an assumed spill pool thickness of one inch. However, the refinery is adjacent and in proximity to an unnamed tributary. In a worst-case scenario, the crude oil released from the refinery site could drain into the tributary, resulting in a smaller area due to the confinement of the channel. Most of the potentially contaminated land would be confined to the ordinary high water mark along the tributary channel and downstream reaches. To estimate the maximum size of a potentially contaminated land-based area for the very unlikely spill scenarios, both release volume and local terrain were considered. At this location, the spreading of spilled oil would be limited by the quantity of a spill. The worst-case maximum volume of a land-based spill is estimated to be about 100,000 bbl. The impact on soils could potentially range from small and localized due to amount of impervious surface associated with the refinery footprint, or extremely more severe if the spill made its way into the unnamed tributary. As stated previously, cleanup responses that occur immediately after the release reduces the number of potentially contaminated sites that require long-term cleanup.

4.4.2 Construction Alternatives

4.4.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the entire 468.39-acre site would be conveyed into trust status, but construction and operation of the refinery project would not go forward. Therefore, the 468.39-acre project site would most likely continue to be used for agricultural purposes, which have occurred for decades. The MHA Nation could decide to use the entire project site to produce feed or forage hay for buffalo, or the land could be included in a tenant farm-leasing program. Based on the foregoing, there would be no impacts from spills in the project area associated with a refinery.

4.4.2.2 Alternative 3 — No transfer to Trust, Refinery Constructed

The impacts from spills from the implementation of this alternative would be the same as described for Alternatives 1 and A. The MHA Nation would construct and operate the refinery and associated facilities and the same impacts would occur.

4.4.2.3 Alternative 4 — Modified Proposed Action

Implementation of this alternative would result in the same impacts as described in Alternatives 1 and A. The revised site refinery layout would be constructed, so impacts from spills would be the same. However, instead of holding ponds, the surge tanks described earlier in Alternative 4 would contain any spills until cleanup measures could be implemented.

4.4.2.4 Alternative 5 — No Action

Under this alternative, the 468.39-acre site would not be conveyed into trust status and the refinery would not be built. The 468.39-acre project site would continue to be used for agricultural purposes, which have occurred for decades. There would be no impacts from spills in the project area.

4.4.3 Effluent Discharge Alternatives

4.4.3.1 Alternative B — Partial Discharge through an NPDES Permit and Some Storage and Irrigation

Under this alternative, wastewater would be treated, then discharged through an NPDES permit or stored and used for irrigation. Impacts from spills in the project area would be similar to those described under Alternatives 1 and A due to construction of the refinery.

4.4.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this alternative, the effluent from the WWTP would be discharged to a Class I, Non-hazardous UIC well that would be drilled on the project site. This well would dispose of non-hazardous fluids into isolated formations beneath the lowermost existing or potential future underground source of drinking water. The impacts from spills would be similar to those described under Alternatives 1 and A.

4.4.3.3 Alternative D — No Action

No effluent would be generated or discharged because the refinery would not be constructed under this alternative. There would be no impacts from spills in the project area under this alternative.

4.5 Solid and Hazardous Wastes

Hazardous and non-hazardous wastes will be produced from refinery operations and stormwater. A waste inventory appears in Chapter 2 and the Solid and Hazardous Wastes Management Report identifies the nature, source, and potential risks associated with these wastes. The proposed refinery is likely to be a LQG of hazardous wastes. Depending on facility design and operation, the facility may also be regulated under the RCRA, a federal hazardous waste law, as a RCRA TSD Facility. RCRA TSD facilities must obtain a RCRA TSD permit. Regulation pursuant to RCRA is discussed in detail in the interim final EPA document entitled: “Discussion of Regulatory Applicability of RCRA /NPDES/UIC to Three Affiliated Tribes Refinery Alternatives” (March 2008) (Regulatory Applicability Discussion).

Generators of hazardous waste are classified according to the amount of hazardous waste they generate each month. Generators that generate less than 100 kilograms per month and accumulate less than 6,000 kilograms of hazardous waste at any time are small quantity generators (SQG). Generators that generate more than 1,000 kilograms per month (approximately 5 fifty-five gallon drums of waste per month) or more than 1 kilogram of acutely hazardous waste per calendar month are LQGs. Regulatory requirements for small and LQGs are found in 40 CFR Part 262.

Generators of hazardous wastes may not treat or accumulate hazardous wastes in surface impoundments (ponds) without a RCRA TSD permit. LQGs, such as the proposed refinery, may accumulate wastes on site up to 90 days in tanks and containers without a RCRA TSD permit as long as the generator complies with training, design, preparedness and prevention requirements, contingency plans, and emergency procedures found in 40 CFR Part 265.

Generators of hazardous wastes may not treat or accumulate hazardous wastes in surface impoundments (ponds) without a RCRA permit. However, if the treatment and accumulation of hazardous wastes occurs in tanks instead of ponds and the wastes are discharge under an NPDES permit, the facility would most likely not need a TSD permit.

Hazardous wastes generated at the proposed refinery will be stored temporarily (for up to 90 days) onsite following the requirements at 40 CFR Part 265 until being sent off-site for disposal. These wastes will be sent to a third-party, licensed, off-site hazardous waste disposal site. No hazardous wastes will be disposed of in or on the refinery site. Impacts from transporting hazardous waste will be controlled and/or mitigated through the RCRA transporter requirements under 40 CFR Part 263. Transporters of hazardous waste are required to be licensed under these regulations and transport the waste in appropriate containers and vehicles to approved waste management facilities. Both hazardous waste and solid waste will be disposed of properly at approved waste management facilities. The RCRA regulations for solid and hazardous wastes management facilities will control and/or mitigate potential environmental impacts.

4.5.1 Alternatives 1 and A — Original Proposed Actions

Under this alternative, process wastewater from the refinery and contaminated (oily) water from the refinery process areas would be collected and treated at a WWTP. Following treatment, wastewater would be stored in two downstream effluent holding ponds (700,000 gallons each/1.4 million gallons total). Contaminated (oily) stormwater would be collected from process areas (i.e. loading area, tank farm (Figure 2-5) and routed directly to a 1.4 million gallon holding pond upstream of the WWTU. Depending on quality, the wastewater from the holding pond would be sent directly to the two effluent holding ponds described above or sent to the WWTU for treatment and then into the effluent holding ponds (Figures 2-3 and 2-4). The effluent from the holding ponds would be recycled back to the refinery processes as needed or discharged through a permitted NPDES outfall.

The proposed alternative is expected to generate and store FO37 hazardous waste in the holding pond upstream of the WWTU aggressive biological treatment unit ABTU. A RCRA TSD permit is required for surface impoundments which receive and/or generate hazardous waste, and that do not conduct aggressive biological treatment. A RCRA TSD permit can also be required for downstream units from ABTUs that do not conduct aggressive biological treatment and land dispose of hazardous waste. Therefore, a RCRA TSD permit would be required under this alternative. In addition to the holding pond upstream of the ABTU, the holding ponds downstream of the ABTU could also require the refinery to be subject to a TSD permit if regulated hazardous wastes were to enter or accumulate in these ponds (e.g. if the ABTU is not designed and operated on a continuous basis as required by 40 CFR 261.31(b)(2). For more information see the “Discussion of Regulatory Applicability” document (EPA, March 2008).

Holding ponds which generate and accumulate hazardous wastes are required to have a RCRA TSD permit under 40 CFR Parts 264 and 270 before they are constructed. The permit application must be submitted at least 180-days prior to construction. The TSD permitting requirements under 40 CFR Part 264 would include double-liner and leak detection requirements, operating requirements, ground water, training plans, preparedness and prevention requirements, contingency plans, emergency procedures, air emissions standards, closure plans, post-closure plans, financial assurance for closure and post-closure, and liability insurance for sudden and non-sudden accidental occurrences. The entire facility would also be subject to corrective action requirements for releases to soil, ground water, and surface water from all SWMUs. A post-closure permit would be required if the holding pond could not be “clean-closed” at the end of operations.

Air impacts from hazardous waste ponds could be significant within the facility. As discussed in the air quality section in this chapter, the air impacts will generally be confined to the refinery site. The RCRA TSD permit would have provisions to control and/or treat VOCs in the wastewater surface impoundments and/or tanks. Similarly, the RCRA hazardous waste generator requirements contain provisions to control air emissions from tanks.

Failures or leaks in surface impoundment liners would result in contamination of soils and ground water beneath the facility. Contamination of soils and ground water would result in the requirement to implement corrective action measures to eliminate the source of contamination and to restore ground water quality.

Hazardous waste container storage areas would be on concrete pads with concrete curbing to contain any spills or leaks. This should allow for spills or leaks to be readily detected and addressed. Therefore, limited impacts to soils or ground water are anticipated from these areas. Hazardous waste generator requirements under 40 CFR Part 262 would apply as appropriate.

Reclamation/Closure Impacts

At some point in the life of the refinery, the decision would be made to cease refinery operations and permanently close the facility. The closure of the refinery would be expected to follow a process of decommissioning, decontamination and demolition, followed by cleanup of any remaining soil and ground water contamination and final reclamation of the site. One component of closure planning is the RCRA "closure plan" which is required for facilities regulated as TSD Facilities under a RCRA permit. Closure performance standards are also required of RCRA generators under RCRA. The "closure plan" would need to include a range of potential closure and reclamation scenarios developed specifically for the proposed refinery. The RCRA closure plan would only cover the HWMU. The closure activities would be carefully managed in order to minimize impacts to the environment and other receptors such as area residents.

Some level of cleanup would be anticipated at the proposed refinery; as normal refinery operations over time result in some local contamination of soils and ground water. However, as discussed in the proposed alternatives, impacts would be minimized through effective design considerations, operating practices and environmental management systems. The discovery of any release(s) of hazardous wastes or constituents prior to closure would be addressed through the implementation of applicable RCRA permit requirements or an enforcement order.

The basic procedures that would be followed in closing the facility under an approved RCRA closure plan include:

- Field checks and review of refinery drawings, piping location maps and aerial photos to identify all known or suspected piping and subsurface structures as well as areas of "high risk" for spills and releases throughout the refinery;
- Removal of any remaining hazardous waste sludge, liners, contaminated soils in or beneath all hazardous waste surface impoundments. If the hazardous waste surface impoundments are not clean-closed, a RCRA post-closure permit would be required.
- Removal of any waste;
- Decontamination as appropriate;
- Evaluation to determine if there was a possibility that hazardous waste/constituents have been released;
- Collection and analysis of soil and ground water samples, as appropriate, to determine if hazardous wastes/constituents have been released – data from existing monitor wells would be utilized;
- Determination, as appropriate, of the extent of any soil and ground water contamination which may be present beneath and around a given area;
- Determination of the need for soil and/or ground water remediation by developing remediation objectives;
- Development, execution, and completion of any required remediation efforts;
- Verification that the required remediation efforts met the remediation objectives established in the approved plan;
- Certification by the owner/operator that the requirements of the approved plan were met; and
- Appropriate remediation of all contaminated soil and ground water.

Once the site has met the appropriate regulatory requirements and designated cleanup standards, the site should be reclaimed in a manner that would be consistent with its intended use. Ground water monitoring wells no longer needed for their intended purposes (e.g., regulatory compliance) would be closed/plugged as per the appropriate regulatory requirements. See Soils Section of this Chapter for additional discussions of soils reclamation.

As per any corrective action, requirement/agreement from EPA, the facility could have the flexibility of using those portions of the RCRA corrective action process deemed to be appropriate at the site. The five major steps that would be considered during RCRA corrective action would be:

- RCRA Facility Assessments (RFA) including identification of potential or actual releases from SWMUs;
- Interim/Stabilization Measures including short-term actions to address any immediate threats to human health and the environment;
- RCRA Facility Investigation (RFI) including compilation of information to fully characterize the release in order to better determine the appropriate response action;
- Corrective Measures Study (CMS) including identification of appropriate measures to appropriately address the release, following completion of the RFI; and
- Corrective Measure Implementation (CMI) including design and implementation of the cleanup remedy that is protective of human health and the environment.

4.5.2 Construction Alternatives

4.5.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the entire 468.39-acre site would be accepted into trust status, but construction and operation of the refinery project would not go forward. Therefore, the 468.39-acre project site would most likely continue to be used for agricultural purposes, which have occurred for decades. Based on the foregoing, there would be no solid and hazardous waste impacts associated with a refinery.

4.5.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Under this alternative, the hazardous and solid waste impacts will be the same as Alternatives 1 and A.

4.5.2.3 Alternative 4 — Modified Proposed Action

Under Alternative 4, solid waste and hazardous waste would be managed as generally described under the proposed Alternative 1. However, the contaminated (oily) stormwater holding pond and effluent holding ponds would be replaced with tank systems (Figure 2-16). The tank systems would be designed to meet specific regulatory requirements under RCRA. The tanks would be underground, shallow tanks to accommodate gravity filling following the site gradient. The tanks would be made of double wall steel or equivalent in compliance with 40 CFR 264/265 Subpart J as applicable. The use of tanks rather than surface impoundments (ponds) should provide greater protection for soils and ground water. The use of tanks would allow for further recycling/treatment of wastewaters. Also, the sludge thickening process would be designed to minimize hazardous wastes generated for offsite disposal by use of a centrifuge with naphtha solvent wash or similar process. Figure 2-17 shows how wastes generated from the redesigned wastewater treatment unit would be handled. Hazardous waste generator requirements under 40 CFR Part 262 would apply as appropriate.

Under Alternatives 4 and A, the refinery would be redesigned so the facility would be regulated as a hazardous waste generator under RCRA but would not be regulated as a RCRA TSD facility. Alternatives 4 and A rely exclusively on tanks in the wastewater treatment system to manage hazardous wastes. Such tanks are typically exempt from RCRA permitting under the RCRA wastewater treatment unit (WWTU) exemption because wastewater is treated and discharged pursuant to a CWA NPDES permit; see 40 CFR 264.1(g)(6), 260.10 and 270.1(c)(2)(v). Even if no RCRA permit were required, the following selected wastes could be generated in the wastewater treatment system: DO18, KO48, KO49, KO51, FO37, and FO38. However, compliance with hazardous waste generator requirements will minimize the impact of wastes on the facility environs. Spills, leaks, and unanticipated releases would be the main sources potential impacts. Generator plans prepared in compliance with regulatory requirements found in 40 CFR Part 265 and implemented after releases would assure proper responses to such events. As there would be no RCRA permit, there would be fewer RCRA requirements applicable to the facility. For example, there would be no RCRA permitting requirements for ground water monitoring, and corrective action. Under this alternative, there is no requirement for financial assurance under EPA's RCRA regulations. However, RCRA generators are required to demonstrate “clean closure” of areas used to temporarily store hazardous waste. Without the funding available through financial assurance, cleanup activities and other remedial actions may be delayed or may not be implemented. Ground water monitoring programs and RCRA corrective action are not required for non-TSD facilities. [Note: In accordance with 40 CFR Parts 262.34, 265.111, and 265.197, all hazardous waste tanks must be clean-closed at the time of closure, or a RCRA post-closure TSD permit will be required.]

All hazardous waste tanks and tank systems would be required to meet applicable RCRA requirements including: appropriate construction materials, double-wall construction (including double-floor construction as appropriate), liners, leak detection systems, and secondary containment. These requirements would reduce the likelihood of releases to soils and ground water.

Hazardous waste container storage areas would be on concrete pads with concrete curbing to contain any spills or leaks. This would allow for spills or leaks to be readily detected and addressed. Therefore, only minor impacts to soils or ground water are anticipated from these areas.

4.5.2.4 Alternative 5 — No Action

Under this alternative, the 468.39-acre site would not be accepted into trust status and the refinery would not be built. The 468.39-acre project site would continue to be used for agricultural purposes, which have occurred for decades. There would be no impacts from solid or hazardous wastes.

4.5.3 Effluent Discharge Alternatives

4.5.3.1 Alternative B —Partial Discharge through an NPDES permit and Some Storage and Irrigation

Under this alternative the hazardous waste impacts would be similar to those described under Alternatives 1 and A.

Under this alternative, the wastewater from the holding ponds (Alterative 1 and B and Alternative 3 and B) or tanks (Alternative 4 and B) would be discharged through a permitted NPDES outfall or used for irrigation water. Prior to discharge or use for irrigation, the process wastewater would be treated in the WWTU and then sent to holding ponds or tanks. Depending on its quality, the potentially contaminated (oily) stormwater may be sent directly to the holding ponds or tanks for the treated process water or first sent to the WWTU for treatment and then routed to the holding ponds or tanks. The uncontaminated (non-oily) stormwater would be stored in a holding pond prior to discharge through a permitted NPDES outfall or to use for make up water for the fire water system.

A RCRA TSD permit is required for all alternatives involving land application of wastewater regardless of construction alternative used. The wastewater treatment unit exemption does not apply to facilities which land applies wastewater because the proposed irrigation is not subject to the NPDES permit. The RCRA TSD permit would include the entire WWTU.

Treated wastewater that is land applied would be considered to be a "solid waste" under RCRA regulations. This means that wastewater proposed to be used for irrigation should be treated to meet appropriate standards to protect human health and the environment. In addition, unless the wastewater is treated sufficiently, it would continue to be considered a “solid waste containing hazardous waste constituents”, and RCRA corrective action requirements would apply for the irrigated land parcel. This is because the irrigated land parcel would be considered a SWMU. The RCRA TSD permit may establish additional treatment levels for irrigation water.

RCRA hazardous waste regulations would also apply if wastewater is not treated to proper levels prior to land application. If the wastewater is not properly treated prior to irrigation, the irrigated land parcel could potentially become a RCRA hazardous waste land treatment unit (LTU). Such a designation would significantly change the nature of the proposal under this alternative, as there would be a greater likelihood of releases to soils, ground water and surface water, and there would be additional requirements related to human food-chain considerations. In order for the treated wastewater to be used as irrigation water for human food-chain crops, it should meet strict standards in order to be protective of human health and the environment. Requirements for RCRA hazardous waste LTUs include: preparedness and prevention, land treatment program, design and operating requirements, food-chain crop requirements, unsaturated zone monitoring, ground water monitoring, financial assurance, corrective action, and closure and post-closure care.

Hazardous waste generator requirements under 40 CFR Part 262 would apply as appropriate.

4.5.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this alternative, all the wastewater including treated process water, potentially contaminated (oily) stormwater, and uncontaminated (non-oily) stormwater would be discharged to a Class I, Non-hazardous UIC well that would be drilled on the project site. The hazardous waste impacts would be similar to those described under the associated construction alternative. The UIC alternative raises some regulatory issues under RCRA. The facility could become a RCRA TSD if a NPDES permit is not obtained (and the “wastewater treatment unit” exemption at 40 CFR 264.1(g)(6) does not apply).

4.5.3.3 Alternative D — No Action

Implementation of this alternative would have no effects to the project area. No solid or hazardous waste would be generated because the refinery would not be constructed.

4.6 Soils

4.6.1 Alternatives 1 and A — Original Proposed Actions

Effects to soils under the proposed action would be associated with the following components: construction, operation, and maintenance of the clean fuels refinery, and the production of forage for the MHA Nation's buffalo.

4.6.1.1 Construction Impacts

Effects to soil resources from the construction phase of the refinery would be related to activities that include grading, construction traffic, equipment storage, and excavation associated within the refinery footprint. Effects to soil resources in the project area would also result from oil and natural gas pipeline construction activities, including the operation of heavy equipment, clearing and grading, trenching, excavation, and pipe and pole installation. Potential effects during the construction phase could include contamination of soils by fuel spills or accidental release of toxic or hazardous chemicals. Therefore, all contractors would have individual Emergency Response Plans that would include preparations for quick and safe cleanup of accidental spills. It would prescribe hazardous materials handling procedures to reduce the potential for a spill during construction, and would include an emergency response program to ensure quick and safe cleanup of accidental spills. The plan would identify areas where refueling, vehicle maintenance, and storage of hazardous materials, if any, would be permitted. These directions and requirements would also be reiterated in the SWPPP for Stormwater Construction NPDES permit.

Refinery

Overall, implementation of Alternative 1 would result in the disturbance of 190 acres related to construction activities associated with the refinery. The refinery construction footprint area represents approximately 40 percent of the project area. In an effort to reduce overall long-term impacts to soil resources, the A horizon would be removed, separately segregated, and stored for site closure reclamation activities. The B horizon would be treated in the same manner. Storage locations for topsoil would be located outside the influence of construction activities and located where full retrieval of topsoil is feasible. Topsoil would be stored as a berm around the north property boundary in a manner that maximizes surface area and minimizes depth. A vegetative cover would be seeded or other comparable erosion control practices would be applied to the stored soil to reduce erosion losses. In addition, sediment controls (e.g. silt fences, straw bales, berms, sediment traps) would be installed to prevent sediment transport to undisturbed lands, stream, rivers, and drainages.

Water erosion that could occur during construction activities would be controlled through a SWPPP required by the Stormwater Construction NPDES permit. Storm water generated during the construction phase would be controlled and collected, treated if necessary, and discharged under conditions issued through the permit. The implementation of the permit conditions and standard construction practices is expected to prevent the proposed project from generating significant impacts caused by wind or water erosion.

Erosion

Although all soils are prone to erosion to some degree, factors that would influence the rate of erosion include soil texture and structure, the length and percent of slope, vegetative cover, and rainfall or wind intensity. The most erosion-prone soils are generally bare or sparsely vegetated, non-cohesive, fine textured, and situated on moderate to steep slopes. Soils more resistant to erosion include those that are well vegetated, well structured with adequate percolation rates, and located in nearly level terrain. Because of the varied weather patterns and seasonal timing of precipitation events, water erosion at the site would be generally limited to periods of rainfall precipitation or the spring runoff period.

Soil erosion from wind or water could occur during construction because of earthmoving and grading activities. Construction activities occurring where vegetation is removed and the soil is broken up present the greatest threat to soils with potential for wind erosion. Excavation associated with facility foundations and ROW cleared for pipelines could break down soil aggregates, increasing runoff and rill and gully formation. Pipeline trenches could change erosion patterns and form gullies if soils settle in the backfilled trench after reclamation.

Oil and Natural Gas Pipeline Impacts

Enbridge would construct a pipeline to connect the terminus of its Wabek/Plaza field pipeline to the crude oil storage tanks in the refinery's tank farm (Figure 2–12). Additionally, Enbridge would construct four new 30,000-bbl storage tanks between Outlook, Montana and the refinery (Figure 2–1). Construction of the oil storage facilities would occur within existing pads that have previously been developed, thereby avoiding additional soil resource impacts.

Two options are provided to deliver natural gas to the refinery: MDU Resources Group, Inc. and Bear Paw Natural Gas Company. MDU would supply natural gas using a new pipeline that would connect its existing Williston Basin Interstate Pipeline to the refinery (Figure 2–12 and Figure 2–13). Under the second option, Bear Paw Natural Gas Company would supply natural gas using a new pipeline that would connect its existing Plaza pipeline to the refinery (Figure 2–12).

Erosion

Pipeline construction activities such as clearing, grading, trench excavation, backfilling, and movement of construction equipment along the ROW would affect soil resources. Erosion is a continuing, natural process that can be accelerated by human activities. Clearing, grading, and moving equipment on the ROW would remove the protective vegetation cover and expose soils to the effects of wind, rain, and runoff. These effects would accelerate the erosion process and, without adequate protection, could result in discharges of sediment to wetlands and waterbodies, and could potentially lower soil fertility.

The construction of both of the buried pipelines would temporarily disturb about 24 acres of topsoil, and would expose the substratum soils. Therefore, to minimize soil impacts, an erosion control and sediment transport control plan would be prepared in association with the SWPPP as required by the Stormwater Construction NPDES permit. This plan would be prepared in accordance with EPA guidelines and other applicable standard construction practices. At a minimum, the applicant would install and maintain various erosion control measures during construction of the project site and active construction ROW. These measures may include temporary slope breaks on slopes and temporary sediment barriers, such as straw bales or silt fences, across the ROW during construction at the base of slopes; adjacent to waterbodies, wetlands, and roadways; and along the edge of the ROW as necessary to prevent sediment from flowing off the ROW. In addition, the applicant would install erosion control netting on waterbody banks, very steep slopes, and in drainages that may be susceptible to erosion. To protect topsoil from wind erosion, water would be applied to active construction areas in all areas identified as highly susceptible to wind erosion and in all areas where soil conditions warrant. Implementation of the SWPPP would reduce the overall short-term and long-term erosion impacts associated with the pipeline construction.

Soil Compaction

Construction equipment operating and traveling on the construction ROW can compact the soil, especially during wet periods and on poorly drained soils. Soil compaction can also result from the storage of heavy spoil piles on certain types of soil for extended periods. Soil compaction destroys soil structure, reduces pore space and the moisture-holding capacity of the soil, and increases runoff potential. If unmitigated, compaction results in soil with a reduced revegetation potential and an increased erosion hazard. The degree of compaction depends on the moisture content and texture of the soil. Wet soils with fine clay textures are the most susceptible to compaction.

Measures to reduce soil compaction would be developed in the SWPPP. The applicant would attempt to minimize compaction by adjusting construction schedules to avoid compaction-prone areas during short-term weather events. In addition, compaction impacts may be avoided or minimized by limiting operating heavy equipment within or across minor tributaries, adjacent to wetlands, and other areas as deemed necessary during construction. Should compaction occur, soils would be plowed with a paratill, paraplow, or other deep-tillage device. Implementation of conditions in the SWPPP would reduce impacts associated with compaction.

Topsoil Mixing

In addition to erosion and compaction, construction activities such as grading, trenching, and backfilling can cause mixing of soil horizons. Mixing of topsoil with subsoil, particularly in agricultural lands, leaves less productive soils in the root zone, which lowers soil fertility and the ability of disturbed areas to revegetate. Another result of soil mixing and disturbance can be a change in appearance of the surface disturbed soils when viewed in comparison with the adjacent undisturbed soils. Introducing stones or rock fragments to the surface could result from mixing of topsoil and stony subsoil layers; excess rock brought to the surface could adversely affect agricultural land and restoration efforts.

To reduce the mixing of soil horizons on its construction ROW and any other construction location, the applicant would segregate topsoil and subsoil. Topsoil segregation generally helps to preserve the chemical and physical properties of the topsoil and would protect any native seed sources. At a minimum, the applicant would segregate topsoil in all annually cultivated or rotated agricultural lands, hay fields, and residential areas.

Revegetation would be initiated as soon as possible or within 1 month after completion of ground-disturbing activities, whichever is shorter. Reclamation plans would identify quantities and re-spread depths of topsoil (A and B horizons). Seeding would be completed as either a fall dormant seeding or an active spring seeding. A seed mixture would be developed with appropriate input from the local agencies. At a minimum, the seed mixture would designate species and the applied pure live seed (PLS) rate. All areas would be mulched with certified weed-free hay at a rate of 2 tons per acre. Hay would be crimped into the soil surface on slopes greater than 20 percent. Woody nursery stock would be used where revegetation limitations are severe and the pre-disturbance community is composed of woody vegetation.

Poor Revegetation Potential

Poor revegetation potential is a concern with the Wabek (1 to 35 percent slopes) and Zahl – Williams (9 to 25 percent slopes) soil series. These series have capability classes indicating that the soil would respond poorly to reclamation. These series are primarily limited to the pipeline routes.

Mixing of soil materials during excavation or compaction, especially in the soil series listed above, could have an effect on reclamation and future productivity. Therefore, construction activities should be limited in areas where the soil is shallow or on steep slopes, as these series have poor revegetation potential.

Natural Gas and Crude Oil Pipeline and Power Lines

Both pipelines would cross Wabek and the Zahl – Williams series. Table 4-8 details the acreage of the project area ROW that would be disturbed by construction activities on soils with poor revegetation potential.

Table 4-8 Soils with Poor Revegetation Potential and Associated Right-of-Way

ROW	Sum Of Acres	Description	Map Soil Type	County
Gas Pipeline	1	Zahl-Williams (9 to 25 percent slope)	24E	Mountrail
Gas Pipeline	1	Wabek (1 to 35 percent slope)	54E	Mountrail
Gas Pipeline	1	Williams Loam, Undulating	WlC	Ward
Oil Pipeline	2	Wabek (1 to 35 percent slope)	54E	Mountrail
Oil Pipeline	28	Zahl-Williams (9 to 25 percent slope)	24E	Mountrail
Oil Pipeline	4	Max-Bowbells-Zahl Loams, Hilly	MlE	Ward
Oil Pipeline	10	Max-Williams Loams, Rolling	MmC	Ward
Oil Pipeline	1	Max-Williams Loams, Strongly Sloping	MmD	Ward
Oil Pipeline	1	Max-Zahl Loams, Rolling	MoC	Ward
Oil Pipeline	12	Williams Loam, Undulating	WlC	Ward
Oil Pipeline	3	Williams Clay Loam, Strongly Sloping	WmD	Ward
Oil Pipeline	1	Zahl Loam, Hilly	ZaE	Ward
Oil Pipeline	1	Zahl-Max Loams, Hilly	ZmE	Ward
Transmission Line	2	Williams Loam, Undulating	WlC	Ward
Transmission Line	7	Max-Bowbells-Zahl Loams, Hilly	MlE	Ward
Transmission Line	6	Max-Williams Loams, Rolling	MmC	Ward

Reclamation efforts would be implemented to enhance revegetation and address soils with poor revegetation potential. These efforts would include topsoil segregation, recontouring, applying erosion control mulch on slopes, respreading cut vegetation or preserved rock mulch, imprinting the surface of the ROW, installing permanent slope breaks, and seeding with species adaptable to the climate. These measures would also reduce soil impacts associated with poor revegetation potential.

Power Lines

The entire length of the transmission alignment would be constructed within either the Highway 23 or the local road ditch ROW. Therefore, the overall amount of disturbance is expected to be minimal, and direct compaction effects would be limited to the access point and tower pad excavation areas.

Impacts associated with soil disturbance would be short-term, and the potential significance of these impacts would be reduced by the implementation of erosion control measures and permit conditions associated with the SWPPP.

Construction of the proposed project is expected to result in only temporary impacts on near-surface soil resources from construction activities. Soil erosion from all construction activities is expected to be minimal because the proposed project would be constructed following standard practices and permit conditions to control wind erosion by limiting the removal of vegetation, avoiding construction on steep and erosive slopes, revegetating or covering any topsoil that was removed and stockpiled, surfacing roads, and reclaiming areas in a timely manner. In addition, active construction sites would be watered, as necessary (except during periods of rain), to minimize the potential for wind erosion.

4.6.1.2 Operation Impacts

The refinery would use a number of hazardous materials at the site to manufacture clean fuels. Shipping, handling, storing, and disposing of hazardous materials inherently pose a certain risk of a release to the soil layer. The toxic substances handled by the refinery include hydrogen sulfide, ammonia, and spent sulfuric acid. Additionally, the refinery handles regulated flammable substances including propane, butane, isobutene, and pentane; and other petroleum products including gasoline, fuel oils, diesel, and other products, which pose a risk of spill.

In general, oil or petroleum product dumped or spilled onto soils can saturate the soil matrix. This type of concentrated contamination can be problematic to remediate. If oil or petroleum product is introduced at any depth within the soil matrix, natural weather and biodegradation processes can be rendered less effective and the chances may increase that some of the oil or petroleum product may contaminate ground water, if present. Because many oil or petroleum product components have densities lower than or close to that of water, the lighter non-aqueous phase liquids (LNAPLs) generally pose less potential for ground water pollution that most chlorinated solvents (e.g., PCBs or TCE) that are denser than water (denser non-aqueous phase liquids [DNAPLs]).

A spill of hazardous materials (generally petroleum products and by-products from the refining process) could occur under normal operating conditions. Spills could also occur from corrosion of containers, piping, and process equipment; and leaks from seals or gaskets at pumps and flanges. The overall spill hazards associated with the handling and transport of processed fuel oils are expected to be less than at refineries based on older technologies. It is anticipated that if an event occurred, it would be either a human or a mechanical error.

All facilities (refinery, pipelines, tanks associated with the pipeline) would have a SPCC plan or equivalent as required under Oil Pollution Act and HMTA. The SPCC plans would be designed to prevent spills from on-site facilities, and include requirements for secondary containment, provides emergency response procedures, establishes training requirements, and so forth. In addition, construction of the tanks, vessels, and foundations have been designed to incorporate spill containment systems to reduce the impacts of spills of petroleum products. Specifically, the refinery has been designed to minimize impacts to soil resources by constructing an impervious layer under all refinery processing and handling facilities. In addition, all storage containers would be double-lined, constructed on an impervious surface, and constructed within a self-containing berm. Therefore, all of the structures would be built to contain and control accidental spills and releases.

In the event of a spill or accidental release, all materials would be collected within designed containment facilities and pumped to an appropriate tank, or sent off-site if the materials cannot be used on-site. Conversely, large spills outside of designed containment areas would be captured by impervious surfaces and directed to the process water system where they would be collected, controlled, and treated or separated.

The project would be required to develop and implement a SWPPP under the NPDES permit for the operations at the facility. The SWPPP would identify areas that have a potential for pollutants entering into the stormwater systems at the facility and BMPs to minimize pollutant introductions from those identified sources. These areas at the proposed facility include raw material, intermediate and final product storage facilities, loading and unloading operations, and refinery process areas.

4.6.1.3 Buffalo Forage

There would be no effects to soil resources from buffalo forage production. Approximately 279 acres of previously disturbed agricultural land would be initially seeded with oats and crested wheatgrass, and then later converted to alfalfa and a mixture of grasses. Soils in the area are currently being used for agricultural purposes, which is not significantly different from the proposed use. Therefore, no impacts to soil resources would occur.

4.6.1.4 Treated Wastewater and Stormwater Discharges

Effects to soils would be limited to the outfall locations and downstream reaches and sediment deposition on aquatic and wetland vegetation. Implementation of this alternative would modify soil and topographic conditions at the outfall sites to accommodate the outfall locations and changes to hydraulics. Construction activities and discharge volumes are of particular concern as soil erosion is an important problem both at its source and downstream of the outfall location sites. Lost soil would be deposited somewhere downstream, and the location of the deposition could have the potential to alter downstream hydrology and deposit on aquatic and emergent vegetation. Sedimentation may also pose a water quality issue directly as a result of siltation and indirectly from contaminants carried with or attached to soil particles. Excess soil can increase the turbidity within the downstream reaches, causing deposition on plants and reducing the amount of sunlight that reaches the plants growing in the water.

During operations, the proposed project would change the hydrology of the watershed, increasing flows rates and changing the system to more of continuous flow régime. Over time, the wetlands and the tributary to the East Fork of Shell Creek would adjust through erosion or additional sediment deposition to the changes in hydrologic conditions.

4.6.1.5 Reclamation/Closure Impacts

At some point in the life of the refinery, the decision would be made to cease refinery operations and permanently close the facility. The closure of the refinery would be expected to follow a process of decommissioning, decontamination, and demolition, followed by cleanup of any remaining soil and ground water contamination and final reclamation of the site. These activities would be carefully managed in order to minimize impacts to the environment and other receptors such as area residents. A part of the overall closure and reclamation planning would be the RCRA "closure plan" which is required if the refinery is regulated as a TSD Facility under RCRA. The preliminary design for Alternatives 1 and A would be a TSD Facility. For more information about the RCRA "closure plan" please see the Solid and Hazardous Waste section in this Chapter.

Normal refinery operations would over time be expected to result in some local contamination of soils and ground water. However, impacts should be minimized through effective design considerations, operating practices and environmental management systems. Current plans are to monitor for contamination throughout the life of the refinery and to begin cleanup activities at the time when the contamination is discovered. Typically activities that may be needed during cleanup at refineries are the removal of contaminated soils or the treatment of contaminated soils. Soil cleanup activities serve two main purposes: removal/treatment of contaminants within the soils that are sources of contamination to underlying ground water and the cleanup or removal of surface soils would be to protect human health and the environment on the sites after closure of the facility. If the hazardous waste surface impoundments are not clean-closed, a RCRA post-closure permit would be required.

After the removal of the refinery units, tanks, buildings, roads, surface cleanup activities, etc., revegetation would be initiated as soon as possible or within 1 month after completion of recontouring and topsoil placement. Reclamation plans would identify quantities and re-spread depths of topsoil (A and B horizons). These efforts would include topsoil segregation, recontouring, applying erosion control mulch on slopes, respreading cut vegetation or preserved rock mulch, imprinting the surface of the ROW, installing permanent slope breaks, and seeding with species adaptable to the climate. These measures would also reduce soil impacts associated with poor revegetation potential. Seeding would be completed as either a fall dormant seeding or an active spring seeding. A seed mixture would be developed with appropriate input from the local agencies. At a minimum, the seed mixture would designate species and the applied PLS rate. All areas would be mulched with certified weed-free hay at a rate of 2 tons per acre. Hay would be crimped into the soil surface on slopes greater than 20 percent. Woody nursery stock would be used where revegetation limitations are severe and the pre-disturbance community is composed of woody vegetation. The revegetated areas would be irrigated as needed for reestablishment of the vegetation. The reclaimed area will be inspected regularly in order to identify any actions needed for proper propagation of the vegetation.

4.6.2 Construction Alternatives

4.6.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the entire 468.39-acre site would be accepted into trust status, but construction and operation of the refinery project would not go forward. Therefore, the 468.39-acre project site would most likely continue to be used for agricultural purposes, which have occurred for decades. Therefore, there would be no effect to soil resources from continuing agricultural uses such as buffalo forage production.

4.6.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

The effects to soils of the implementation of this alternative would be the same as those described for Alternatives 1 and A. The MHA Nation would construct and operate the refinery and associated facilities, and the same effects to soils would occur. Also, the production of forage for the MHA Nation’s herd of buffalo would be the same.

4.6.2.3 Alternative 4 — Modified Proposed Action

The effects to soils of the implementation of this alternative would be the same as those described for Alternatives 1 and A. The MHA Nation would construct and operate the refinery and associated facilities, and the same effects to soils would occur. However, the RCRA "closure plan" would not be required as the refinery would not be regulated as a TSD Facility under RCRA. The production of forage for the MHA Nation’s herd of buffalo would be the same as in Alternative 1 and A.

4.6.2.4 Alternative 5 — No Action

There would be no changes to soil resources in the project area under the No Action alternative. Soils with hazards and limitations would remain, but they would not be affected beyond the current condition. The effects on soil resources would depend on future and current management activities.

4.6.3 Effluent Discharge Alternatives

4.6.3.1 Alternative B — Partial Discharge through an NPDES permit and Some Storage and Irrigation

Under this alternative, wastewater would be treated, then discharged through an NPDES permit or stored and used for irrigation. During the growing season, treated wastewater could be land applied. During wet weather or when it is too cold to irrigate, the wastewater would be discharged under the NPDES permit or stored for future irrigation.

If this alternative is selected, an irrigation plan would need to be developed to configure the land application site to prevent runoff, to determine appropriate rates of land application for the soils and the size of the land application site. Soils on the site are generally moderately well-drained at the surface, decreasing to moderately slow below 30 inches. Water application must not exceed soil infiltration rates or unwanted surface runoff might occur. The impacts from land application of treated wastewater would depend on the degree of treatment prior to land application and rate of land application.

The use of treated wastewater for irrigation could potentially impact soil, if the wastewater was high in salt. Wastewater has the potential to become saline, because the refinery plans to reuse wastewater which could concentrate salts due to refinery processes and evaporation. Also one of the water sources for the facility, the Fox Hills-Hell Creek aquifer, is typically salty. The refinery would need to pretreat water from the Fox Hills-Hell Creek aquifer prior to refinery use to reduce salinity. During normal precipitation periods, the refinery, as proposed in Alternative 1, generally would not need to use the Fox Hills-Hell Creek aquifer. Under Alternative 4, more well water would be used and the wastewater would be saltier as less stormwater is available for makeup water.

4.6.3.2 Alternative C — Effluent Discharge to an UIC Well

Implementation of this alternative would not affect soils other than through construction of the well and associated piping. These types of impacts are common to all refinery construction alternatives. Water sent to the UIC well would be discharged to a deep aquifer where it would be contained for thousands of years. Thus, soils would not be exposed to the discharged effluent.

4.6.3.3 Alternative D — No Action

Under this alternative, the proposed Refinery would not be constructed. Thus, no discharges of water of any kind would be permitted and no additional impacts to soils.

4.6.4 Cumulative Impacts

Regional agriculture is the most common disturbance to vegetative cover and is the biggest impact to regional soil resources. These activities primarily include agricultural equipment disturbing soils. As the vegetative cover is disturbed and removed, the topsoil, and subsoil (in some circumstances) below the ground surface is degraded, causing changes in the local hydrology, slope stability problems, and surface erosion. Vegetation can also be affected by road dust generated by traffic on unpaved roads; snowmelt due to dust deposition can lead to flooding, ponding, and hydrological changes in soil. Where roads are not paved, all activities that generate vehicle traffic on roadways generate dust. Thus, continuing regional agricultural activities requiring road travel add cumulatively to the volume of road dust generated. The quantitative increase in the settled dust layer, as well as increases in the frequency of dusting may increase effects on vegetation and snow cover, thus ultimately affecting soils and vegetation.

Because any project impacts related to soil resources would be highly localized and primarily limited to the time of construction, cumulative impacts on soil resources would occur only if another project is planned for construction in proximity or adjacent to the proposed refinery. Currently, there are no other known projects planned in the project area. Consequently, there are no cumulative impacts to soil resources anticipated.

4.7 Vegetation

Vegetation removal and soil handling associated with the construction of the refinery facilities and installation of pipelines, access roads, transmission lines, water wells, and railroad spur infrastructure would affect vegetation resources both directly and indirectly. Construction of the refinery would generally correspond to the following sequence: (1) identifying and constructing access roads; (2) blading/grading of the footprint, clearing of the ROW, trench area and structure sites including material staging construction yards; (3) installing foundations; (4) assembling/erecting the linear infrastructure and appurtenant facilities; and (5) cleanup and disturbed site reclamation. Various phases of construction would occur simultaneously at different locations throughout the construction process. This may require several construction crews operating in these different locations.

Construction, operation, and maintenance activities that could result in the temporary or permanent loss or degradation of vegetation communities include:

- Blading/grading of access roads, construction footprint clearance, and material staging areas;
- Improvements to some portions of the existing access roads;
- Vegetation removal where needed for construction vehicle access, transmission tower installation, and pipeline trenching activities;
- Excavations resulting from hole augering for transmission tower footings;
- Utilization of temporary construction material staging areas;
- Soil compaction;
- Introduction and proliferation of noxious weeds;
- Loss of topsoil;
- Alteration of soil horizons and structure at pipeline trenching and transmission pole locations; and
- Equipment access through stream channels.

4.7.1 Alternatives 1 and A — Original Proposed Actions

4.7.1.1 General Vegetation

Construction of the proposed project would require vegetation crushing, clearing, or other ground disturbance that would result in both temporary disturbance and permanent conversion of existing vegetation and habitat within the refinery footprint and appurtenant linear infrastructure (note that potential impacts to wetland habitats are discussed below). Clearing of mixed-grass prairie vegetation community types is not expected to occur within the footprint of the proposed refinery. Table 4-9 summarizes the amount of temporary and permanent disturbance that would be associated with various project components.

4.7.1.2 Refinery

Table 4-9 shows that an estimated 190 acres of cultivated agricultural fields would be affected by surface disturbance associated with the refinery footprint over the long-term operation of the refinery. The proposed refinery footprint would disturb approximately 41 percent of the project area. The primary vegetation community impact is to cultivated agricultural fields, which occupy 81 percent of the project area. As stated above, clearing of mixed-grass prairie vegetation community types is not anticipated to occur from the refinery footprint. In addition, approximately 3 acres of developed land (existing farm house and outbuildings) would be used as maintenance buildings and during construction of the facility.

Direct impacts to vegetation communities would include the short-term loss of vegetation (modification of structure, species composition, and areal extent of cover types) caused by soil disturbance and grading. Indirect impacts would include the short-term and long-term increased potential for non-native species invasion, establishment, and expansion; exposure of soils to accelerated erosion; shifts in species composition and/or changes in vegetative density; reduction of wildlife habitat; and changes in visual aesthetics.

If any of the remnant patches of the mixed-grass prairie vegetation community were to be developed, direct impacts would include the short-term loss of vegetation, primarily modification of structure, species composition, and areal extent of cover types. Indirect impacts would include the short-term and long-term increased potential for non-native species invasion, establishment, and expansion; exposure of soils to accelerated erosion; shifts in species composition and/or changes in vegetative density; reduction of wildlife habitat; reduction of livestock forage; and changes in visual aesthetics.

Table 4-9 Estimated Temporary and Permanent Vegetative Community Disturbance Associated with Project Components

Activity/ Project Component Disturbance	Disturbance by Vegetative Community (acres)					
	Agriculture Land		Developed Land		Wetland[3, 4, 5]	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Refinery	190	190	3	3	0	0.8
Oil Pipeline[1]	0	0	24	0	0.7	0
Natural Gas Pipeline[1]	0	0	26	0	27/3	0
Transmission Lines[2]	0	0	>1	<1	0.4	0
Total	**190**	**190**	**54**	**4**	**28/4.1**	**0.8**

Note:

1. ROW widths for the transmission line were estimated at 25 feet, and both the oil and natural gas pipeline were estimated at 50 feet.
2. The estimated average distance between transmission towers is 300 feet or 18 structures per mile. Temporary disturbance acreage was estimated to equal 300 square feet, and permanent disturbance acreage was estimated to equal 50 square feet at each tower location.
3. Wetlands within the 468.39-acre fee to trust property were formally delineated using 1987 USACE methodology.
4. The refinery footprint would require the fill of approximately 2,000 feet of wetland PEMF#2 at approximately 10 feet in Section 19 or 0.5 acres. The upper portion of the wetland would be re-routed by constructing a ditch approximately 2,650 linear feet and 10 feet of width or 0.6 acres. There would be an additional impact to PEM/ABF#3 of 0.3 acres. Wetlands impacts would be avoided or mitigated following the 404 permit (CWA).
5. Wetlands within the three linear project ROW corridors were not formally delineated. FWS - National Wetland Inventory data were used to estimate wetland impacts, as all three linear projects would be constructed within existing road, section line, or railroad rights-of-way.

In general, the duration of effects on cultivated agricultural land and mixed-grass prairie vegetation are significantly different. Cropland areas can be readily returned to production through fertilizer treatments and compaction relief. However, disturbed native prairie tracts require reclamation treatments and natural succession to return to predisturbance conditions of diversity (both species and structural). Reestablishment of mixed-grass prairie to predisturbance conditions would be influenced by factors that are both climatic (growing season, temperature, and precipitation patterns) and edaphic (physical, chemical, and biological) conditions in the soil.

Construction activities, increased soil disturbance, and higher traffic volumes could stimulate the introduction and spread of undesirable and invasive, noxious species within the project area. Noxious species invasion and establishment has become an increasingly important result of previous and current disturbance in western states. Noxious species often out-compete desirable species, rendering an area less productive as a source of forage for livestock and wildlife. Additionally, sites dominated by invasive, noxious species often have a different visual character that may negatively contrast with surrounding undisturbed vegetation. Currently, the project area is relatively free of noxious weeds; however, the cultivated fields and wetland basin margins are dominated by numerous invasive, non-native weed species.

Construction, operation, and maintenance activities could introduce or spread noxious weeds into currently uninfested areas. Construction equipment, vehicles, or imported materials may disperse plants, seeds, or pests if the appropriate preventative measures are not taken. The introduction of noxious weeds can have direct or indirect long-term effects on vegetation resources, wildlife and wildlife habitat, and special-status plants and animals in more mesic environments, including river and stream channels, burned areas, and eroded slopes. Noxious species are largely confined to road edges, newly graded areas, and other areas where existing vegetation is crushed and soils are impacted. Potential impacts associated with noxious weed introductions and spread would be minimized through the implementation of the prescribed mitigation measures listed in Section 4.17.

4.7.1.3 Wetlands and Riparian Areas

The dominant native plant communities in this region are native mixed-grass prairie interspersed with wetland and riparian communities located in moist swales and along watercourses. Agricultural land consists largely of croplands interspersed between low-lying basins which typically contain prairie pothole wetlands. Most of the soils in the wetlands are silty clay loam with some silt loams and loams. In most cases, wetlands are bordered by agricultural or other developed land uses, which may have altered the extent and quality of the wetlands.

Land ownership along the pipeline and transmission lines is primarily private. The proposed pipeline and transmission routes have not been surveyed for wetlands or navigable waters of the U.S. However, wetland acreages were estimated using FWS - National Wetland Inventory (NWI) wetland data coverage.

Temporary and permanent impacts related to project construction and access road clearing, and new transmission line and oil and natural gas pipeline construction may potentially impact wetlands and ephemeral and intermittent drainages.

Refinery

A wetland delineation was conducted on the 468.39-acre proposed project site. The USACE determined that wetland PEMF#2 is a jurisdictional water of the United States (Figure 3–12) (Cimarosti 2005). A portion of wetland PEMF#2 was reportedly constructed in 1976 under NDSWC Permit #661 and Ward County Agricultural Stabilization and Conservation Service authorized maintenance of the drainage in 1994. The other fifteen delineated wetland basins are isolated, intrastate, non-navigable waters not subject to jurisdiction under Section 404 of the CWA (Cimarosti 2005).

Construction of the refinery facilities under Alternative 1 is expected to directly result in the loss of approximately 2,000 linear feet and an approximate ten feet of width or approximately 0.5 acre of waters of the United States delineated as part of wetland PEMF#2. The loss of the jurisdictional wetland due to discharge of dredge and fill material would be addressed through the CWA 404 permit process.

It is important to note that wetland PEMF#2 would be re-routed and constructed around the wastewater storage facilities. The proposed reroute of the drainage would consist of grading and excavation to create a new channel and outfall in wetland PEMF#2. The reroute of the drainage would be approximately 2,650 linear feet, extending west from the upper portion of wetland along the half section line, then due north approximately 2,650 linear feet rerouting flow to the lower portion of wetland PEMF#2. The channel would be trapezoidal, and depths would vary from 5 to 15 feet. The side slopes and bottom would be hydroseeded to establish a grass-lined channel. The outfall would be constructed with energy dissipaters and bank armor for erosion control to prevent channel scour in the wetland outfall area.

The refinery site plan may impact wetland PEM/ABF#3, which is 0.3 acres in size and adjacent to the existing railroad. The proposed rail spur would be built on this wetland. The USACE identified Wetland PEM/ABF#3 as isolated, intrastate non-navigable water that is not subject to jurisdiction under Section 404 of the CWA. This wetland is not located within a 100-year floodplain nor is it adjacent to the jurisdictional wetland PEMF#2.

There would be a loss of 0.5 acres of jurisdictional wetland and a loss of 0.3 acres of non-jurisdictional wetland with this alternative. These losses may require compensatory mitigation.

Transmission Lines

Construction of the transmission line would occur within the existing Highway 23 road ditch ROW for a majority of its length, with the remaining segment built within the ROW of 366th Street. Construction of the transmission line is not expected to directly or indirectly result in the loss of any waters of the United States, including wetlands. The average span between transmission poles would average approximately 300 feet. Therefore, most, if not all wetlands would be avoided by placing transmission towers outside of wetland boundaries. If a large wetland is encountered, in which the linear extent is greater than 300 feet, the transmission line route would switch to the opposite side of the road ROW to avoid affecting the wetland. Therefore, construction of the transmission line is not likely to impact any waters of the United States, including wetlands.

Oil Pipeline

Enbridge would construct a pipeline to connect the terminus of its Wabek/Plaza field pipeline to the crude oil storage tanks in the refinery's tank farm (Figure 2–12). Additionally, Enbridge would construct four new 30,000-bbl storage tanks between Outlook, Montana and the refinery (Figure 2–1).

Construction of the oil pipeline would require approximately 4 miles of new pipeline. A significant portion of the pipeline would be constructed on the north side of the existing C.P.R. ROW, with the remaining portion constructed on the east side of the gravel road ROW.

As detailed in Table 4-10, the oil pipeline route would cross a total of 5 wetland sites. Since the centerline of the oil pipeline route would be within the railroad ditch, it would not cross any designated NWI wetlands. Assuming a 50 foot construction ROW, construction would result in a maximum total temporary disturbance area of approximately 0.7 acres. Temporary disturbance would primarily occur in palustrine emergent wetlands or wetlands that include the palustrine emergent community type.

Table 4-10 NWI Wetlands Potentially Affected by Construction and Operation of Linear Infrastructure including Pipelines and Transmission Lines

Project Component	Emergent Wetland	
	# of wetlands crossed	Construction area (acres)[1]
Transmission Lines	14	0.4
Oil Pipeline[2]	5	0.7
MDU Resources Natural Gas Pipeline[2]	42	26.9
Bear Paw Natural Gas Pipeline	11	3.0

Note:
[1] Construction impacts are based on a proposed 50-foot wide construction ROW. The calculated acreage assumed impacts to the entire 50-foot wide construction ROW.
[2] The Enbridge oil pipeline and the MDU Resources natural gas pipeline would share the same corridor. Therefore, the impacts to certain wetlands are overestimated.
Source: FWS National Wetland Inventory metadata.

Natural Gas Pipeline

Two options are provided to deliver natural gas to the refinery: MDU Resources Group, Inc. and Bear Paw Natural Gas Company. MDU would supply natural gas using a new pipeline that would connect its existing Williston Basin Interstate Pipeline to the refinery (Figure 2–12 and Figure 2–13). Under the second option, Bear Paw Natural Gas Company would supply natural gas using a new pipeline that would connect its existing Plaza pipeline to the refinery (Figure 2–12). Construction of the natural gas pipeline would require 4 or 29 miles of new pipeline, depending on which option is constructed. Part of the pipeline would be constructed on the south side of the existing C.P.R. ROW. The remainder of the MDU Resources pipeline option would primarily follow the Ward and Mountrail County border until it interconnects with the existing MDU Resource pipeline in Section 24, Township 156 North, Range 88 West.

Numerous NWI wetlands would be intersected by the construction of the gas pipeline. Based on wetlands indicated on the NWI, it is anticipated that temporary impacts would occur to numerous palustrine emergent wetlands. Temporary wetland loss would primarily occur from the active pipeline trench, temporary workspace/pads, and access roads.

The MDU natural gas pipeline corridor route would cross a total of 42 wetland sites resulting in a maximum total temporary disturbance area of approximately 26.9 acres. In addition, the centerline of the MDU pipeline would cross approximately 3,030 feet of wetlands, Temporary disturbance would primarily occur in palustrine emergent wetlands or wetlands that include the palustrine emergent community type.

Conversely, the Bear Paw natural gas pipeline route would cross a total of 11 wetland sites resulting in a maximum total potential disturbance of 3.0 acres. The centerline of the Bear Paw would cross approximately 2,611 feet of wetlands. Because the new pipeline would be classified as a utility line[5], it is anticipated that a USACE Nationwide 12 permit would be required prior to

[5] A “utility line” is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquefiable, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone and telegraph messages, and radio and television communication. The term "utility line" does not include activities that drain a water of the United States, such as drainage tile; however, it does apply to pipes conveying drainage from another area.

initiation of any construction activities. Nationwide 12 permits generally cover discharges of dredged or fill material associated with excavation, backfill, or bedding for utility lines, including outfall and intake structures, provided there is no change in preconstruction contours.

Oil Storage Facilities

In addition to the pipeline which would supply synthetic crude oil feedstock to the refinery, Enbridge would also construct four new 30,000-bbl storage tanks between Outlook, Montana and the refinery. Construction of the oil storage facilities would occur on existing pads that have previously been developed, thereby avoiding additional wetland impacts.

Current and Potential Site Conditions

Cattails and reed canary grass are plants that currently dominate many of the wetlands the pipelines and transmission would disturb. Cattails comprise one recognized type of wetland habitat, and although not valued as highly as a sedge meadow or other wetland types, they nevertheless form an important component of the wetland ecosystems in the region.

It is anticipated that all areas affected by the pipeline and transmission line ROWs would be returned to their current land uses following completion of construction and restoration activities. The temporary nature of planned construction and restoration activities should not result in any conflicts with existing land uses. Implementation of the mitigation measures would ensure that construction of the pipelines and transmission lines would result in no permanent impacts to jurisdictional wetland sites. Invasion by other non-native species may also be difficult to control, considering the long history of disturbance in many of these wetlands. Lastly, all wetlands affected by the project pipelines and transmission lines would be restored to pre-construction conditions following construction.

4.7.1.4 Effluent Discharges

Under this alternative (Alternative 1 and A), all wastewater would be treated to meet the refinery's discharge limits in the NPDES permit and discharged into wetland PEMF#2. PEMF#2 is on the western side of the site next to Highway 23 in the NW ¼ of Section 19. The total area for wetland PEMF#2 is approximately 11.7 acres. The wetland connects to an unnamed tributary of the East Fork of Shell Creek, located about a mile downstream of the proposed outfalls. The wetland has been classified as a palustrine emergent semi-permanently flooded (PEMF#2) (Wetlands Technical Report, BIA, November, 2005). It is an ephemeral prairie pothole wetland that has been altered by road construction and construction of a drainage system in the 1970's. The wetland is fed by surface runoff from precipitation.

The proposed refinery would change flow conditions in the wetland PEMF#2 and the unnamed tributary to the East Fork of Shell Creek. Flow would be discharged more continuously throughout the year, depending on the how much water is being recycled at the refinery. When the refinery is recycling water, the average discharge rate would be 10 gpm (5.1 million gallons per year or 16 acre feet), with a peak discharge rate of 89 gpm. If water is not being recycled, the average discharge rate would be 50 gpm (26 million gallons per year or 80 acre feet) and the peak discharge rate would be 130 gpm.

The primary impacts from the proposed effluent discharges to vegetation would be to the riparian/wetland resources on-site and downstream of the site. Vegetation would be affected by changes in hydrology and water quality. The proposed refinery would change flow conditions in the wetland PEMF#2 and the unnamed tributary to the East Fork of Shell Creek. Flow would be discharged more continuously throughout the year, depending on the how much water is being recycled at the refinery. When the refinery is recycling water, the average discharge rate would be

10 gpm (5.1 million gallons per year or 16 acre feet) with a peak discharge rate of 89 gpm. If water is not being recycled, the average discharge rate would be 50 gpm (26 million gallons per year or 80 acre feet) and the peak discharge rate would be 130 gpm.

Under a full recycle scenario it is expected that much of the runoff water would be used by the refinery. This would reduce the volume that flows into wetland PEMF#2 from the refinery site. However, this decreased volume of is not anticipated to be significant as the flow from the south of the site will still be maintained through the created diversion channel.

If the refinery does not recycle process water or use runoff, the additional water to wetland PEMF#2 would likely cause the wetland area to become more permanently flooded. This would result in changes to wetland characteristics such as increasing obligate vegetation (cattails) within the wetland or increasing open water areas. The size of the wetland would be controlled by discharge through the culvert under Highway 23. The wetlands to the north of Highway 23 would also be impacted by the additional water. As a result of the development of the refinery, the amount of surface runoff and/or shallow subsurface water discharge to the wetland would likely increase. This would contribute to the likelihood of a shift from a semi-permanent wetland with periodic drying to permanent wetland type for PEMF#2. There would be a similar shift to the unnamed tributary of the East Fork of Shell Creek.

Wetlands/riparian areas may also be affected during the unlikely events of a pipeline failure or tank rupture. As discussed in the Spill Section of this Chapter, these events are very unlikely to occur.

Erosion and sedimentation impacts to wetland PEMF#2, and the unnamed tributary from increased stream flow are not expected due to the limited discharge volume. However, any potential impacts would be mitigated by implementing BMP for stream channel erosion prevention. Over time, the wetlands and the tributary to the East Fork of Shell Creek would adjust through erosion or additional sediment deposition to the changes in hydrologic conditions. Potential impacts would be mitigated by implementing BMPs for stream channel erosion prevention. A SWPPP detailing sediment and erosion control measures and any BMPs would be developed in accordance with the facility's NPDES permits.

4.7.2 Construction Alternatives

4.7.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the entire 468.39-acre site would be accepted into trust status, but construction and operation of the project would not go forward. Therefore, the 468.39-acre project site would most likely continue to be used for agricultural purposes, which have occurred for decades. The MHA Nation could decide to use the entire project site to produce feed or forage hay for buffalo, or the land could be included in BIA's leasing program. Based on the foregoing, impacts to vegetative resources would be similar to the existing conditions.

4.7.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Under this alternative, the magnitude and type of effects would be similar to those presented under Alternatives 1 and A.

4.7.2.3 Alternative 4 — Modified Proposed Action

The effects to vegetative resources from implementation of this alternative would be similar to the no recycle option for Alternatives 1 and A. The modification of the proposed refinery site plan would reduce the wetland impacts caused by filling wetland PEMF#2 from 0.5 acres in

Alternative 1 to 0.1 acres in Alternative 4. Wetland PEM/ABF#3 would still be impacted. Cumulative impacts to the PEMF#2 wetland are likely to be the same for both Alternatives 1 and Alternatives 4 if the refinery requires future expansion for technological and/or regulatory changes requiring additional process units or other modifications, as this was the space eliminated from the Alternative 1. The production of forage for the MHA Nation's herd of buffalo would be the same.

4.7.2.4 Alternative 5 — No Action

Under this alternative, the 468.39-acre site would not be accepted into trust status or apply for an NPDES permit. Therefore, the project site would continue to be used for agricultural purposes, which have occurred for decades. The types of direct and indirect effects occurring to vegetative resources from agricultural practices would continue under existing conditions.

4.7.3 Effluent Discharge Alternatives

4.7.3.1 Alternative B —Partial Discharge through an NPDES Permit and Some Storage and Irrigation

With this alternative, surplus treated wastewater would be disposed of through land application to irrigate crops as practicable otherwise wastewater would be discharge through NPDES permitted outfalls. There would be some reduction in flow to the wetlands. There would be impacts to vegetation from irrigation wastewaters. The land has not previously been irrigated, and irrigation could potentially cause changes in the types of crops grown and farming practices. The impacts from land application of treated wastewater would depend on the level of treatment prior to land application and rate of land application. The irrigation management plan should identify the appropriate land application rates and treatment levels necessary to protect vegetation, human health, and the environment.

4.7.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this alternative, the MHA Nation would discharge all effluent from the WWTP to a Class I, Non-hazardous UIC well that would be drilled on the project site. Since the well would be finished deep below the ground surface, no additional impacts would occur to vegetation.

4.7.3.3 Alternative D — No Action

Under this alternative, the proposed Refinery would not be constructed. Thus, no discharges of water of any kind would be permitted and no additional impacts would occur to vegetation or wetlands.

4.7.4 Cumulative Impacts

Wetlands in the area have been previously impacted through agricultural practices such as cultivation of uplands and wetlands. Wetland hydrology has also been affected by roads and railroad tracks; and agriculture; in particular, some farm fields have been recontoured to enhance drainage of wetlands. Ongoing agricultural practices would continue to be the primary contributor to cumulative impacts to wetlands. Long-term impacts to wetlands from this project affect a very minor portion of cumulative impacts to wetland resources in the area.

If Alternative 4 is selected, it is possible that future expansions of the petroleum refinery would increase wetland impacts to the same level as Alternative 1. Refinery operation expansions of the processing area are common due to new technologies and regulatory requirement changes.

Alternative 1 already includes an area for refinery expansion. The expansion area was not included in Alternative 4 to avoid direct wetland impacts.

4.8 Wildlife

4.8.1 Alternatives 1 and A — Original Proposed Actions

4.8.1.1 Big Game Mammals

A variety of big game mammals, as described in Chapter 3, inhabit the project area and make use of all habitats present. These habitats include wetlands, drainages, field edges, shelterbelts, agricultural fields, and mixed-grass prairie. This analysis of possible direct and indirect effects to big game mammal species include: (1) loss or degradation of habitats, (2) displacement, (3) vehicle collisions, (4) noise, (5) dust, (6) habitat fragmentation; and (7) population effects. Each of these effects is discussed below.

Loss or Degradation of Habitats

Habitat loss associated with construction and operation of facilities would result in a reduction of available forage and other habitat components in the affected area. Habitats adjacent to areas that are directly disturbed could be affected by changes in vegetation, including the potential invasion of noxious weeds. The exact location and concentration of this effect would vary depending on the timing and extent of development, but is not expected to result in the alteration of seasonal habitat use or herd movements of big game mammals within the project area.

The direct loss of habitats caused by construction of the refinery infrastructure is not anticipated to have significant adverse effects to big game mammals. In general, the direct habitat removal of approximately 190 acres is expected to have minimal impacts on big game mammals. The direct loss of cultivated field habitat would not result in any loss of wintering range or impact a major corridor in the region. Therefore, it is concluded that the capacity of the remaining undisturbed portions of the project site that could support big game populations should remain essentially unchanged from current conditions.

Displacement

Disturbances from construction of the linear facilities may affect utilization of habitat(s) immediately adjacent to these affected areas. Areas of habitat that are avoided because of human activities or the consequences of human activities are generally less effective at supporting populations of big game. The area subject to this impact is not lost to each species, but their use of this area is reduced by some unknown amount that depends on many factors such as the spatial and temporal scale of the disturbance, natural history characteristics of each species, and the habituation of individual animals to each type of disturbance.

It is envisioned that most big game mammal responses would consist of avoidance of areas proximal to the construction and operational areas, with most individuals carrying out normal activities of feeding and bedding within adjacent suitable habitats. However, big game mammals are adaptable and generally adjust to non-threatening, predictable human activity. It is anticipated that the magnitude of displacement would decrease over time as: (1) the animals have more time to adjust to the operational circumstances, and (2) the extent of the most intensive construction activities, such as pipeline trenching and transmission line construction, would be short-term. By the time the refinery is under full production, construction activities would have ceased, and traffic and human activities in general would be greatly reduced. As a result, this impact would be greatly reduced, and it is unlikely that big game mammals would be displaced under full project development. The level of big game mammal use of the project area is more likely to be determined by the quantity and quality of forage available.

Vehicle Collisions

Increased vehicle traffic is anticipated in association with all phases of the project. The potential for vehicle collisions with big game mammals would be directly correlated with the volume of traffic. The volume of project-related traffic is expected to be greatest during the construction phase and to gradually diminish during the production phase. Speed limits set for project roads would reduce the potential for collisions; however, most collisions occur on county roads and highways, where speeds are higher and are regulated by the state. Overall, a 30 percent or more increase in traffic is anticipated, which may result in additional collisions between big game mammals and vehicles. However, the incidence of vehicle collision impacts to big game mammals is anticipated to occur infrequently, and no long-term adverse effects are expected.

Noise

Noise is one factor in the displacement of big game mammals from areas of otherwise suitable habitat and was considered as part of this analysis. Elevated levels of noise associated with increased human activity and facility operations may affect big game. The effects would depend on the occurrence pattern and intensity of produced noise. Big game responses may vary from a developed tolerance over time to complete avoidance of affected habitats.

Dust

Dust would be generated and deposited on vegetation that provides forage for big game mammals along existing and any new access roads within the project area. Deposition of road dust on vegetation can affect vegetation health, nutrition, and palatability. These effects are typically most severe immediately adjacent to roads, but can extend up to ½ mile away. Vegetation within these areas represents a relatively small proportion of the total available forage within a typical big game mammal range. In general, habitats along roads are avoided because of the disturbance caused by vehicle traffic; therefore, the loss of forage productivity attributable to dust would have only minimal effects on big game because this forage is typically under-used.

Habitat Fragmentation

Construction of the proposed project and appurtenant facilities would result in some degree of habitat fragmentation throughout the project area. The effects of habitat fragmentation and the subsequent suitability of big game mammal ranges would depend on several factors, including current range condition, carrying capacity, current population levels, species habitat requirements, degree of disturbance, and availability of suitable habitats. In addition, critical life stages of big game mammals are tied to seasonal use patterns, migration corridors to spring and winter ranges, as these animals use different portions of their range at different times of the year. Habitat fragmentation is an issue for some wildlife species because of the creation of barriers between suitable and unsuitable habitats. These barriers often limit species occurrence and movement among habitats. Construction activities in some portions of the project area may make these areas less available or fragmented to a degree that they would be unsuitable to several species of big game mammals.

The pattern of fragmentation that would occur under this project alternative would consist of the loss of 190 acres of a seasonal, agricultural (cereal grain, row crop) field, and narrow strips of habitats within the pipeline and transmission line ROW. However, because the pipeline and transmission line would be constructed primarily within existing road and railroad ROW, these areas have already been fragmented. Therefore, any new disturbances to these corridors would have minimal effects on big game habitat.

Population Effects

The effects of the proposed project on big game mammal populations are difficult to predict because of the many unknown factors associated with each of the potential effects and the potential for a synergistic or antagonistic relationship among the individual effects. The scale and nature of the anticipated effects, particularly in terms of indirect effects, suggests that some minor declines in big game mammal populations may occur. The degree of this potential decline is not known, but is not likely to occur to the extent that viability of any local population is compromised in the project area or across the range of the species as a whole, due to the adaptability of local populations.

Based on the foregoing, neither short-term nor long-term adverse effects are expected to occur on any localized big game mammal populations.

4.8.1.2 Birds

A variety of passerine, waterfowl and raptors inhabits the project area and makes use of all habitats present. These habitat areas include wetlands, drainages, field edges, shelterbelts, trees and shrubs, agricultural fields, and mixed-grass prairie. Possible effects to passerine, waterfowl and raptor species include: (1) direct mortality (including vehicle collisions and collisions with power lines), (2) harassment and displacement, (3) habitat loss, (4) noise, (5) availability of prey, (6) population effects, and (7) habitat fragmentation. Each of these effects is discussed below.

Raptor, passerine, and waterfowl species may be affected in several ways. Vehicle collision and collision with and electrocution by power lines could cause direct mortality of raptor, passerine, and waterfowl species.

Vehicle Collisions

Raptor and Passerine Species

Access roads would be constructed as part of the proposed pipeline and transmission line construction. Based on the construction schedule, increased vehicle traffic is anticipated in association with all construction and operational phases of the project. The literature on avian mortality caused by collision with vehicles is reviewed by Erickson et al. (2001). Most birds killed by vehicle collision are passerines, although raptors, particularly owls, are also killed. Raptors may be struck by vehicles while they hunt or feed on carrion near roads. Most raptors, however, do not focus their foraging efforts on carrion (Ehrlich et al. 1988), thereby reducing their potential for being struck by vehicles along roads.

The potential for vehicle collisions would be directly correlated with the volume of traffic. Project-related traffic is expected to be greatest during the construction phase and to gradually diminish during the production phase. The use of speed limits on project roads would reduce the potential for collisions; however, most collisions occur on county roads and highways, where speeds are higher and regulated by the state. Foraging raptors may tend to avoid areas of heavy traffic, further reducing their potential for being struck by vehicles on busy roads. Overall, a 30 percent or more increase in traffic is anticipated, which may result in a similar increase in mortality to raptors. This impact is not expected to have a substantial effect on raptor or passerine populations because of the low incidence of mortalities from vehicle collisions compared with the relatively large size of the raptor and passerine populations in the region.

Waterfowl

It was estimated that 13,500 ducks are killed each year by vehicle collisions in the PPR of North and South Dakota (Erickson et al. 2001). An average number of 0.04 duck fatalities per mile of road has been used by several authors to estimate total waterfowl mortality from vehicle collisions in the PPR (Erickson et al. 2001). Most of these studies have been conducted along paved, high-speed roads, rather than low-speed dirt roads. The rate of mortality with mostly unpaved project roads in the project area would be much lower than reported for the study. Thus, the effects of collisions of waterfowl with vehicles on the local populations of waterfowl within the project area are anticipated to be much less than the study estimate.

Collisions with Power Lines

The presence of new aboveground power lines may increase the potential for birds to be killed by collision. Water birds and waterfowl are the most common groups of birds killed by collision with power lines. Raptors also collide with power lines; however, the proportion of raptor mortalities attributed to collision is minimal compared with mortalities attributed to electrocutions (Erickson et al. 2001). Specific measures that would help reduce the potential for raptor collision with power lines, such as avoiding areas of high avian use, would be implemented where feasible.

Raptors

The presence of new aboveground power lines also could increase the potential for raptor electrocutions. Support structures associated with aboveground power lines could be used as perches by raptors. These new perches would provide raptors with new opportunities for hunting and capturing prey, which could increase the efficiencies and success of raptors that hunt from perches. This increase in success could result in an increase in the local population of raptors that hunt from perches and reduce the populations of the species on which these raptors prey. Installing devices to prevent raptors from perching in or on structures supporting power lines near sensitive areas (e.g., grouse leks) could eliminate these facilities as perches for raptors. Therefore, all aboveground structures would be designed and equipped with Avian Power Line Interaction Committee (APLIC) (2006) devices intended to prevent and reduce the risk of electrocution to perching raptors.

Waterfowl

Few comprehensive studies have been conducted on collisions of birds with power lines. However, where nationwide annual estimates of avian mortality caused by such collisions have been made, they range widely from more than 10,000 to more than 174,000,000 birds per year (Erickson et al. 2001). Waterfowl are most susceptible to colliding with power lines that span or occur near streams, water bodies, and wetlands. Considering the existing distribution and proposed height of transmission lines, the potential for waterfowl colliding with power lines is limited.

Harassment and Displacement

Raptor species inhabiting the region are strongly drawn to mixed-grass prairie and cultivated agricultural fields, and they would often nest within proximate shelterbelts or woodland habitats. Therefore, raptors potentially occupying suitable habitats could be temporarily displaced from habitats in areas of human activity. Displacement during the construction phase could alter patterns of habitat use for foraging individuals. The extent of displacement would depend on the duration and intensity of the activity and on the sensitivity and habituation to disturbance of individual animals. In addition, construction may result in displacement from affected habitats during the entire construction phase (a time frame of weeks to months), while operation of the refinery would result in permanent displacement from the 190-acre project footprint. If raptors are displaced, it is anticipated that individuals would move to other adjacent habitats, but may encounter inter- and intra-specific competition for resources, depending on niche availability and density of raptors.

Disturbance associated with construction activities can cause nest failure, nest abandonment, and unsuccessful fledging of young to nesting raptors. It is also important to note that nests not used in 1 year may potentially be used in subsequent years. Subsequent development within close proximity to these nests may preclude use of the nest in following years. Therefore, protection of nests that may potentially be used in future years may require limiting construction activities within a specified line of distance to minimize impacts. In addition, ground-nesting raptors would experience a greater loss of nesting habitats relative to tree-nesting raptors because trees are less likely to be disturbed by the project.

Habitat Loss

Passerine and Raptor Species

The direct disturbance and loss of approximately 190 acres of wildlife habitat in the project area would likely reduce the availability and effectiveness of habitat for a variety of passerine bird and raptor species. The initial phases of surface disturbance and increased construction noise could result in some direct mortality to small and medium sized mammals and would displace some bird species. In addition, mortality from increased vehicle use of roads in the project area is expected.

The temporary disturbances that occur during the construction period would tend to favor generalist wildlife species such as ground squirrels and ground-dwelling passerine species (e.g., horned larks), and would have more impact on specialist species (e.g., lark buntings and grasshopper sparrows). Overall, it is believed that the long-term disturbance of 190 acres would have a minor effect on common wildlife species. This is because of the current land use and subsequent disturbance regimen. The production cycle of cereal crops requires extensive management treatments over the course of a growing season. Birds are highly mobile and tend to disperse into surrounding areas, using suitable habitats and open niches to the extent that they are available. In addition, because of the high reproductive potential of these species, they can rapidly repopulate vacant niches as those habitats become suitable. While there is no way to accurately quantify the changes associated with construction activities, the impact is likely to be minor in the short term.

Waterfowl

Wetlands are the habitat types of highest importance to the waterfowl in the project area. The amounts of these habitat types that would be lost are relatively small compared with the areal extent of these habitats that would not be affected. Thus, direct loss of habitats would have minimal effect on waterfowl. Most birds would avoid construction equipment, and most construction would not occur within or near wetland habitats. However, nests placed in locations subject to disturbance (agricultural field edges near wetlands) could be lost. This effect would be relatively minor because of the low potential for direct mortality, the short breeding season for waterfowl, and the small percentage of the project area that would be directly affected during the breeding season. It is anticipated that surface disturbance associated with the construction and operation of the facilities would have little potential to cause direct mortality to waterfowl.

Holding ponds would consist of rectangular 2-acre, 10-foot-deep ponds with 2:1 side slopes. The ponds are designed to handle discharge from the WWTP as well as storm water runoff from the refinery. If water depth is sufficient, the holding ponds may attract waterfowl and other avian species. To minimize the use of refinery retention ponds by birds, four inch to six inch rock should be used to line exposed in-slopes of all wastewater/storage ponds. In addition, any ponds having the potential to hold contaminated (oily) water should be netted. The larger rock and netting will prevent the creation of an attractive nuisance for waterfowl and other avian species.

Overall, impacts to waterfowl and avian species should be negligible. Because of the design of the side slopes, it is unlikely that any emergent vegetation would grow within the holding ponds. In addition, the ongoing pumping and discharge of the ponds would discourage use by waterfowl or other avian species.

Noise

Noise is one factor in the displacement of raptors from areas of otherwise suitable habitat. Elevated levels of noise associated with increased human activity and facility operations may affect raptors. The effects of project-related noise levels on raptors depend on the patterns of occurrence and intensity of the noise. Responses of individual raptors may vary from a high degree of tolerance to avoidance of affected habitats. Increased noise in areas adjacent to new noise sources is expected to have minimal effects because raptors would avoid these areas or may become accustomed to this type of disturbance.

Availability of Prey

The raptor species that occur in the project area rely on a variety of prey species that make use of different habitats. The primary small mammals found on the project area include, but are not limited to, eastern cottontail, deer mice, thirteen-lined ground squirrel, white-footed mouse, meadow jumping mouse, and northern pocket mouse. The development of the proposed refinery site would initially disturb an estimated 190 acres of potential habitat for several species of small mammals such as mice and rabbits that may serve as prey items for raptors. These prey species would experience localized population losses; because of direct mortality, and loss of habitat. Overall, the collective distribution and occurrence of these prey species would decrease in the project area and may be reduced to the extent that the availability of prey is reduced for foraging raptors, especially in areas of high and concentrated development. However, the small amount of short-term change in prey base populations created by the construction activities is minimal in comparison with the overall status of the small mammal populations in the region. Also the high reproductive potential of these small mammals would enable populations to quickly repopulate adjacent habitats. For these reasons, implementation of the project is not expected to produce any appreciable long-term negative changes to the raptor prey base.

Population Effects

The effects of the proposed project on avian populations are difficult to predict because of the many unknown factors associated with each of the potential effects, differing sensitivity of species to each of these effects, and the potential for synergistic or antagonistic relationships among the individual effects. The widespread nature of the anticipated impacts, particularly in terms of collisions, displacement, and availability of prey species, suggest that some minor declines in raptor populations may occur. The degree of this potential decline is not known, but is not likely to occur to the extent that any avian population viability is compromised in the project area or across the range of any specific species as a whole.

Habitat Fragmentation

In some areas, disturbance could also result in fragmentation of existing vegetation communities/habitats. Fragmentation occurs whenever a large continuous habitat is transformed into smaller patches that are isolated from each other by both natural and human-induced mechanisms. The changed landscape functions as a barrier to dispersal for species associated with the original vegetation community/habitat. These smaller and more isolated habitats also support smaller populations, which are more vulnerable to local, randomly determined extinction events, thereby causing smaller, more isolated habitats that ultimately contain fewer species and lower biodiversity. As more "edge" habitat becomes available because of fragmentation, the "edgedwelling" species have the opportunity to "invade" the interior vegetation community/habitat and become a major threat to the survival of the "interior-dwelling" species.

The potential effects of habitat fragmentation are dependent upon several factors, including current habitat condition, proximity of additional suitable habitats, degree of proposed disturbance, density and distribution of noxious weeds, and local population size. Given the sensitivity of wildlife species to the relationship to edge effects and noxious weed invasions, construction of the new natural gas and oil pipelines would create essentially all edge habitat and would therefore have a much higher potential for impact than construction of the refinery itself.

The siting of the proposed pipelines and transmission lines looked to maximize the linear extent of the lines along the existing C.P.R., Highway 23 ROW, and section lines to the maximum extent feasible because these ROW areas are devoid of native tracts of mixed-grass prairie that have a high susceptibility to impacts. The pattern of fragmentation that could occur from the proposed project would have minimal effects on raptors because their ability to make use of both disturbed and edge habitats would not be affected. However, an indirect affect may occur to populations of some prey species, especially smaller mammals, which could be affected by fragmentation, resulting in a decrease in population size, ultimately affecting the availability of prey for some raptor species. As a result, the effects of potential fragmentation would not likely adversely affect wildlife habitats, because of the minimal amounts of new habitat disturbance and the widespread occurrence and availability of suitable habitats adjacent to and throughout the project area.

Oily Ponds

Many bird species are attracted to open water including refinery ponds and tanks. Oily ponds may present a hazard to birds, and cause increased bird mortalities. The FWS Section 7 Consultation on the refinery dated August 22, 2006 and January 11, 2006 memorandums recommended, among other measures, that all potentially oily ponds be netted. Therefore, oily ponds should be netted to keep birds from coming into contact with oily waters.

4.8.1.3 Aquatic Species

This section describes the potential direct and indirect effects of each of the proposed alternatives on aquatic species in the project area. These effects include: (1) changes in timing and quantity of stream flows, (2) changes in temperatures, (3) accidental spills of fuels, and (4) changes in species diversity.

This analysis is based on the three types of wastewater effluent: (1) sanitary wastewater, (2) uncontaminated (non-oily) wastewater, and (3) contaminated (oily) or potentially contaminated (oily) water. Each of these streams of wastewater would be handled separately and would receive different levels of treatment as described briefly below.

(1) Sanitary wastewater from the offices and other buildings would be collected and disposed of via a sanitary sewer system. All water collected by this system would be discharged via a septic system into a leach field.

(2) Non-oily wastewater would consist of non-oily water from the boiler plant. This water would be routed to a WRP. This waste stream would be segregated from the potentially contaminated (oily) wastewater to minimize the production of hazardous sludge.

(3) The third stream of wastewater would consist of process wastewater and potentially contaminated (oily) water. This is water collected directly from process units or storm water collected from the process area, product loading area, and tank farm. All process

wastewater and potentially contaminated (oily) water would be routed to a WWTU for treatment. Following treatment, previously contaminated (oily) water would be held in the three holding ponds and tested. If the water meets the refinery's criteria for discharge, it would be released to a discharge outfall. If testing suggests that additional treatment is needed, the water would be recycled through the WWTU.

Wastewater Discharges

Treated wastewater and uncontaminated (non-oily) storm water would be discharged into or near the wetlands on site. The wastewater would be required to meet the NPDES permit limits (EPA issued permit). The limits have been developed to protect aquatic life, wildlife and birds, and other designated uses such as agricultural and livestock uses. However, the discharge of treated wastewater and storm water would change water quality from existing conditions. It is predicted that there would be some shifts in the aquatic life communities. For example, macro-invertebrate species that prefer more nutrients and additional flow would grow in preference to those communities that are more sensitive to nutrients levels and prefer dry conditions during most of the year.

Timing and Quantity of Stream Flows

Modification of flow is one of the most widespread human disturbances of stream environments (Bain and Finn 1988). A change in stream flow translates into a change in the water depth and velocity for any specific location in a stream. Consequently, changes in stream flow can be regarded as modifications to the physical composition of the aquatic habitat (Bain and Finn 1988). Fish that inhabit the East Fork of Shell Creek are frequently exposed to disturbances from both flood and drought periods, and must persist in environments that are characterized by fluctuating flows. Changes in the pattern of these fluctuating flows can be viewed as a disturbance in the stability of stream habitat. Potential negative effects to fish and invertebrates caused by changes in flow include physical, behavioral, habitat, and food changes that may occur if stream flows are increased or decreased substantially, especially during spawning.

Increased stream flows can make it difficult for certain species to migrate upstream to spawning and rearing areas. Increased flows in rearing areas may also make survival more difficult for young fish. Bain et al. (1988) and Fausch and Bramblett (1991) reported that the shallow and slow-water fishes were adversely affected by an artificially high variability in flow. Conversely, decreases in flow force fish that are restricted to shallow areas to relocate to maintain the specific habitat conditions. Rapid increases in flow may expose shallow-water fish to increased predation because shallow shoreline areas become accessible to larger fish-eating wildlife as depth increases (Bain and Finn 1988). In contrast, generalist species that use mid-stream type habitats responded positively to increased variability in flows (Bain and Finn 1988). Very few scientific studies have addressed the changes to macroinvertebrate populations caused by changes in stream flow (Gore 1987). It has been assumed that responses of macroinvertebrates to stream flow changes would closely match those of fish; however, macroinvertebrates lack the rapid reinvasion capabilities of fish when they live in an environment of fluctuating discharges (Gore 1987). More research is needed to support the general application of studies of macroinvertebrate response to instream flows for regulated flow management (Gore 1987).

Stream flows are expected to increase to varying degrees to the East Fork of Shell Creek under the proposed alternative. Increasing stream flows could have both positive and negative effects on aquatic species. The main positive effect would be to provide habitat to fish and macroinvertebrates in areas that are normally dry. This new habitat could provide opportunities for population growth. Conversely, aquatic species may be affected by the amount of water discharged to the surface receiving drainage under the proposed alternative, especially during periods of low flow and spawning. Based on the fish species found within the East Fork of Shell

Creek (Table 4 11), it is likely that an increase in stream flow would favor some species such as the Iowa darter. Other species that favor slower-moving streams, such as the fathead minnow, spottail shiner, brook stickleback, and white sucker may be negatively affected by an increase in stream flow. See Section 4.3, Surface Water Resources, for a complete discussion of anticipated effluent and storm water discharge flows.

Table 4-11 Fish sampled per site on East Fork of Shell Creek – June 2001

Species	East Fork of Shell Creek		
	Reach 2A	Reach 2B	Reach 2C
Brook stickleback	6	89	7
Fathead minnow	701	211	7
Iowa darter	1	0	0
Spottail shiner	1	0	0
White sucker	100	0	0
Total	**809**	**300**	**14**

Source: Confluence Consulting, Inc. 2001

Water Temperature

Water temperature can affect growth, metabolism, reproduction, emergence, and distribution of aquatic species (Vannote and Sweeney 1980). The magnitude and pattern of historical, annual, seasonal, and daily fluctuations in temperature may be important when selecting and maintaining a variety of aquatic insects in a stream reach (Vannote and Sweeney 1980). Sudden increases or decreases in water temperature could result in population- and community-level changes in aquatic insects within the project area.

The temperature of discharge water would vary seasonally. The discharge water is expected to be ambient temperature during spring, summer, and fall seasons. It is anticipated that the discharge effluent would range between 2 and 24°C with a median of 12°C. The temperature of streams within the project area can range from 1°C during winter to 24°C or more during summer; therefore, changes in temperature are not expected to be dramatic but would vary depending on the volume and timing of the discharge.

Spills and Surface Water Discharge

If a large spill occurs, there may be discharges of oil and petroleum fractions. [Gasoline and crude oil are complex mixtures of hydrocarbons. When spilt, the compounds in gasoline or crude oil tend to separate into “fractions” with similar chemistries.] See section 4.4 for more information about spills. The NPDES permit would also allow the discharge of minor concentrations of oil and grease (15 mg/L) during storm water events. The relatively low density of many petroleum fractions can pose short-term concerns, especially for fish and wildlife resources. Many petroleum fractions float in water and form thin surface films. Gasoline, diesel, or other fuel oils spilled into water quickly spread out into a film generally 0.1 millimeter thick. Therefore, a very small amount of refined fuel or oil product can create a film over a very large water surface area. While natural physical and biological weathering processes would dissipate or degrade such oil slicks in time frames ranging from days to a few weeks, there is considerable short-term opportunity for damage to waterfowl, aquatic mammals, fish, and other aquatic organisms.

Some heavier petroleum fractions show neutral buoyancy or may be heavier than water. Some fraction components may have the potential to accumulate in substrates. Depending on the frequency and clean-up of spills and leaks, the heavier (sinking) fractions can impact benthic organisms and bottom-feeding fish species. Other fish species may also be impacted through reductions in food supply.

The effluent holding ponds may attract waterfowl and other shorebirds. These birds and other aquatic animals (e.g. muskrats and mink) may become oiled in the event of a spill that is contained within these ponds prior to treatment, if mitigation measures such as hazing or netting are not employed to decrease wildlife use of the ponds.

Spills of oil and other contaminated waste material that may potentially reach the unnamed surface drainage and East Fork of Shell Creek could result in fish and macroinvertebrate kills and degradation of habitat. The severity and scope of a stream kill would depend on the volume of material spilled, the distance of the spill from surface water, and the chemical and toxicological properties of the materials spilled. However, it is important to note that the refinery has been designed with state-of-the-art technology to capture all surface water runoff, including oil spills and other potentially contaminated waste material. Site generated storm water and any subsequent waste material generated on the site would be captured and treated in the WWTU prior to being discharged into holding ponds. Therefore, potentially contaminated (oily) surface runoff generated on the site would be treated, stored, and tested prior to discharge into the East Fork of Shell Creek Basin.

Species Diversity

As discussed previously, the effects of the surface discharge on aquatic species, such as changes in water flow and temperature could have an effect on multiple levels of biodiversity (genetic, population/species, community/ecosystem, and landscape). The amount of positive effects would increase as the baseline condition remains altered for any period. The longer discharge effluent produced at the site enters the basin drainage, the higher the probability for effects to species diversity over large portions of drainage. Potential changes in species diversity would be the greatest under Alternative 4 because this alternative would have the most continuous flow of all the Alternatives, therefore, the greatest impact on aquatic ecosystems.

4.8.1.4 Special-status Species

The ESA was enacted in 1973 to address the decline of fish, wildlife, and plant species in the United States and throughout the world. The purpose of the ESA is to conserve “the ecosystems upon which endangered and threatened species depend” and to conserve and recover listed species (ESA [§ 2, 16 U.S.C. 1531]). The law is administered by the FWS. The EIS analysis of threatened and endangered species constitutes a Biological Assessment prepared in accordance with 50 C. *Federal Register* Part 402. BIA and EPA submitted the DEIS to the FWS for review. The FWS reviewed the Biological Assessment (DEIS) and responded in an August 22, 2006 memorandum. The FWS concurred with the "no effect" and "may affect, not likely to adversely effect” determinations in the DEIS.

Under the ESA, species may be listed as either “endangered” or “threatened.” The ESA defines an endangered species generally as any species that is in danger of extinction throughout all or a significant portion of its range (ESA, Section 3(6)). A threatened species is one that is likely to become an endangered species within the foreseeable future throughout all or a significant part of its range (ESA, Section 3(20)). All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened.

The ESA also affords protection to “critical habitat” for threatened and endangered species. The definition of "critical habitat" includes the specific areas within the geographical area occupied by the species at the time it is listed, on which are found physical or biological features essential to the conservation of the species and which may require special management considerations or protection (ESA, Section 3(5)(A and B)). Except when designated by the Secretary of the Interior, critical habitat does not include the entire geographical area that can be occupied by the threatened or endangered species (ESA, Section 3(5)(C)).

Some species may also be proposed and candidates for listing (ESA Section 4(b). The FWS defines proposed species as any species that is proposed in the *Federal Register* to be listed under Section 4 of the ESA; while candidate species are those for which the FWS has sufficient information on their biological status and threats to propose them for listing as endangered or threatened under the ESA, but for which development of a listing regulation is precluded by other higher-priority listing activities. Candidate species receive no statutory protection under the ESA, but by definition, these species may warrant future protection under the ESA. There are no proposed species known to occur in North Dakota.

Bald Eagle

Species Description

Bald eagles occur throughout North Dakota where there is suitable habitat, which usually entails rivers or lakes as well as trees for nesting and roosting. Bald eagles are uncommon breeders in North Dakota; however, in 1997, 8 nests were located in North Dakota along the Missouri River and one nest along Devils Lake. Man-made reservoirs have provided winter habitat. Fish are the primary food source, but bald eagles also prey upon a variety of birds, mammals, and turtles as well as carrion when fish are not readily available.

Analysis of Effects from Proposed Refinery Construction and Operation

The proposed action would place a 468.39-acre tract of land in trust land status and construct a 190-acre refinery. Construction of the refinery would expand human disturbance on the 190-acre tract.

There currently are no known nest sites or winter roost areas in the project area or within the proposed pipeline and transmission line corridor alignments. However, eagles are known to use the Missouri River corridor south of the project area for nesting, roosting, and as a migration corridor. Therefore, bald eagles may occasionally forage in the project area. If eagles occur in proximity to the project area, it is envisioned that they would most likely alter foraging patterns, as they would be expected to avoid active construction and operational areas. However, based on the unique habitat affinity for the Missouri River system, the occurrence of a bald eagle in proximity to the project area would be a rare and random incident.

Use of the roads accessing the refinery site would continue after the refinery is constructed, which may result in vehicular collisions and roadside carcasses for up to 20 to 25 additional years. The presence of roadside carcasses can result in bald eagle foraging along roads, which creates the potential for road kills of foraging bald eagles. In addition, no suitable roosting habitat or concentrated prey or carrion sources for bald eagles are present on the project area. Therefore, it is not anticipated that any bald eagle foraging habitat would be lost during construction or operation of the refinery. Finally, the potential for bald eagles to collide with or be electrocuted by transmission lines would be minimal because of use of low voltage power lines that would be properly designed to avoid electrocution of raptors.

Determination

Construction and operation of the refinery under the proposed action “would have no effect” on the bald eagle. This determination is based on the lack of project actions that would disturb or remove roosting or foraging habitat for bald eagles.

Since the publication of the DEIS, the bald eagle has been removed from the Federal List of Endangered and Threatened Species, effective August 8, 2007. The *National Bald Eagle Management Guidelines* (U.S. Fish and Wildlife Service 2007) were reviewed relative to the project actions. There are no nests, roosts, or foraging habitat within the project area that would be disturbed or removed by the project actions.

Analysis of Effects from Proposed NPDES-Permitted Effluent Discharge and Alternatives

EPA's proposed NPDES permitting action would permit surface water discharges from the refinery to tributaries of the East Fork of Shell Creek. EPA believes that neither the proposed permit issuance nor any of the effluent discharge alternatives would have an effect on the bald eagle or its habitat. There would be no effect to this species or its habitat from the proposed NPDES action or any of the effluent discharge alternatives considered. There is no suitable roosting habitat or concentrated prey or carrion sources and the occurrence of bald eagles in proximity to the project area would be a rare incident. In addition, the proposed NPDES-permitted discharge of effluent from the refinery would meet permit limits and would result in water quality in the tributary and mainstem that would have no effect on any bald eagle that might ingest the water or prey on species residing in the discharged water. The pollutants likely to be discharged by the facility and proposed effluent limits are noted in the draft NPDES permit and Fact Sheet attached to the EIS. In addition, the location of the NPDES discharge is not within the general habitat of the bald eagle.

Determination

EPA's issuance of an NPDES permit or any of the other effluent discharge alternatives would have "no effect" on the bald eagle or its habitat. This determination is based on EPA's finding that eagles are not expected to occur in the project area.

Whooping Crane

Species Description

Whooping cranes require open exposed wetlands, prairie potholes, or freshwater marshes. They seek shallow lakes and lagoons containing small islands of cattails, bulrushes, and sedges. Their diet consists of insects, crustaceans, small mammals, frogs and berries, and is often supplemented with roots and grains.

Analysis of Effects from Proposed Refinery Construction and Operation

Whooping cranes do not breed in North Dakota. However, they are known to migrate through North Dakota during the spring and fall migration periods. According to Austin and Richert (2001), 279 whooping crane observations have occurred in North Dakota between 1943 and 1999. In addition, the migratory path of the whooping crane has been extensively documented. The documented migration path, as outlined by the distribution of whooping crane observations, follows a relatively straight line north-northwest from Aransas National Wildlife Refuge to central North Dakota, then curves northwest along the Missouri Coteau to the North Dakota-Saskatchewan border. The Aransas-Wood Buffalo population, as of January 4, 2006, numbered approximately 217 birds including 189 adults and 28 young. Current and historic records show the proposed construction area to be an important corridor for the migration of the whooping crane. Based on this migration corridor path, the presence of new transmission lines may pose a collision risk to the whooping crane.

Conservation Measures

To minimize the collision and electrocution risk hazard, the transmission lines will be constructed according to APLIC, Edison Electric Institute's Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006 and Edison Electric Institute's "Mitigating Bird Collisions with "Power Lines: The State of the Art in 1994."

Determination

Implementation of the proposed refinery construction and operation action "may affect, but is not likely to adversely affect" the whooping crane.

Analysis of Effects from Proposed NPDES-Permitted Effluent Discharge and Alternatives

EPA's proposed NPDES permitting action would permit surface water discharges from the refinery to tributaries of the East Fork of Shell Creek. EPA believes that neither the proposed permit issuance nor any of the effluent discharge alternatives would have an effect on the whooping crane or its habitat. There would be no effect to this species or its habitat from the proposed NPDES action or any of the effluent discharge alternatives considered, because the proposed NPDES-permitted discharge of effluent from the refinery would meet permit limits and would be of such quality that it would have no effect on a whooping crane that might ingest receiving waters for some brief period or prey on species residing in the receiving water. In addition, the location of the NPDES discharge would not be within the general habitat of the whooping crane.

Determination

EPA's issuance of an NPDES permit or any of the other effluent discharge alternatives would have "no effect" on the whooping crane or its habitat.

Interior Least Tern

Species Description

The interior least tern is migratory and its breeding range extends from Texas to Montana and from eastern Colorado and New Mexico to northern Indiana. Of the approximately 2,500 pairs of interior least terns, about 100 pairs are known to occur in North Dakota.

Analysis of Effects from Proposed Refinery Construction and Operation

Interior least terns occurring throughout North America nest in areas with habitat attributes similar to those of the project area. The riverine nesting areas of interior least terns are sparsely vegetated sand and gravel bars within a wide, unobstructed river channel, or salt flats along lake shorelines. Nesting locations are usually at the higher elevations and away from the water's edge because nesting starts when the river flows are high and small amounts of sand are exposed. The size of nesting areas depends on water levels and the extent of associated sand bars.

Under the proposed action, no direct effects to the interior least tern or its habitat are expected to result from any construction activities. There are currently no known nest sites within the project area or within the proposed pipeline and transmission alignments. However, the interior least tern is known to use the Missouri River corridor for nesting and as a migration corridor, and may occasionally use the project area as a transient migratory pathway.

Determination

Implementation of the proposed action "would have no effect" to the interior least tern or its habitat. This determination is based on the lack of project actions that would disturb or remove breeding, roosting, or foraging habitat for the interior least tern.

Analysis of Effects from Proposed NPDES-Permitted Effluent Discharge and Alternatives

EPA's proposed NPDES permitting action would permit surface water discharges from the refinery to tributaries of the East Fork of Shell Creek. EPA believes that neither the proposed permit issuance nor any of the effluent discharge alternatives would have an effect on the interior least tern or its habitat. There would be no effect to this species or its habitat from the proposed NPDES action or any of the effluent discharge alternatives considered because the interior least tern is not expected to utilize the receiving waters. To the extent interior least terns may briefly be present in the tributaries or mainstem, the proposed NPDES-permitted discharge of effluent from the refinery would be of such quality that it would have no effect on an interior least tern that might ingest the receiving water or species residing in the receiving water. In addition, the location of the NPDES discharge would not be within the general habitat of the interior least tern.

Determination
EPA's issuance of an NPDES permit or any of the other effluent discharge alternatives would have "no effect" on the interior least tern or its habitat.

Piping Plover

Species Description
Piping plovers breed in open, sparsely vegetated habitats. The Great Plains population nests along sand and gravel shores of rivers and lakes. They have been observed eating marine worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates. As of 2001, a piping plover census found 1,112 plovers in North Dakota including 643 along the Missouri River. Critical habitat was designated for the piping plover in the September 11, 2002, *Federal Register*. This included critical habitat in the counties of the proposed action. However, no critical habitat has been designated in the area proposed for the refinery and/or effluent discharge.

Analysis of Effects from Proposed Refinery Construction and Operation
The piping plover is known to breed on a wetland within close proximity to the proposed refinery site. Since piping plovers breed and forage on unvegetated, gravel shorelines of wetlands, it is reasonable to expect that piping plovers would potentially use exposed shorelines of constructed ponds while foraging.

Conservation Measures
To minimize the use of refinery retention ponds, four inch to six inch rock should be used to line exposed in-slopes of all wastewater/storage ponds. In addition, any ponds having the potential to hold contaminated (oily) water should be netted. The larger rock and netting will prevent the creation of an attractive nuisance for piping plovers.

Determination
Implementation of the proposed action "may affect, but is not likely to adversely affect" the piping plover.

Analysis of Effects from Proposed NPDES-Permitted Effluent Discharge and Alternatives
EPA's proposed NPDES permitting action would permit surface water discharges from the refinery to tributaries of the East Fork of Shell Creek. EPA believes that neither the proposed permit issuance nor any of the effluent discharge alternatives would have an effect on the piping plover or its critical habitat. There would be no effect to this species or its critical habitat from the proposed NPDES action or any of the effluent discharge alternatives considered because the piping plover is not expected to utilize the receiving waters. To the extent the piping plover may briefly be present in the tributaries or mainstem, the proposed NPDES-permitted discharge of effluent from the refinery would be of such quality that it would have no effect on a piping plover that might ingest the receiving water or species residing in the receiving water.

Determination
EPA's issuance of an NPDES permit or any of the other effluent discharge alternatives would have "no effect" on the piping plover or its critical habitat.

Gray Wolf

Species Description

The gray wolves have been documented in North Dakota at the rate of about 1 to 2 verified reports per year. These are mostly dispersing males from Canada or Minnesota. They once had a variety of habitats including boreal forest, temperate forests, and temperate grasslands. They now occur primarily in forested areas. Prey species for the gray wolf includes larger prey species such as deer, elk, moose, caribou, bison, musk ox, and mountain sheep. They also take smaller prey consisting of rabbits, hares, beaver, and smaller rodents which are generally taken when larger prey are scarce or an easy kill presents itself.

Analysis of Effects of the Proposed Refinery Construction and Operation and the Proposed NPDES-Permitted Effluent Discharge

There would be no effects to wolves from either the proposed refinery construction and operation or the proposed NPDES-permitted effluent discharge and discharge alternatives. Breeding wolves are not known to occur in or near the project area. Additionally, there is no recent evidence of wolf pairs or packs in the region. Because of the highly mobile nature of this species, it is possible that wolves would periodically travel through the project area. It is anticipated that any use of the project area would be of short duration because of the transitory nature of the species, and would occur at localized habitats within the region. There would always be a low to moderate level of human activity in proximity to the refinery, and wolves are expected to avoid areas with this type of human activity. The proposed action has little potential for affecting local or range-wide prey availability for gray wolves.

Determination

Implementation of the proposed refinery construction and operation action or the NPDES-permitted effluent discharge action would have “no effect” to the gray wolf. This determination is based on the low likelihood for gray wolves to occur within the project area and their tendency to avoid areas of human activity

Pallid Sturgeon

Species Description

The pallid sturgeon is a large fish known to occur only in the Missouri River, the Mississippi River downstream from the Missouri River, and the lower Yellowstone River. Pallid sturgeons require large, turbid, free-flowing riverine habitat with rocky or sandy substrate. The pallid sturgeon feeds on aquatic insects, crustaceans, mollusks, annelids, eggs of other fish and sometimes other fish. In April of 2001, 11 pallid sturgeon were caught in the upper Missouri River and Yellowstone River (not in Lake Sakakawea). No reproduction has been documented in North Dakota in more than a decade.

Analysis of Effects from the Proposed Refinery Construction and Operation

The pallid sturgeon is found only in major rivers such as the Missouri River. Pallid sturgeon habitat is not found in the East Fork of Shell Creek or its tributaries. The proposed refinery and effluent discharges to a tributary of the East Fork of Shell Creek would have no effect on the pallid sturgeon as the refinery is located about 25 miles upstream of Lake Sakakawea (on the Missouri River) and discharge limitations will be protective of aquatic life from the point of discharge.

Determination

Implementation of the proposed action would have “no effect” on the pallid sturgeon.

Analysis of Effects from Proposed NPDES-Permitted Effluent Discharge and Alternatives

EPA's proposed NPDES permitting action would permit surface water discharges from the refinery to tributaries of the East Fork of Shell Creek. EPA believes that neither the proposed permit issuance nor any of the effluent discharge alternatives would have an effect on the pallid sturgeon or its habitat. There would be no effect to this species or its habitat from the proposed NPDES action or any of the effluent discharge alternatives considered because there are no pallid sturgeon in the tributaries of the East Fork of Shell Creek, which is where the permit discharge point would be located; nor are there any pallid sturgeon in the East Fork of Shell Creek itself. By the time the treated discharge reaches Lake Sakakawea, located more than 20 stream miles downstream from the refinery, the discharge would be so diluted and mixed with the receiving waters, that there would be no effect to the lake waters. In addition, the pallid sturgeon is not presently known to occur in Lake Sakakwea. Moreover, even at the point of discharge, effluent from the refinery would meet permit limits and would be of such quality that it would have no effect on the pallid sturgeon. The pollutants likely to be discharged by the facility and the proposed effluent limits for the pollutants are noted in the draft NPDES permit and Fact Sheet attached to the EIS. These limits should ensure no effect on the pallid sturgeon.

Determination

EPA's issuance of an NPDES permit or any of the other effluent discharge alternatives would have "no effect" on the pallid sturgeon or its habitat. This determination is based on EPA's finding that refinery effluent discharged through an NPDES permit would be discharged to a tributary of the East Fork of Shell Creek where there are no pallid sturgeons. Likewise, there are no pallid sturgeons in the East Fork of Shell Creek. By the time the discharge reaches Lake Sakakawea, the discharge will be diluted to the extent that it would have no effect on the species or its habitat. In addition, the NPDES permit would ensure that the discharged water is of such quality that it would have no effect on the pallid sturgeon or its habitat. Stored, land applied, or reinjected water would have no effect on the pallid sturgeon or its habitat.

Dakota Skipper

Species Description

The Dakota skipper butterfly inhabits fragments of high-quality tallgrass and mixed grass prairies. As both a larva and as an adult, it feeds on specific plants found in low and upland prairie habitats.

Analysis of Effects from Proposed Refinery Construction and Operation and the Proposed NPDES-Permitted Effluent Discharge

The Dakota skipper is a candidate species. Historically, the butterflies were found in grasslands in the north-central U.S. and south-central Canada. Currently, the butterflies are found in remnants of high quality native prairie containing a high diversity of wildflowers and grasses. Dakota skipper habitat is very restricted in selection, as feeding of both larval and adult stages is limited to low prairie and upland prairie habitats. The nearest extant metapopulation located on Reservation lands is within McKenzie County, a significant distance west of the project area. Because a significant portion of the project area has been tilled for agricultural uses, only remnant tracts of mixed-grass prairie exist around the edges of wetlands, ditches, and section lines. Because of the small patch sizes of these habitats, it is not believed that any of these existing tracts would be of a size or contain the right diversity of plant species consistent with niche habitat patch requirements. In addition, construction activities associated with linear infrastructure would be constructed within previously disturbed ROWs. Therefore, it is highly unlikely that any extant metapopulations of Dakota skipper would exist in proximity to these disturbed habitats.

Determination

Implementation of the proposed refinery construction and operation action or the NPDES-permitted effluent discharge action would have "no effect" on the Dakota skipper. This determination is based on the lack of project actions that would disturb or remove any required habitat for the Dakota skipper and that it is highly unlikely that any extant metapopulations of Dakota skipper would exist in proximity to the project area.

4.8.1.5 Wildlife, Birds and Aquatic Species Ecological Risk Evaluation

This section evaluates risk to wildlife from air emissions resulting from the proposed alternative and all other construction options during the operation of the refinery through application of a food chain model. For the purpose of this ecological risk evaluation, four areas of interest were examined. See Figure 4-1 for the locations that were analyzed in the food chain model (through air deposition).

- Maximum air concentration was modeled at location R-1 – Located along the process area fenceline to the southeast
- Maximum soil concentration was modeled at location R-2 – Located along the process area fenceline to the northwest
- Farmhouse location – the nearest residence outside the refinery site was modeled to determine soil concentrations from air deposition.
- Forage Location – location within the site boundary where forage for buffalo may be grown in the location of highest expected deposition of chemicals, and where wildlife may be expected to graze.

Receptor locations for areas of possible impact were identified from aerial photos and maps; locations are shown respective to the 16 facility emission sources (units within the refinery) and process boundary on Figure 4-1. Soils concentrations of each HAP were modeled at each of the four locations in the Industrial Risk Assessment Program Human Health (IRAP-h) View model according to methods described in Section 4.16 of the FEIS. Soil concentrations were calculated from the wet and dry deposition rates of chemicals emitted as a vapor and chemicals emitted as particles or bound to particles. Deposition rates were determined in the air dispersion model from the cumulative emissions from the 16 sources. At each of the four receptor locations, the maximum soil concentrations were conservatively assumed to represent the lifetime exposures of each ecological receptor.

To assess the potential for refinery emissions to adversely affect ecological receptors, maximum concentrations of chemicals in soils at each of these areas were compared to applicable ecological screening values (Table 4-12).

Screening values from the following four sources were used in the evaluation:

- Oregon Department of Environmental Quality (ODEQ) Level II Screening Level Values (ODEQ 2001). Where sufficient data are available, ODEQ publishes receptor-specific soil screening level values for plants, invertebrates, birds, and mammals. However, for three of the four TAT refinery HAPs modeled, ODEQ has published mammalian values only. Mammalian values are based on exposure to an unspecified mammal via incidental soil ingestion, assuming a diet of 10% soil.
- EPA Region 5 (EPA 2003b) Ecological Screening Levels. Values are based on exposure to the masked shrew (*Sorex cinerus*).

- EPA Region 4 (EPA 2001b) Ecological Screening Values. Values for the TAT HAPs are based on Beyer (1990) and Dutch Target Values (MHSPE 1994).
- Toxicity Reference Values from EPA's *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1999); includes values developed to protect terrestrial plants and soil invertebrates.

Estimated maximum soil concentrations were all well below (i.e., at least four orders of magnitude or 10,000 times) applicable ecological screening values (Table 4-12). While some uncertainty arises from the fact that available screening values are primarily based on exposures to mammals only, effects to other terrestrial receptors such as birds, plants, and invertebrates are unlikely given the magnitude of estimated maximum soil concentrations. These contaminant concentrations would not be detectable using standard analytical methods.

To confirm that the estimated maximum soil concentrations are unlikely to adversely affect terrestrial receptors other than mammals, an analysis of screening values was conducted for chemicals other than the four principal chemicals of concern. EPA has developed Ecological Soil Screening Values (EPA 2007) for 19 chemicals, including 14 metals and five organics. Where data are available, EPA publishes four receptor-specific Ecological Soil Screening Levels (Eco-SSL) per chemical, developed to protect, plants, invertebrates, birds, and mammals. For six of the 19 chemicals for which Eco-SSLs have been published, values are available for all four receptors, and for 18 of the 19 chemicals, values are available for at least two receptors. An analysis of Eco-SSL values indicates that, for any given chemical, Eco-SSLs for all the various terrestrial receptors are typically within two orders of magnitude, and are always within three orders of magnitude, of each other. A similar analysis conducted on ODEQ (2001) values for volatile and semivolatile organics indicates that, with the exception of two phthalate compounds, screening values for different terrestrial receptors are also always within three orders of magnitude of each other. Thus, given that estimated maximum soil concentrations are at least four orders of magnitude less than the available screening values, refinery operations are unlikely to adversely affect terrestrial receptors.

4.8.2 Construction Alternatives

4.8.2.1 Alternative 2 — Transfer to Trust, No Refinery

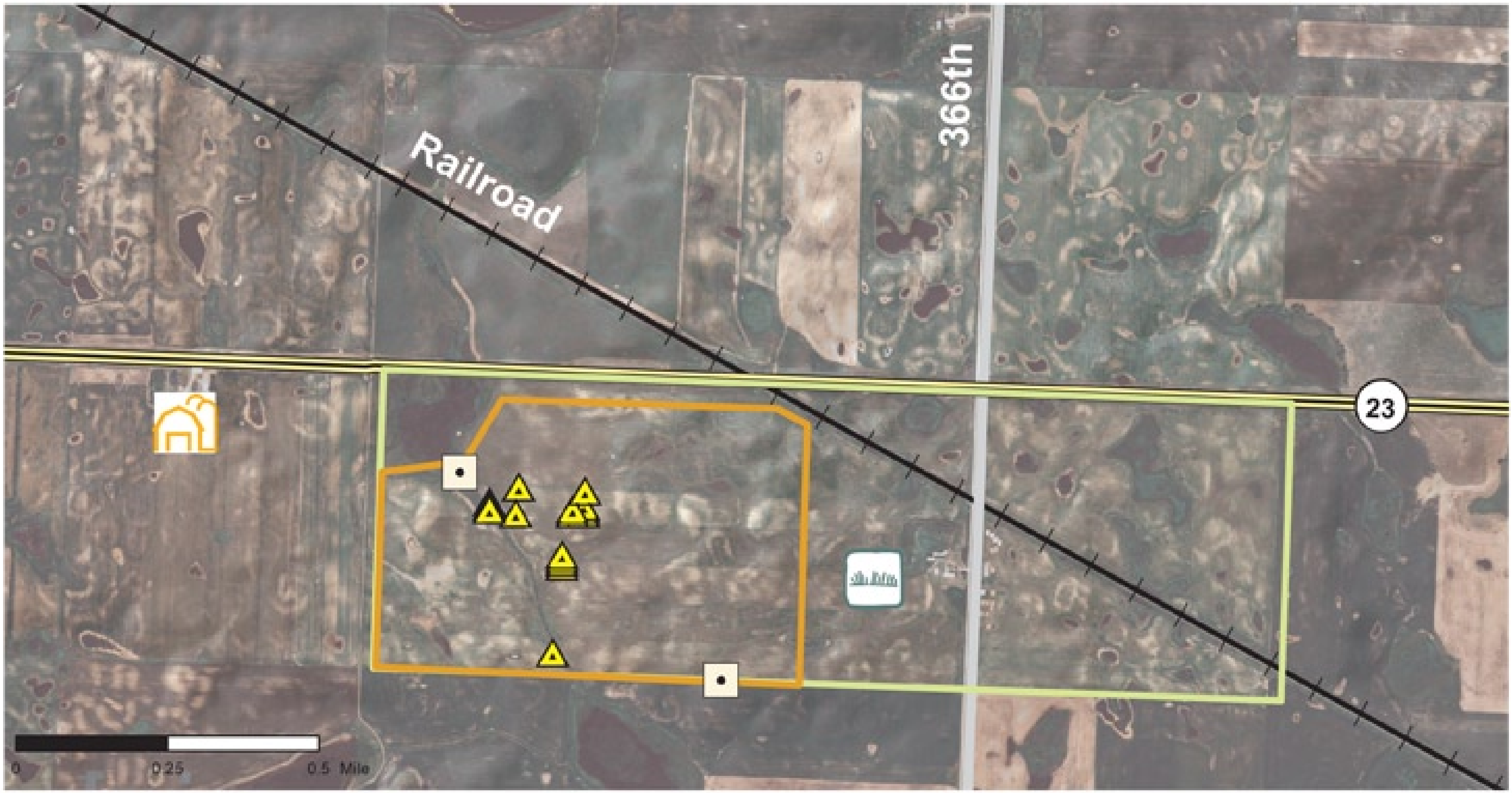
Under this alternative, the entire 468.39-acre site would be accepted into trust status, but construction and operation of the project would not go forward. Therefore, the 468.39-acre project site would most likely continue to be used for agricultural purposes, which have occurred for decades. The MHA Nation could decide to use the entire project site to produce forage for buffalo or the land could be included in a tenant farm-leasing program. Based on the foregoing, impacts to wildlife would be similar to the existing conditions.

4.8.2.2 Alternative 3 – No Transfer to Trust, Refinery Constructed

Under this alternative, the magnitude and type of effects would be similar to those presented under Alternatives 1 and A.

4.8.2.3 Alternative 4 — Modified Proposed Action

Implementation of this alternative would result in effects similar to those as described in Alternatives 1 and A. The pipelines and power lines would be constructed the same as Alternative 1. The revised site layout avoids disturbing most of the wetland PEMF#2 and replaces wastewater storage ponds with tanks, resulting in some changes in impacts to wildlife. Avoiding the wetland, retains 0.5 acres of wetlands habitat; however the habitat would be located within the refinery site. The replacement of wastewater holding ponds with tanks would reduce the "shore" like and pond areas that may be attractive to waterfowl and plovers. There would still be fire ponds and an evaporation pond under this alternative. In order to minimize impacts to piping plovers and other water birds, these ponds would have to be lined with cobbles not gravel. This alternative would have the most continuous flow which could cause a shift in aquatic organisms to more water dependent species within the wetland system.



Proposed MHA Nation Refinery Site

Legend

- Emissions locations
- Farmer Receptor Location
- Forage Receptor Location
- Modeled Maximum Deposition Locations
- Refinery Process Area
- Entire Parcel Boundary
- Highway
- Streets
- Railroads

2005-07-19, "Airphoto USA",
1:12000, 1.0m resolution

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Sources:
The base map used for this figure is based on the US Census Bureau's 2000 TIGER Data. EPA makes no claims regarding the accuracy, precision, or use of this locational data. Questions concerning the locational data should be referred to the US Census Bureau or other source agencies. The highways and railroads data came from data sets purchased from GDT (Geographic Data Technology). This is proprietary data and cannot be distributed except by GDT. Other data comes from EPA Project personnel and other EPA sources.

Table 4-12 Comparison of Maximum Cumulative Soil Concentrations to Ecological Screening Values

Chemical of Interest	Maximum Cumulative Soil Concentration[A] (mg/kg)	ODEQ Level II Screening Level Value for Plants[B] (mg/kg)	ODEQ Level II Screening Level Value for Mammals[C] (mg/kg)	EPA Region 5 Ecological Screening Level[D] (mg/kg)	EPA Region 4 Ecological Screening Value[E] (mg/kg)	EPA SLERAP TRV for Terrestrial Plants[F] (mg/kg)	EPA SLERAP TRV for Soil Invertebrates[G] (mg/kg)
Farmhouse							
Benzene	1.8740E-009	NA	3.30E+03	2.55E-01	5.00E-02	NA	NA
Benzo(a)pyrene	1.0225E-006	NA	1.25E+02	1.52E+00	1.00E-01	1.20E+00	2.50E+01
Formaldehyde	7.2537E-005	NA	3.90E+03	NA	NA	NA	NA
Toluene	7.8083E-009	2.00E+02	1.44E+03	5.45E+00	5.00E-02	NA	NA
Forage Location							
Benzene	3.4028E-009	NA	3.30E+03	2.55E-01	5.00E-02	NA	NA
Benzo(a)pyrene	1.8313E-006	NA	1.25E+02	1.52E+00	1.00E-01	1.20E+00	2.50E+01
Formaldehyde	1.3176E-004	NA	3.90E+03	NA	NA	NA	NA
Toluene	1.4194E-008	2.00E+02	1.44E+03	5.45E+00	5.00E-02	NA	NA
RI_1							
Benzene	6.8018E-009	NA	3.30E+03	2.55E-01	5.00E-02	NA	NA
Benzo(a)pyrene	4.4999E-006	NA	1.25E+02	1.52E+00	1.00E-01	1.20E+00	2.50E+01
Formaldehyde	2.6312E-004	NA	3.90E+03	NA	NA	NA	NA
Toluene	2.8359E-008	2.00E+02	1.44E+03	5.45E+00	5.00E-02	NA	NA
RI_2							
Benzene	1.5850E-009	NA	3.30E+03	2.55E-01	5.00E-02	NA	NA
Benzo(a)pyrene	1.1287E-005	NA	1.25E+02	1.52E+00	1.00E-01	1.20E+00	2.50E+01
Formaldehyde	6.1392E-005	NA	3.90E+03	NA	NA	NA	NA
Toluene	6.6283E-009	2.00E+02	1.44E+03	5.45E+00	5.00E-02	NA	NA

Notes:

[A] Calculated from the cumulative emissions of 16 sources in the air dispersion modeling; further discussed in Section 4.16 of FEIS

[B] Based on Oak Ridge National Laboratory toxicity value for plants (ODEQ 2001).

[C] Based on exposure via incidental soil ingestion, assuming a diet of 10% soil (ODEQ 2001).

[D] Based on exposure to the masked shrew (*Sorex cinerus*) (EPA 2003b).

[E] Values are as published (EPA 2001b); value for benzene is based on MHSPE (1994), value for benzo(a)pyrene is based on Beyer (1990), and value for toluene is based on both MHSPE (1994) and Beyer (1990).

[F] Value from EPA (1999); based on chronic No Observable Adverse Effect Level (NOAEL) for wheat.

[G] Value from EPA (1999); based on chronic NOAEL for woodlouse (*Porcellio scaber*).

4.8.2.4 Alternative 5 – No Action

Under this alternative, the 468.39-acre site would not be accepted into trust status. Therefore, the 468.39-acre project site would continue to be used for agricultural purposes, which have occurred for decades. The types of direct and indirect effects occurring from agricultural activities to wildlife that have occurred over decades would continue under existing conditions.

4.8.3 Effluent Discharge Alternatives

4.8.3.1 Alternative B —Partial Discharge through an NPDES Permit and Some Storage and Irrigation

Under this alternative, surplus treated wastewater would be disposed of through land application to irrigate trees and crops on the project site, as practicable; otherwise, there would be discharge through NPDES permitted outfalls. Since most of Sections 19 and 20, Township 152 is already used in an agricultural crop rotation, no additional impacts are expected to occur to wildlife species, as long as wastewaters are properly treated prior to land application.

Unlike Alternative 1and A, this alternative would involve irrigating crops potentially consumed directly by humans or crops used as forage for livestock that would be consumed by humans. These same crops may provide forage for wildlife that utilize the irrigated parcel. As a result, there is a potential for exposure to wildlife from contaminants in wastewater via food chain exposure pathways. Potential plant uptake of certain contaminants present in irrigated wastewater may result in accumulation of contaminants in soils or plant tissues at concentrations greater than those present in wastewater. In particular, uptake and storage of metals, such as mercury, chromium, and lead, in plant tissue could potentially pose a risk to wildlife that consumed crops irrigated with wastewater from the refinery.

While it is unclear if these scenarios will occur, they represent an uncertainty that has not been quantitatively evaluated, and must be considered when evaluating each alternative. Until such time as a quantitative analysis of the potential risks posed by discharge of refinery wastewater via irrigation of crops has been performed using actual site-specific data, it cannot be determined that alternative B will be protective of human health and the environment. Therefore, refinery wastewater effluent should not be used to irrigate food chain crops until a quantitative risk assessment is conducted.

The refinery wastewater is considered to be (by definition) a solid waste under RCRA. As such, all wastewater proposed to be used for irrigation should be treated to meet appropriate standards to protect human health and the environment. In addition, unless the wastewater is treated sufficiently, it will continue to be considered a solid waste containing hazardous waste constituents, and RCRA Corrective Action requirements would apply for the irrigated land parcel. This is because the irrigated land parcel would be considered a SWMU. Therefore, a RCRA TSD permit may establish additional treatment levels for irrigation water.

The determinations of effects on Threatened and Endangered species would be the same as described for Alternative 1 and A; “no effect" for: whooping cranes, interior least tern, gray wolf and pallid sturgeon; and "may affect, not likely to adversely effect" for the piping plover. Under Alternative B, piping plovers may use the irrigated parcel for forage. However, that parcel would not be used preferentially over other forage areas.

4.8.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this alternative, the MHA Nation would discharge all effluent from the WWTP to a Class I, Non-hazardous UIC well that would be drilled on the project site. Since the well would be finished deep below the ground surface, no additional impacts would occur to wildlife.

For Alternative C, reinjecting wastewater would have no effect on Threatened or Endangered species.

4.8.3.3 Alternative D — No Action

Under this alternative, the proposed refinery would not be constructed. Thus, no discharges of water of any kind would be permitted and no additional impacts would occur to wildlife.

4.8.4 Cumulative Impacts

The primary economy in the region is derived from agriculture. Therefore, agricultural activities are a leading cause of habitat loss within the project area and the region. Much of the rural settlement and development of agriculture took place in this area after the construction of the railroad to Plaza, which was in the early 1900s. The location of the project area near Makoti and Plaza provided access to major agricultural markets by way of the railroad. Therefore, significant conversion of mixed-grass prairie occurred in this region between 80 and 100 years ago.

Livestock grazing typically occurs in the hillier regions. Because of topographical relief, these areas generally preclude the ability to till the lands. These areas are generally west and north of the project area. It is not envisioned that a regional expansion of grazing would occur in the future.

Recreation occurs year-round in the cumulative-effects area. Primary activities are centered on both small and big game hunting. Increased human use of the project area over time can result in wildlife disturbance and, in the extreme, wildlife displacement. Because a significant amount of land is held in private ownership and the balance held in trust by BIA for individual Indians or the MHA Nation, it is not envisioned that construction of the refinery and appurtenant linear facilities would attract additional hunting activities nor would it open up more land to recreation and hunting than is currently allowed by the land owners.

4.9 Cultural Resources

4.9.1 Alternatives 1 and A — Original Proposed Actions

Implementation of Alternatives 1 and A are not expected to substantially affect cultural resources in the project area. The till plain and pothole setting of the project area has soils that are generally good for cultivation, but support a comparatively low diversity of natural resources. These conditions correspond to a low potential for prehistoric or historic cultural resources other than readily visible farm complexes.

The North Dakota SHPO (Swenson 2005) and the Cultural Preservation Office of the Three Affiliated Tribes (Crows Breast 2005) have reviewed the available information for the project area. Both offices have concurred that there is a low potential for significant cultural resources in the project area, and both have recommended a determination of no historic properties affected. The farm complex near the refinery site would not be affected by the proposed action and the farm complexes near the pipeline and power line corridors can be avoided.

The primary affect resulting from implementation of these alternatives would be modification of the old Soo Line Railroad branch line that runs through the property. The line itself would not be moved or removed, but a new siding would be constructed from the line into the refinery. This addition would not adversely impact the historic character of the rail line. The farm house and outbuildings would not be disturbed for construction of the refinery or production of the forage for buffalo.

Under these alternatives, the year-round effluent discharge of 10 gpm would equal 5.25 million gallons or about 16 acre-feet discharged annually into the drainage ditch and ultimately into the wetland PEMF#2 and the tributary to the East Fork of Shell Creek. This discharge of effluent is not expected to affect cultural resources. The locations of the outfalls were disturbed previously. Therefore, construction of the outfalls would not affect cultural resources. The discharges of effluent also would not affect cultural resources.

4.9.2 Construction Alternatives

4.9.2.1 Alternative 2 — Transfer to Trust, No Refinery

Implementation of this alternative would not affect cultural resources. The refinery would not be constructed, so no potential would exist for disturbance to prehistoric or historic cultural resources. Additionally, the production of forage for the MHA Nation's herd of buffalo would not involve a change from current land uses. Thus, the continued agricultural use of the project site would not affect any cultural resources potentially present on the site.

4.9.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Implementation of this alternative would result in the same effects as described for Alternatives 1 and A. The same refinery, pipelines, and power lines would be constructed, so effects attributed to these facilities would be the same. BIA's decision to not accept the project site into trust status would not affect the MHA Nation's proposal for use of the property for refining oil and producing forage for buffalo. Consequently, the effects would be the same as those described for Alternatives 1 and A.

4.9.2.3 Alternative 4 — Modified Proposed Action

Implementation of this alternative would result in the same effects as described in Alternatives 1 and A. The revised site refinery layout, pipelines and power lines would be constructed, so effects attributed to these facilities would be the same.

4.9.2.4 Alternative 5 — No Action

Implementation of this alternative would result in no effects to cultural resources. The refinery, pipelines, and power lines would not be constructed, so no potential would exist for disturbance to prehistoric or historic cultural resources. Additionally, current uses of the project site would continue into the future, so no changes in effects to cultural resources would occur from continued agricultural use.

4.9.3 Effluent Discharge Alternatives

4.9.3.1 Alternative B — Partial Discharge through an NPDES Permit and Some Storage and Irrigation

With this alternative, the Project would irrigate when possible, but also would be able to discharge when conditions for irrigating are not optimal. For the reasons discussed for Alternatives A, no effects to cultural resources are expected from the implementation of this alternative.

4.9.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this alternative, the MHA Nation would discharge all effluent from the WWTP to a Class I, Non-hazardous UIC well that would be drilled on the project site. Because the well would be drilled at a location that already is disturbed, no additional impacts would occur to cultural resources.

4.9.3.3 Alternative D — No Action

Under this alternative, the proposed Refinery would not be constructed. Thus, no discharges of water of any kind would be permitted and no impacts would occur to cultural resources.

4.9.4 Cumulative Impacts

Cumulative effects to cultural resources are expected to be negligible. No other projects or activities have been identified in the project area that could cumulatively contribute to adverse effects to cultural resources.

4.10 Land Use

This section discusses the effects to existing land uses that are anticipated to occur from implementation of the alternatives.

4.10.1 Alternatives 1 and A — Original Proposed Actions

4.10.1.1 Project Site

Under these alternatives, BIA would accept the project site, which the MHA Nation purchased from a private landowner, into trust status. With the project site in trust status, MHA Nation would be able to supplement their existing land base within the Fort Berthold Reservation Boundaries and no longer pay taxes to a non-Indian government. The trust land would be exempt from property taxes paid to the Ward County government, which would lose an estimated $1,960 per year of property taxes. All other lands adjacent to the parcel are privately owned.

There would be no other impacts on existing land ownership or management status from the siting, construction, and operation of the refinery, as it would affect only trust lands owned by the MHA Nation. The croplands surrounding the project site would continue under existing land uses and zoning. Because there are no current plans for other types of development (such as subdivisions) in the immediate vicinity of the project, no long-term impacts to planned land uses on lands surrounding the project site are expected from the construction and operation of the refinery. It is anticipated that the refinery facilities would be constructed on the western portion of the property. Croplands in the eastern portion of the property would be used for the production of forage crops for buffalo.

Short-term disruption during construction from the physical intrusion of the crew and equipment, the generation of dust and noise, and the obstruction of traffic would affect one residence located on the northwest side of the project site. The residence would be affected primarily by noise generated by construction activities, although there would be some air quality impact from dust generated by construction activities and pollutants generated by refinery operations. Other residences along Highway 23 could be affected by construction traffic.

The project site is privately owned and is not used for any recreational activities. In addition, no noteworthy recreational use occurs on or near the project site. Dispersed activities, such as hunting, do occur on lands within the Reservation, however it is primarily on non-crop lands. Recreational activities on the Reservation would not be affected by the construction and operation of the refinery.

Access into the project site from Highway 23 would be provided via a new access road. The proposed access road would be entirely within the project site and used only for access to the project site. There would be no disruption to land uses outside of the project site from construction of the access road. Traffic on Highway 23 would be temporarily disrupted at the junction with the access road by construction activities, and from construction traffic entering and exiting Highway 23.

Access to the power lines and pipeline rights-of-way would be from existing roads, which consist of local and county roads, and the C.P.R. rail line. Because no new access roads would be constructed and the pipelines and power lines would be constructed along existing linear rights-of-way, no existing land uses would be affected.

The effluent discharge outfalls associated with Alternative A would fall within the disturbance footprint of the refinery and would not cause a change in land use.

4.10.1.2 Electric Power Lines

Land ownership along the entire power line ROW is private. If necessary, easements for the power lines on private lands would be negotiated with the landowners. The proposed power lines that would not be in a road ROW would be located along the section lines.

During the construction phase of the project, existing land uses would be temporarily disrupted while the line is constructed. Short-term disruption during construction would consist of the physical intrusion of the crew and equipment, the generation of dust and noise, and the possible short-term obstruction of traffic at road crossings. The small area surrounding each pole structure would be permanently removed from existing uses. There would be no change, and therefore no long-term impact to other existing land uses within or adjacent to the proposed power line ROW.

There would be no impact to recreational opportunities in the project area from the construction and operation of the proposed power lines. The lines would be located within or along existing county road rights-of-way adjacent to privately owned croplands. The affected roads do not provide access to developed recreational areas or opportunities.

4.10.1.3 Pipelines

The natural gas and crude oil pipelines would be constructed along existing rights-of-way for roads and the C.P.R. rail line. Because the pipelines would be buried in existing rights-of-way, they would not affect existing land uses once they are installed. During construction, some minor disruptions of land use may occur within the rights-of-way; however, they would be short-term. Reclamation of the rights-of-way would return them to their previous uses.

There would be no impact to recreational opportunities in the project area from the construction and operation of the proposed pipelines. The pipelines would be located within or along existing county road rights-of-way adjacent to privately-owned croplands. The affected roads do not provide access to developed recreational areas or opportunities.

4.10.1.4 Crude Oil Storage Tanks

Construction of the four storage tanks along Enbridge's existing pipelines would not affect any current land uses. The tanks would be constructed within Enbridge's existing, fenced facilities. Other storage tanks already exist on all four sites.

4.10.2 Construction Alternatives

4.10.2.1 Alternative 2 — Transfer to Trust, No Refinery

Implementation of this alternative would result in minimal effects to land use. Without the refinery, the entire project site would be devoted to agricultural uses, similar to those that have been occurring on the site for decades. Additionally, no changes to land uses along the rights-of-way for the power lines and pipelines discussed under Alternatives 1 and A would occur.

Under this alternative, BIA would accept the project site, which the MHA Nation purchased from a private landowner, into trust. With the project site in trust, MHA Nation would be able to supplement their existing land base within the Fort Berthold Reservation boundaries and no longer pay taxes to a non-Indian government. The trust land would be exempt from property taxes paid to the Ward County government, which would lose an estimated $1,960 per year of property taxes.

4.10.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Implementation of this alternative would result in effects to land use similar to those described for Alternatives 1 and A. Overall, the effects to land use resulting from construction of the refinery would be as described for alternative. The one exception would involve the project site. With the project site not accepted into trust status by BIA, the land would not be exempt from property taxes paid to Ward County. In fact, Ward County would reassess the property and the MHA Nation would pay substantially higher property taxes than the most recent assessment of $1,960.

4.10.2.3 Alternative 4 — Modified Proposed Action

Implementation of this alternative would result in the same effects as described in Alternatives 1 and A. The revised site refinery layout, pipelines and power lines would be constructed, so effects attributed to these facilities would be the same.

4.10.2.4 Alternative 5 — No Action

Implementation of this alternative would not affect land use. The refinery would not be constructed, and BIA would not accept the project site into trust status. Consequently, land uses on and around the project area would continue as they currently exist, and the MHA Nation would continue to pay taxes to Ward County.

4.10.3 Effluent Discharge Alternatives

Implementation of the effluent discharge alternatives is not expected to result in more than negligible effects to land uses.

4.10.3.1 Alternative B — Partial Discharge through an NPDES Permit and Some Storage and Irrigation

The irrigation associated with this alternative would not change the existing agricultural use of the land, unless the wastewater was not adequately treated or high salinity water was used for irrigation. If inadequately treated wastewater was applied, the irrigation site could become classified as a RCRA hazardous waste LTU. If the irrigated land parcel were to be classified as a LTU, additional land use restrictions would apply.

4.10.3.2 Alternative C — Effluent Discharge to an UIC Well

The UIC well associated with this alternative would fall within the disturbance footprint of the refinery and would not cause a change in land use.

4.10.3.3 Alternative D — No Action

Alternative D would not result in any discharges of effluent or effects to land uses.

4.10.4 Cumulative Impacts

Cumulative effects to land uses from implementing any of the alternatives are expected to be minimal. The project area is rural and agricultural in nature and that situation is not expected to change with the construction and operation of the proposed refinery. Consequently, no projects have been identified where their effects would overlap in time or space with the effects of the alternatives analyzed here. Without projects or activities that have effects that overlap with the effects of the alternatives analyzed in this EIS, no cumulative effects would occur.

4.11 Transportation

4.11.1 Alternatives 1 and A — Original Proposed Actions

Implementation of Alternative 1 would noticeably affect transportation around the project site (segment of Highway 23 between the turnoffs to Parshall and Makoti). The refinery would increase weekly commercial truck traffic by almost 30 percent. Traffic associated with cars would increase by a similar amount. As distance increases east and west from the project site, the effects of the additional traffic would decrease until they would not be detectable.

The addition of the access road to Highway 23 and increase in traffic would inevitably lead to an increase in accidents along Highway 23 where it adjoins the project site. The addition of trucks accelerating, decelerating, and turning along this segment of the highway would increase the potential for additional accidents. The greatest potential for accidents would likely occur during changes of shifts at the refinery. The addition of traffic control lights and nighttime lighting would help minimize the potential for increases in accidents.

Relatively small levels of directs effects to the primary access routes within the Project Area including State and County roads would occur as a result of the project-related vehicular traffic associated with implementation of any of the alternatives. The primary impacts identified are minimal increases in daily traffic and associated slight increases in risk of accidents during construction and operation of the refinery. Secondary impacts may include increased road wear on Highway 23 and additional county feeder routes.

The direct and indirect transportation effects would include an increased risk of traffic accidents in proportion to the amount of increased daily traffic for each of the alternatives for constructing and operating the refinery. The potential for an increase in accidents would be most significant during the construction phase. The rates of traffic accidents would most likely rise due to the increase in the volume of traffic, which is not expected to be significant.

Increased degradation of existing roadways may result from construction and operation of the refinery when the incremental effects of the proposed refinery traffic are added to the daily vehicle trips. Once the refinery is operational, worker and product tanker truck daily trips would account for the majority of refinery vehicle trips. Heavy truck traffic would result in increased costs for road maintenance because heavy trucks result in more damage to road surfaces relative to automobiles and light trucks.

There would be no increase in the miles of road open to the public on Indian, State, or private lands, as all proposed access roads on private lands would be closed under all alternatives. Therefore, implementation of the Project would not result in significant traffic congestion or accident rates in the region.

The effluent discharge outfalls associated with Alternative A would fall within the disturbance footprint of the refinery and thus would not in and of themselves cause a change in transportation around the project site.

4.11.1.1 Transportation Spills

Risk from flammable materials (e.g., gasoline) is driven by frequently occurring accidents that involve low numbers of injuries and fatalities. These types of accidents are called high-probability/low-consequence events. Historical records contain information on many gasoline incidents.

4.11.1.2 Accident Rates

Accident rates are determined by analyzing historical data. To compare the risks that result from transporting various hazardous materials, Brown et al. (2000) conducted a National Transportation Risk Assessment (NTRA) to define the risks associated with rail and highway transportation of hazardous materials in the United States. At the center of their study was a detailed risk assessment for the national transportation of (1) six toxic-by-inhalation (TIH) chemicals, (2) liquefied petroleum (LP) gas, (3) gasoline, and (4) explosives. Results from their study provide a basis for comparison of the transportation risks associated with various hazardous material classes, container types, and transportation modes. The results of their risk assessment study for these chemicals, together with historical data, are provided on Table 4-13.

As summarized on Table 4-13, more than 40,000 Americans die each year and several hundred thousand are injured in transportation-related incidents, mainly from motor vehicle accidents. However, results of their study also show that compared to the other types of transportation risks encountered by the public, the overall risks due to the transportation of hazardous materials is relatively low. Specifically, a small number of the annual traffic fatalities and injuries result from the unintentional release of hazardous materials during transport. As detailed on Table 4-12, during each of the past 15 years, approximately 11 people died as a result of fires that occurred in gasoline-truck accidents, (with truck drivers accounting for approximately 7 of the 10 deaths). Also, the results of their study show that approximately 18 fatalities and 122 injuries would occur on average each year from the combined unintentional releases resulting from highway and rail transportation of all HAZMAT materials including highway transportation of LP gas, gasoline, and explosives.

Table 4-13 Comparisons of Risks Calculated in This Study with Other Transportation-Related Risks in the United States

Risk Type	10-Yr Period Fatalities	10-Yr Period Injuries	Annual Fatalities	Annual Injuries
Risks primarily due to trauma				
Motor vehicles, including large trucks	416,160	22,500,000	41,616	2,250,000
Large trucks	50,877	1,327,000	5,087	132,700
Large trucks carrying HAZMAT	2,500	66,000	250	6,600
Rail accidents (grade crossing)	5,439	16,905	544	1,691
Rail accidents (nongrade crossing)	5,860	163,377	586	16,338
Risks due to hazardous material releases only				
Gasoline transportation	108	205	11	21
Highway LP gas transportation	42	154	4.2	15
Explosives transportation	4.9	14	0.5	1.4
TIH highway accidents	3.8	149	0.4	15
TIH highway en route/non-accidents	0.7	36	0.1	3.6
TIH highway derailments	16	559	1.6	56
TIH rail en route/non-accidents	2	103	0.2	10
Total TIH materials transportation	23	846	2.3	85
Total highway risk for HAZMAT releases	160	558	16	56
Total rail risk for TIH material releases	18	662	1.8	66
Total risk of HAZMAT releases considered in study	178	1,219	18	122

Source: Brown et al. 2000

4.11.1.3 Bulk Liquids

Brown et al. (2000) also estimated release probabilities for bulk liquefied gases using commodity flow and historical release data for gasoline including aviation fuel, distillate fuel oil and sulfuric acid. The results of their analysis for these materials are provided on Table 4-14.

Table 4-14 Release Probability Analysis for Bulk Liquids

Primary Container Type[1]	Commodity	Annual Commodity Flow (MTM)	Average Cargo Capacity (Gal)	Average Shipment Weight (tons)	Annual Truck Miles ($x10^6$)	Accident Rate (per 10^6 Mi)	No. of Accidents	No. of Releases	Release Probability
MC 306	Gasoline/ aviation fuel	17,000	8,500	25	690	2.5	19,000	1,125	0.06
MC 306	Fuel oil	6,600	7,000	21	310	3.0	11,000	720	0.07
MC 312	Sulfuric acid	2,700	4,000	28	96	1.3	1,400	53	0.04

Note:
1. Gasoline and fuel oil were used in estimating release probabilities for MC 306 cargo tanks, whereas sulfuric acid was used in estimating the release probability for MC 312 cargo tanks.

Source: Brown et al. 2000

As summarized on Table 4-14, the release probabilities for transporting gasoline, fuel oil, and sulfuric acid are equal to 0.06, 0.07, and 0.04, respectively. In considering these results, the annual commodity flow when compared to the accident rates for gasoline/aviation fuel is in the middle of the results. The total number of releases and accidents resulting from gasoline/aviation fuel transportation exceeds that of fuel oil and sulfuric acid by a large margin. However, this is a direct result of the high commodity flow for gasoline relative to other materials considered.

In summary, total transportation-related injury risk for gasoline is relatively low. The accident rate for 1 million truck miles is equal to 2.5. Or stated another way, of the 690 million truck miles drive annually, about 19,000 accidents occur with about 1,125 resulting in releases. Based on the foregoing, the transportation of gasoline which results in a spill is a low consequence event. It is important to note the transportation of gasoline materials has the highest total fatality risk in comparison to the other materials. While someone is more likely to be injured as a result of a transportation-related TIH release, that same person is more likely to be killed as a result of a gasoline or LP-gas related incident.

4.11.2 Construction Alternatives

4.11.2.1 Alternative 2 — Transfer to Trust, No Refinery

Implementation of this alternative would not detectably affect transportation resources. Without the construction and operation of the refinery, no real increase in traffic would occur. The project site would experience some additional traffic as the MHA Nation produces forage and transports that forage off the site to its herd of buffalo. However, the increase in traffic would be minor and widely dispersed over time.

4.11.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Implementation of this alternative would result in effects that would be the same as described for Alternatives 1 and A. The same level of traffic would occur with the MHA Nation's construction and operation of the refinery. The same level of traffic associated with the production and transport of forage for the buffalo would also occur.

4.11.2.3 Alternative 4 — Modified Proposed Action

Implementation of this alternative would result in the same effects as described in Alternatives 1 and A. The revised site refinery layout, pipelines and power lines would be constructed, so effects attributed to these facilities would be the same. Wastewater from employee facilities (e.g. restrooms) may be hauled to Minot or another municipal WWTP. There would be 1 to 2 additional trucks per week to haul sanitary wastewater under this option.

4.11.2.4 Alternative 5 — No Action

Implementation of this alternative would result in no effects to transportation resources. The refinery would not be constructed, so the increase in traffic associated with that facility would not occur. Additionally, agricultural use of the project site would continue. Therefore, no change in traffic would occur.

4.11.3 Effluent Discharge Alternatives

The three effluent discharge alternatives (Alternatives B, C, and D) would have no effects on transportation. All three alternatives involve the discharge of effluent to surface or ground waters. None of these alternatives would involve any of the components of the refinery that would affect transportation. Therefore, none of the additional effluent discharge alternatives would affect transportation.

4.11.4 Cumulative Impacts

The refinery is predicted to increase traffic in the immediate area by approximately 30 percent. Existing usage of the transportation system surrounding the proposed site is generally low. Currently, Highway 23 is used by residents of nearby communities, travelers to New Town and for transporting agricultural goods and equipment. Existing uses of the transportation system are anticipated to continue at the same level. No other projects have been identified in the area which would increase traffic or rail use. The cumulative impacts to the transportation system, combining the proposed refinery with existing usage are not expected to be significant.

4.12 Aesthetics

Impacts to visual resources from the development of the refinery would result from changes to the physical setting and visual content of the landscape, and from effects on the landscape as viewed from sensitive viewpoints, including travel routes, recreation areas, and residences. The proposed facilities and associated access roads would introduce new elements into the landscape, and would alter the existing form, line, color, and texture which characterize the existing landscape.

4.12.1 Alternatives 1 and A — Original Proposed Actions

Project Site

The refinery would be apparent on the existing landscape and would be in the foreground to background distance zones as viewed by people on county roads, Highway 23, rural residences, and Makoti. The refinery buildings in the foreground distance zone of up to 1 mile from the refinery site would be viewed by people on Highway 23, surrounding county roads, and rural residences. The geometric, rectangular block forms of the refinery buildings would dominate the landscape for those viewers nearest to the site, such as the residence on the north side of the site and on county roads near the site. These county roads are used primarily by residents of the area, and there are a small number of residents and travelers on local roads that would view the refinery in the foreground distance zone of the landscape.

There are similarly a very small number of potential viewers in the middleground distance zone between 1 and 3 miles surrounding the refinery site. The refinery buildings would be visible from some residences, although at a 1- to 5-mile distance the refinery buildings would not dominate the landscape viewed by the residents

Beyond a 5-mile radius, the refinery buildings would be in background views, and would be indistinct to viewers in rural residences located throughout the area. The geometric, rectangular block forms of the refinery would be visible in the background zone from the highway, but would be painted to harmonize with landscape colors, which would result in a low contrast with the surrounding landscape because the forms and lines of the buildings would be indistinct at a distance of 3 or more miles. The apparent size of the refinery at this distance relative to the scale of the surrounding landscape is small.

The most visible refinery facility from all viewpoints would be the exhaust stacks. The refinery would have two stacks that would be 180 feet tall and 20 feet in diameter, creating a strong linear, vertical form that would contrast with the surrounding flat, horizontal landscape and be obvious to viewers on the local county roads in the vicinity of the site and visible to nearby rural residences. The remaining six stacks would be 60 feet high and 12 feet wide. The smaller stacks would be similar in height to other refinery buildings, and would not be as obvious to viewers. The refinery would not include cooling towers; therefore there would be no visual impact from a steam plume emanating from the towers.

Refinery facilities would be lit at night to enhance the safety of project personnel and the public. Night-lighting would increase the visibility of project facilities to all viewpoints. The primary impact of night-lighting would be to increase the distance from which the proposed facilities would be visible. The light, glare or backscatter illumination visible to sensitive viewpoints would be minimized by the use of directional shielding of lights. The off-site visibility and potential glare of the lighting would be restricted by the screening structures to be placed around the facility's major equipment, specification of non-glare fixtures, and placement of lights to direct illumination into only those areas where it is needed.

The Federal Aviation Administration (FAA) requires that any permanent object exceeding an overall height of 200 feet above ground level or exceeding any obstruction standard contained in Federal Acquisition Regulations (FAR) Part 77 (Federal Aviation Administration 2000a) be lighted with a flashing lighting system. Because the flare stacks are 180 feet high and more than 3 nautical miles from the nearest airport (as per FAR Part 77), blinking safety lights would not need to be installed (Federal Aviation Administration 2000b).

The year-round effluent discharge, under Alternative A, of 10 gpm would equal 5.25 million gallons or about 16 acre-feet discharged annually into the drainage ditch and ultimately into wetland PEMF#2 and a tributary of the East Fork of Shell Creek. The outfalls would be located within the disturbance footprint of the proposed refinery. Therefore, the outfalls would be indistinguishable from the rest of the refinery. The discharge of effluent would increase flow in the wetland system increasing vegetation and ponded water, thereby changing the aesthetics. If the drainage has more water, it may appear to be greener than other wetlands in the area that periodically dry out.

4.12.1.1 Power Lines

Several effects to visual resources can result from the introduction of power lines into the landscape. The poles introduce straight, vertical lines and color contrasts. There may also be a glare when sunlight is reflected from the conductors.

Long-term impacts to the visual quality of the landscape result primarily from the addition of pole structures into the characteristic landscape. Short-term impacts would result from the construction of the lines. Construction activities, including the transport of materials on local roads, would be obvious to viewers during the construction period. For the duration of construction, the underlying landform colors of light tans and browns would be exposed during the installation of the pole structures. This would not be particularly obvious where the adjacent agricultural land is cultivated.

The power lines would be in the foreground of views seen by travelers on nearby county roads. The power lines would be obvious to viewers on the roads; however, local traffic is relatively sparse. While the power lines would be a new addition to the landscape that would require new ROWs on lands that have not previously been disturbed by any development other than agriculture, it would be viewed by only a small number of residents and travelers. Additionally, the characteristic landscape is common for the area and is not scenic landscape. The power lines would be isolated by distance from any areas that would be sensitive to changes in the landscape.

4.12.1.2 Pipelines

Impacts to visual resources from the construction and operation of the oil and gas pipelines would be primarily short-term and construction-related. Minimal visual impacts would be associated with clearing of vegetation because the existing rights-of-way contain disturbed vegetation from previous road and railroad construction. Once vegetation in the construction ROW is reestablished, the remaining permanent ROW would be similar in appearance to the existing rights-of-way. Once the pipelines are installed, the visual impacts resulting from construction would continue until vegetation has been reestablished on disturbed areas. The pipeline ROW, while visible, would not be a prominent feature in the landscape.

4.12.2 Construction Alternatives

4.12.2.1 Alternative 2 — Transfer to Trust, No Refinery

Implementation of this alternative would not result in any notable effects to aesthetics. The MHA Nation would not construct the refinery; therefore, none of the effects described for Alternatives 1 and A for the refinery, power lines, or pipelines would occur. Use of the project site for the production of forage for the MHA Nation's herd of buffalo would not result in effects to aesthetics. The project site is currently used for agricultural purposes. Thus, the continued use of the site for agricultural purposes would not cause any effects.

4.12.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Implementation of this alternative would result in the same effects to aesthetics as those described for Alternatives 1 and A. The MHA Nation would construct and operate the same refinery and produce forage for its herd of buffalo on the rest of the project site. No effects to aesthetic resources would result from BIA's decision to not accept the project site into trust status.

4.12.2.3 Alternative 4 — Modified Proposed Action

Implementation of this alternative would result in the same effects as described in Alternatives 1 and A. The revised site refinery layout, pipelines and power lines would be constructed, so effects attributed to these facilities would be the same.

4.12.2.4 Alternative 5 — No Action

Implementation of this alternative would result in no effects to aesthetic resources. The MHA Nation would continue to use the project site for agricultural purposes similar to those that currently occur on the site. Thus, no noticeable change in the aesthetics of the project site would occur.

4.12.3 Effluent Discharge Alternatives

4.12.3.1 Alternative B — Partial Discharge through an NPDES Permit and Some Storage and Irrigation

With this alternative, surplus treated wastewater would be disposed of through land application to irrigate crops or discharged through NPDES permitted outfalls. The effects associated with this alternative would be similar to the effects discussed for Alternative A. Effects due to irrigation would be visible, but those associated with the outfalls would not be detectable to casual observers.

4.12.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this alternative, the MHA Nation would discharge all effluent from the WWTP to a Class I, Non-hazardous UIC well that would be drilled on the project site. Because the well would be drilled within the disturbance footprint of the proposed refinery, no additional impacts would occur to aesthetics.

4.12.3.3 Alternative D — No Action

Under this alternative, the proposed Refinery would not be constructed. Thus, no discharges of water of any kind would be permitted and no additional impacts would occur to aesthetics.

4.12.4 Cumulative Impacts

Cumulative impacts to aesthetics would result from other planned or foreseeable development activities that could occur on lands adjacent to or located near to the proposed project in addition to existing developments. No development activities have been identified for the project site's environs. Thus, no changes would occur in the project area whose effects would overlap in time or space with any of the four alternatives. Without any such overlapping effects, no cumulative effects would occur.

4.13 Air Quality

The primary sources of air pollutants for the proposed refinery would be the various heaters and boilers that would serve the refinery's processes and general facility heating requirements. Other emission sources would include tail gas emissions from the sulfur recovery unit and VOC emissions from the storage tanks, product loadout, and piping components. A soybean/oilseed oil extrusion process and a bio-diesel production process would also be included in the proposed project. The Air Quality Technical Report (December 2007) provides a detailed discussion of the sources of air pollutants evaluated in the analysis and the processing and modeling of the air emissions data.

4.13.1 Alternatives 1 and A — Original Proposed Actions

Under these alternatives, the MHA Nation would construct and operate the clean fuels refinery. The effluent discharge outfalls associated with Alternative A would have no effect on air quality. The discharge of effluent to surface or ground waters does not involve any of the components of the refinery that would affect air quality emissions.

4.13.1.1 Clean Air Act Applicable Requirements

Estimated annual air pollutant emissions for the proposed refinery are summarized in Table 4-15. The criteria pollutants include oxides of nitrogen (NOx), CO, VOCs, SO_2, and particulate matter with a nominal aerodynamic diameter of less than 10 micrometers and 2.5 micrometers (PM_{10} and $PM_{2.5}$). The HAPs include benzene, formaldehyde, hexane, toluene, etc.

Table 4-15 Estimated Annual Emissions for the Proposed MHA Nation's Proposed Clean Fuels Refinery

Pollutant	Annual Project Emission Rate (ton/yr)
NO_x	35.7
CO	78.3
SO_2	51.2
VOC	77.0
$PM_{10}/PM_{2.5}$	16.8
Benzene	0.0704
Cyclohexane	0.0493
Ethylbenzene	0.0004
Formaldehyde	0.0883
Hexane (-n)	0.0057
PAH -Polycyclic Aromatic Hydrocarbons	0.0005
Toluene	0.0063
Xylene (Total)	0.0020

In an April 2005 letter to the MHA Nation, EPA made a non-applicability determination for federal air permits for the proposed refinery. Based on the proposed equipment, emissions projections (includes fugitive emissions), and feedstocks (primary feedstock of a low sulfur synthetic crude oil), EPA determined that the proposed refinery was not subject to the permitting requirements of a pre-construction PSD permit or a Title V (40 CFR part 71) operating permit. The "potential to emit" or potential maximum emissions estimated for the refinery were based on the refinery operating 24 hours per day, 365 days a year. Since the estimated "potential to emit" is below 100 tons per year (TPY) of any regulated pollutant and below 10 TPY of any one HAP or 25 TPY of a combination of hazardous pollutants, the proposed refinery would not be considered a major stationary source as defined in the PSD regulations at 40 CFR 52.21(b)(1)(i) and in the Title V operating permit regulations at 40 CFR 71.2. Therefore, the proposed refinery would be classified as a new minor stationary source due to the refinery design and proposed feedstocks. An increase in the proposed refinery's emissions due to any modifications could trigger additional permitting reviews for applicability of the PSD and Title V programs. The applicability of Title V could also be triggered by a new applicable NSPS, as discussed below.

EPA is promulgating new regulations to establish a preconstruction air permitting program for minor stationary sources throughout Indian country. The rule was proposed in the August 21, 2006 *Federal Register.* The effective date for implementing the new regulations is anticipated to be 60 days after the final regulations are published in the *Federal Register*. These regulations may apply to the refinery depending upon when construction on the refinery commences relative to the effective date of these regulations.

The proposed refinery will be subject to several CAA NSPS (40 CFR part 60) and National Emission Standards for HAPs (NESHAP) (40 CFR part 61), which will impose emission limits, fuel gas specifications, or design requirements and require testing, monitoring, recording keeping, and reporting of emissions for many units. However, not all emissions will be required to be monitored under these regulations. Table 4-16 summarizes the applicable NSPS and NESHAP that the refinery will be subject to once constructed, as well as, the testing, monitoring, recordkeeping and reporting requirements. Table A-1 in Appendix A of the Air Quality Technical Report (December 2007) lists the refinery units, their capacity, inherent unit emission controls (if any), and the applicable NSPS and/or NESHAP (if any).

On November 7, 2006, EPA proposed new regulations under NSPS for equipment leaks of VOC in petroleum refineries. These proposed regulations were put out for public comment and the proposal was made final on November 16, 2007. These revised standards are codified at 40 CFR part 60, subpart GGGa, and were effective on November 16, 2007. NSPS subpart GGGa is applicable to the proposed refinery since construction of the affected refinery units will commence after November 7, 2006. [See 72 *Federal Register* 64896, November 16, 2007.] This new regulation will increase the stringency of the leak definition for pumps in light liquid service from 10,000 parts per million (ppm) to 2,000 ppm and for valves in gas/vapor service or light liquid service from 10,000 ppm to 500 ppm. Finalization of NSPS subpart GGGa triggered the requirement for the refinery to apply for a 40 CFR part 71 operating permit within 12 months of commencing operation.

Table 4-16 MHA Nation's Proposed Clean Fuels Refinery, Applicable and Proposed Clean Air Act Requirements Summary[1] New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP)

New Source Performance Standards or National Emission Standards for Hazardous Air Pollutants	Testing and Monitoring Requirements	Recordkeeping and Reporting Requirements
General Provisions 40 CFR Part 60, Subpart A The general provisions apply, except where other subparts are more stringent.	Performance tests must be conducted after achieving maximum production; and in accordance with the EPA test methods referenced in each applicable subpart.	Notify EPA of the date of construction, date of startup, prior to conducting any performance tests, the date the continuous monitoring commences, and of any physical/operational change to the existing refinery which may increase air emissions.
At all times, the owner/operator must maintain and operate any affected facility in a manner consistent with good air pollution control practice to minimize emissions. [40 CFR 60.1- 60.13]		Maintain a file of all measurements, tests, maintenance, reports, and records (including equipment startups, shutdowns, and malfunctions) for at least 2 years.
Flare Standards – General Provisions 40 CFR Part 60, Subpart A The flare must be designed/operated with no visible emissions, be operated with a flame at all times, and meet heat content and tip velocity specifications. [40 CFR 60.18]	The owner/operator must monitor the presence of a flare pilot flame and conduct initial performance tests to determine compliance.	Record all periods of operation during which the flare pilot flame is absent, and report to EPA.
Boiler Standards – Small Units 40 CFR Part 60, Subpart Dc Boilers not subject to SO_2 limits since firing natural gas/refinery fuel gas. [40 CFR 60.40c- 60.48c]	No testing or monitoring requirements, since not subject to SO_2 or PM emission limits.	Record and maintain records of the fuels combusted in the boilers during each calendar month.
Tank Standards for VOCs 40 CFR Part 60, Subpart Kb Fixed roof tanks with an internal floating roof must meet specific requirements for seals, procedures for	The owner/operator must conduct annual visual inspections and repair items within 45 days of	Keep records of tank inspections and other specified tank information; and submit an inspection report to

New Source Performance Standards or National Emission Standards for Hazardous Air Pollutants	Testing and Monitoring Requirements	Recordkeeping and Reporting Requirements
tank filling, bleeder vents, rim space vents, opening covers, etc.	detection.	EPA when tank defects are found.
Tanks with a fixed roof must be equipped with a closed vent system and VOC emissions sent to the processes or flare. [40 CFR 60.110b – 60.116b]	The owner/operator must meet the flare requirements in 40 CFR 60.18 for testing/monitoring and measure for leaks using EPA methods.	Meet the flare requirements in 40 CFR 60.18 for recordkeeping/reporting.
Equipment Leaks of VOCs 40 CFR Part 60, Subpart GGGa The owner/operator must minimize leaks by complying with individual equipment requirements for pumps, compressor seals, pressure relief devices, sampling connection systems, open-ended valves, and valves in vapor/light liquid service. The definition of a leak varies by individual pieces of equipment from 500 ppm to 2,000 ppm. The closed vent system and flare must be operated at all times emissions are vented to them. [40 CFR 60.590a - 60.593a]	Each pump must be equipped with a sensor to detect failure of the seal and monitored monthly. Each pump must be checked by visual inspection, each calendar week, for dripping liquids. Valves in vapor/light liquid service must be monitored monthly using the EPA test method for leaks. A first attempt at pump repair must be made no later than 5 days from detection. All other leaks must be repaired within 15 days from detection. The owner/operator must conduct annual inspections of the closed vent system.	The owner/operator must keep a record of all inspection information (date/time of monitoring, operator identification, instrument reading, etc), the design requirements for the closed vent system, the date and results of weekly visual inspections of pumps for dripping liquids, equipment identification numbers, etc. The owner/operator must submit semiannual reports to EPA that identify monthly the equipment from which leaks were detected and the dates of process unit shutdowns.
VOC Emissions from Wastewater Systems 40CFR Part 60, Subpart QQQ The owner/operator must comply with equipment design and operational requirements for individual drain systems, oil-water separators, the closed vent system, and the flare. [40 CFR 60.690- 60.698]	The owner/operator must inspect wastewater system, such as drain system components and oil-water separators for problems that would produce VOC emissions and must complete all repairs within 15 days of identified problems. The owner/operator must use the EPA test method to measure for VOC leaks from the closed vent system and complete any repairs within 30 days of detection.	The owner/operator must keep a copy of the design specifications for all subject equipment; and a record of information about the operation/ maintenance of the closed vent system and process units that required a shutdown for repair. The owner/operator must record the location, date, and corrective action when VOC emissions are detected during inspections for individual drain systems, oil-

New Source Performance Standards or National Emission Standards for Hazardous Air Pollutants	Testing and Monitoring Requirements	Recordkeeping and Reporting Requirements
		water separators, and the closed vent system and submit an initial report and semiannual reports with this information.
Proposed Fuel Gas Combustion Unit Standards – Effective May 14, 2007, if promulgated as proposed 40 CFR Part 60, Subpart Ja The owner/operator must develop a startup/shutdown/malfunction plan and not routinely release fuel gas to the flare. Sulfur recovery plant (SRP) must meet 99% sulfur removal and H_2S < 10 ppm determined hourly on a 12-hour rolling average. Process heaters/fuel gas combustion devices must meet a 3-hour rolling average SO_2 limit of 20 ppm and a 365 successive day rolling average SO_2 limit of 8 ppm. Process heaters > 20 MMBtu/hr must meet NOx limit of 80 ppm on a 24-hr rolling average. [40 CFR 60.100a – 60.108a]	The owner/operator must conduct performance tests for the SRP, process heaters, and fuel gas combustion devices using EPA test methods. The owner/operator must install and operate O_2 and flow monitors for the SRP and/or process heaters/fuel gas combustion devices, as specified. The owner/operator must install and operate continuous SO_2 and H_2S monitors for the SRP, continuous SO_2 monitors for the process heaters/fuel gas combustion devices, and continuous NOx monitors for the subject process heaters.	Submit results to EPA of all performance tests. Submit semiannual reports to EPA that include revisions made to the startup/shutdown/ malfunction plan and actions taken for startup/ shutdown/malfunction exceedances. Keep records of discharges to the flare gas system. For the SRP, keep records of hourly sulfur production rate and hours of operation. Submit semiannually to EPA a report of excess emissions from the SRP/process heaters/fuel gas combustion devices.
Benzene Emissions from Waste Operations 40 CFR Part 61, Subpart FF If the total annual benzene (TAB) is less than 10 Mg/yr, the owner/operator is exempt from managing and treating the facility waste. If the TAB is greater than or equal to 10 Mg/yr, the owner/operator must be in compliance at initial startup of the facility and must treat and manage the waste streams containing benzene as required by 40 CFR 61.342(c).	The owner/operator must determine the TAB at the point of waste generation using EPA methods detailed in 40 CFR 61.355(c). The amount of the TAB will determine if the TAB must be calculated annually or if the facility must treat, manage, and monitor the waste streams. The TAB must be re-calculated whenever there is a change in the waste generating process.	Records must be kept for 2 years. Records must identify each subject waste stream and identify if it is controlled for benzene emissions. Records also consist of test results, measurements, calculations, etc. Submit to EPA by the initial startup of the facility, a report that summarizes the regulatory status of each waste stream. When the TAB is greater than 1 Mg/yr, a report must

New Source Performance Standards or National Emission Standards for Hazardous Air Pollutants	Testing and Monitoring Requirements	Recordkeeping and Reporting Requirements
[40 CFR 61.340 – 61.357]		be submitted annually with updated information (TAB, etc.) and at all times whenever there is a change in the waste generating process.

Note:
1. Table A-2 in Appendix A of the report details the specific emission limits, design requirements, fuel specifications, testing, monitoring, recordkeeping and reporting requirements that are summarized in Table 4-16 above for the refinery units subject to a NSPS or a NESHAP.

On May 14, 2007, EPA proposed NSPS for new, modified, or reconstructed process units at petroleum refineries. Once finalized these standards will be codified at 40 CFR part 60, subpart Ja. [See 72 *Federal Register* 27177, May 14, 2007.] These proposed standards include emissions limits for several types of affected facilities (see proposed section 60.100a(a)) and the associated testing, monitoring, recordkeeping, and reporting for these facilities. If promulgated as proposed, NSPS subpart Ja will be applicable to the proposed refinery since construction of the affected refinery units will commence after May 14, 2007. Finalization of NSPS subpart Ja will also trigger the requirement for the refinery to apply for a 40 CFR part 71 operating permit within 12 months of commencing operation. Table 4-16 also summarizes the proposed NSPS subpart Ja requirements for the proposed refinery.

The storage tanks with fixed roofs in combination with internal floating roofs will have to meet specific design requirements, such as primary and secondary seals, vents equipped with gaskets, openings equipped with covers, etc. under NSPS, subpart Kb. The storage tanks with fixed roofs will be equipped with a closed vent system for capturing VOCs with no detectable emissions 500 ppm above background. The VOC emissions will be vented back to the processes and sometimes sent to the flare. Tanks will have to be inspected and seals, gaskets, etc. repaired as needed.

To reduce fugitive VOC emissions, leakless valves will be used for valves in gas, light liquid, and heavy liquid service, double seals will be used for the pump seals, open ended valves will be plugged, the compressed seals will be recycled to the process units, and the sample connections will be enclosed. NSPS, subpart GGGa requires a leak detection and repair program for various refinery components, including valves, flanges and pump seals.

NSPS, subpart QQQ also requires that the closed vent system and flare be operated at all times when emissions may be vented to them. The closed vent system is also subject to the leak detection and repair program. A leak is indicated by an instrument reading greater than 500 ppm above background. The flare must be designed and operated with no visible emissions.

The proposed refinery will also be subject to a HAP standard based on the process design information. This standard is the National Emission Standard for Benzene Waste Operations found at 40 CFR part 61, subpart FF. The purpose of this regulation is to monitor and control emissions resulting from the handling, processing, and storage of benzene containing waste streams. While the quantity of these benzene containing waste streams is expected to be minimal, they will be sufficient enough to require the refinery to keep records on the amount of waste created and report these quantities to EPA.

Unit specific emissions in tons per year for both criteria and HAP pollutants are listed in Tables 16, 17, 19, and 21 of the Air Quality Technical Report (December 2007). Data and example calculations can be found in Appendices B and C of the report.

The Air Quality Technical Report (December 2007) details in Table A-2 the new proposed requirements for the process heaters, other fuel gas combustion devices, and the sulfur recovery unit that would be codified at 40 CFR, part 60, subpart Ja and which is summarized in Table 4-16 above. Subpart Ja would require the sulfur recovery unit to be continuously monitored for compliance and to meet a 99% sulfur removal efficiency and a H_2S limit of less than 10 ppm determined on a 12-hour rolling average. Process heaters with a capacity greater than 20,000,000 Btu/hr would have to be continuously monitored for compliance and would be required to meet a NOx limit of 80 ppm on a 24-hour rolling average. All process heaters and fuel gas combustion devices would be required to be monitored continuously and would have to comply with an SO_2

limit of 20 ppm on a 3-hour rolling average and an SO_2 limit of 8 ppm determined daily on a 365 successive day rolling average. The refinery combustion units will all have “Low NOx” burners.

EPA has authority under CAA sections 301(a) and 301(d)(4) to promulgate "Federal Implementation Plans" (FIP) as necessary or appropriate to protect air quality (40 CFR 49.11). EPA may develop a FIP for the refinery which could include additional monitoring, testing, recordkeeping, and reporting for the refinery units as needed to ensure protection of air quality.

4.13.1.2 Air Quality Analysis

An air quality analysis for the proposed refinery project was conducted to model the impact the project would have on the NAAQS, the PSD increments for the Class I and II areas, the Class I AQRV, and the concentrations of HAPs in the project area and surrounding area. The air quality impact analysis for the proposed refinery and surrounding area was conducted using EPA’s ISCST3 air model and Chapter 5 of the Air Quality Technical Report (December 2007) provides a detailed discussion of the analysis, including the modeling of inputs and outputs. The results of the modeling analysis are detailed below. Further modeling of air emissions was conducted to evaluate the potential for food chain exposures from HAPs, the results of which are describe in the Human Health and Wildlife sections of this chapter.

4.13.1.3 Class II Area

The refinery project and surrounding area is classified as a Class II area as defined in Chapter 3 of this FEIS.

Ambient air quality monitoring data for the various criteria pollutants was used to establish background concentrations in the refinery project area. This data came from ambient air quality monitors in White Shield, Beulah, and Fargo and reflects the impacts from existing regional sources such as power plants and mobile sources as well as transported pollutants from neighboring states. The modeled incremental impact from the proposed refinery project was added to these monitored values to estimate total cumulative air quality impacts in the project and surrounding area. The total cumulative air quality impacts are shown in Table 4-17 Modeled Maximum Class II Ambient Air Impacts for each applicable criteria pollutant (6^{th} column) and are compared, as a percentage (7^{th} column), to the NAAQS. The NAAQS pollutants are measured based on various time frames in order to address impacts from short-term and long-term exposures (i.e. SO_2 is measured at 3 hours, 24 hours, and annually). The maximum ambient cumulative impacts associated with the proposed refinery are below all NAAQS.

Table 4-17 Modeled Maximum Class II Ambient Air Impacts

Pollutant	Period	NAAQS ($\mu g/m^3$)[1]	Background ($\mu g/m^3$)	Modeled Impact ($\mu g/m^3$)[2]	Modeled Impact with Background ($\mu g/m^3$)	Relative to NAAQS (percent)	PSD Class II Increment	Relative to PSD Class II Increment (percent)
NO_2	Annual	100	7.1	0.79	7.89	8	25	3
CO	1-Hour	40,000	10,832	67.7	10,899.70	27	n/a	–
	8-Hour	10,000	5,474	30.3	5,504.30	55	n/a	–
$PM_{2.5}$	24-Hour	35	16.07	16.44[3]	32.51	93	n/a	–
	Annual	15	5.82	2.94	8.76	58	n/a	–
PM_{10}	24-Hour	150	37	26.31	63.31	42	30	88
SO_2	3-Hour	1,300	106.5	45.50	152.00	12	512	9
	24-Hour	365	31.9	17.49	49.39	14	91	19
	Annual	80	4.3	1.34	5.64	7	20	7

Note:
1. $\mu g/m^3$ = micrograms per cubic meter
2. For 1-, and 8-, and 24-hour standards the modeled impacts are 1st highest short term values, except $PM_{2.5}$.
3. For the 24-hour $PM_{2.5}$ standard the modeled impacts are the 98th percentile value, per the standard requirements.

Use of these monitored data to establish existing baseline conditions in the project area may, in fact, overestimate future concentrations because several of the largest power plants in the region are subject to EPA regulations that will require them to install Best Available Retrofit Technology (BART) over the next five years. These mitigation measures are projected to reduce SO_2 and NO_2 emissions from the affected facilities by up to 95 percent. Cumulative impacts of emissions from power plants will decrease in the area over time.

The analysis of potential air quality impacts was based on conservative estimates (maximum potential) of the proposed refinery's emissions. Emissions are not expected to increase as the project ages. Potential air emissions from future, local developments in the area are expected to be very minor. Estimated increases in vehicle and rail traffic and new commercial/residential air emissions induced by the proposed refinery are predicted to be too minor to cumulatively affect air quality.

The air quality analysis also modeled the proposed refinery's impact on the PSD increments for the area. Table 4-17 also shows that the proposed refinery project will not violate any of the Class II PSD increments for the area. There are no other increment consuming sources nearby the proposed project area that would contribute significantly to the project's maximum increment consumption, so the maximum increment consumption is based on the contribution of the refinery only. The last column in the table shows the relative percent of the various pollutant increments that the proposed refinery would consume.

Near-field acid deposition for the project and surrounding area was estimated using the wet deposition function of ISCST3. A gas-scavenging coefficient of 0.0001 hours per second-millimeter was used for emissions of SO_2 and NO_x. Precipitation data for Bismarck were used because precipitation data were not represented in the Minot surface meteorological data. As a basis for comparison, the results (Table 4-18) for this Class II area are below the natural background total nitrogen (N) and sulfur (S) deposition level for western Class I areas, which is 0.25 kilogram per hectare-year (kg/ha-yr) for each element (National Park Service and U. S. Fish and Wildlife Service 2005).

Table 4-18 Modeled Near-Field Wet Deposition

Year	Total Nitrogen and Sulfur Deposition (kg/ha-yr)	
	N	S
1984	0.08	0.11
1985	0.06	0.08
1987	0.08	0.14
1988	0.04	0.06

4.13.1.4 Class I Areas

The air quality analysis includes an analysis of impacts from the proposed project at the two federally mandated Class I areas closest to the project area: Theodore Roosevelt National Park and Lostwood Wilderness.

The results of the Class I SO_2 increment consumption analysis for the proposed refinery are shown in Table 4-19. Both Class I areas were assessed for each model year, and Table 4-20 lists the Class I area where the maximum impact occurred. The Class I SO_2 increment consumption was evaluated using similar methods (e.g. meteorological data, modeling switches, receptor locations, etc.) as were used in the EPA Region 8 North Dakota increment modeling analysis (U. S. EPA 2003a**).** This modeling included the same sources and receptors as the EPA 2003 analysis with the addition of the proposed refinery. Table 4-19 shows the potential impacts from the proposed refinery project on the SO_2 increment at TRNP are minimal, as demonstrated by the 3-hour project impact of 0.0000 to 0.0060 $\mu g/m^3$; 24-hour impact of 0.0000 to 0.0050 $\mu g/m^3$; and annual impact of 0.0005 to 0.0024 $\mu g/m^3$. Table 4-20 lists the Class I area where the maximum estimated increment consumption for NO_2 and PM_{10} would occur due to the project's emissions. The data in Table 4-20 shows that the project would consume a minimal amount of the NO_2 (0.10% to 0.14%) and PM_{10} 24-Hour (0.21% to 0.47%) increments.

Table 4-19 CALPUFF Class I SO_2 Increment Analysis

Averaging Period/Year	Class I Area	Project Impact (µg/m³)	PSD Class I Increment (µg/m³)
3-Hour			25
1990	TRNP	0.0060	
1991	TRNP	0.0030	
1992	TRNP	0.0000	
1993	TRNP	0.0020	
1994	TRNP	0.0000	
24-Hour			5
1990	TRNP	0.0030	
1991	TRNP	0.0040	
1992	TRNP	0.0050	
1993	TRNP	0.0010	
1994	TRNP	0.0000	
Annual			2
1990	TRNP	0.0005	
1991	TRNP	0.0024	
1992	TRNP	0.0005	
1993	TRNP	0.0005	
1994	TRNP	0.0015	

Table 4-20 Project Increment Consumption at Class I Areas

		Maximum Modeled Impacts (µg/m³)			
		NO_2 Annual		PM_{10} 24-Hour	
Year	Class I Area	Project Impact	Percent Of Increment	Project Impact	Percent of Increment
1990	LW	0.0029	0.12%	0.0082	0.21%
1991	LW	0.0036	0.14%	0.0171	0.43%
1992	LW	0.0034	0.13%	0.0189	0.47%
1993	LW	0.0035	0.14%	0.0174	0.43%
1994	LW	0.0024	0.10%	0.0122	0.31%

The impact of the proposed project emissions on the increment consumption in the TRNP and LW is minimal for two primary reasons. First, the refinery SO_2 and NO_2 emissions are small as compared to existing sources in the Class I airshed. For example, the refinery is projected to emit 51.2 tons per year of sulfur dioxide, as compared to the existing power plant 2004 SO_2 emissions of 148,726 tons per year. The refinery is projected to emit 35.7 tons per year of nitrogen dioxide, as compared to the existing power plant 2004 NO_2 emissions of 77,589 tons per year. Second, because the proposed facility is located 73 miles from the TRNP and 55 miles from LW, the air quality modeling showed the air emissions from the proposed refinery would disperse to minimal amounts by the time they reach the Class I airsheds. Consequently, the relatively low emissions of SO_2, NO_2 and PM_{10} from the proposed project, combined with the dispersion of those emissions, would result in minimal impacts from this project on the Class I airsheds. The proposed project's contribution to cumulative air impacts at the Class I areas would likewise be minimal.

Table 4-21 presents the estimated project impacts on AQRVs (visibility and acid deposition) on the two nearby Class I areas. Both areas were assessed for each model year, and this table lists the Class I area where the maximum impact occurred. The estimated change in Class I visibility from the operation of the refinery was modeled using five years of historical meteorology data. The highest impacts occurred at the Lostwood Wilderness area with visual range reductions of between 1.59 percent and 4.14 percent depending on the weather data used in the modeling. The estimated maximum visual range extinctions resulting from the project emissions are below the 5% threshold or 0.5 deciview that EPA's BART guideline establishes as a threshold for defining a "contribution" to visibility impairment or considered to be perceptible. The impacts are also well below the 10% or 1.0 deciview that is the general level of concern for Federal Land Managers (FLAG 2000). Similar impacts on visibility would be expected over the 20 year lifetime of the facility while operating at its proposed capacity.

The estimated maximum deposition values resulting from the project emissions shown in Table 4-21 are well below the natural background total nitrogen (N) and sulfur (S) deposition level for western Class I areas, which is 0.25 kilogram per hectare-year (kg/ha-yr) for each element (National Park Service and U. S. Fish and Wildlife Service 2005).

Table 4-21 Class I Area AQRV Analyses

	Estimated Maximum Total Wet Deposition				Estimated Maximum Visual Range Extinction	
Year	Nitrogen		Sulfur			
Modeled	kg/ha-yr	Class I Area	kg/ha-yr	Class I Area	Percent	Class I Area
1990	0.010	TRNP	0.013	LW	1.59	LW
1991	0.011	TRNP	0.012	TRNP	3.68	LW
1992	0.010	TRNP	0.014	TRNP	4.14	LW
1993	0.011	TRNP	0.011	TRNP	3.89	LW
1994	0.013	LW	0.018	LW	2.38	LW
Maximum	**0.013**	**LW**	**0.018**	**LW**	**4.14**	**LW**

4.13.1.5 Hazardous Air Pollutants

A modeling analysis was conducted to determine the potential human health impacts resulting from inhalation of emissions of HAPs from the refinery, and Table 4-22 presents the HAP ambient concentrations ($\mu g/m^3$) results. This table describes HAP ambient concentrations in the project area for 1-hour, 24-hour and annual periods. The results of HAP emissions modeling and current health based inhalation benchmarks are shown together in the Human Health section of this Chapter, in Table 4-27. The Human Health section also describes the site-specific hazardous emissions modeling for the proposed refinery to determine the potential for human health impacts from the following HAPs: benzene; cyclohexane; formaldehyde; hexane; polycyclic aromatic hydrocarbons; toluene; and xylene. The HAPs emissions are compared to chronic health effects levels (i.e., long-term exposure). The analysis is related to lifetime exposure to a hazardous emission; thus, assessing a one-year average concentration against the criteria is a conservative estimate of exposure over a lifetime. The Human Health section describes that the estimated ambient HAP concentrations from the proposed refinery are below the federal risk based concentrations for inhalation and that the proposed refinery would not have significant adverse effects on the human health of the local area communities.

Table 4-22 Hazardous Air Pollutants Ambient Concentrations

HAP	Estimated Ambient Concentrations (µg/m³)		
	1-Hour	24-Hour	Annual
Benzene	4.04E-01	8.77E-02	1.32E-02
Cyclohexane	3.05E-01	6.63E-02	9.91E-03
Ethylbenzene	2.38E-03	5.20E-04	8.00E-05
Formaldehyde	4.36E-01	1.34E-02	1.81E-03
Hexane (-n)	3.50E-02	7.60E-03	1.14E-03
PAH	6.22E-02	4.80E-04	5.00E-05
Toluene	1.52E-01	3.37E-03	6.00E-04
Xylene	1.06E-01	1.59E-03	2.70E-04

4.13.1.6 Upset Emissions

Table 4-23 identifies upset emissions (including malfunctions, startups, shutdowns, and maintenance) from several refineries in Texas and Louisiana and lists their production capacities and reported upset emissions over a one year period.

Typical excess emissions can be prevented by better operational and maintenance practices. Leaks from cooling towers have been identified by refineries as the source of some of the largest excess emissions, especially for VOC emissions. Power interruptions are one of the most frequently cited causes for some of the worst upsets. Sometimes outages occur due to a loss of power from a source outside the plant or to other malfunctions of electrical components within the plant. The failure of sulfur recovery units will trigger flaring and the release of excess SO_2 emissions. These excess SO_2 emissions can be avoided by adequately sizing and maintaining a sulfur recovery unit.

As described in Chapter 2, the proposed refinery would have a detailed maintenance plan in place for commencement of operation. The plan would include defining the requirements for equipment inspections and shutdowns and startups. Scheduled turnarounds (shutdowns and startups) for individual process units would occur approximately every three to five years to allow for cleaning out accumulated undesirable residues, replacing catalysts, replacing absorbents, conducting repairs, etc. The plan would include a shutdown of a portion of the plant each year on a rotational basis utilizing tanks to store intermediate products, so there would not be a total outage for any of the individual units every year and flaring of emissions would be minimized. Unscheduled shutdowns result from upset plant conditions usually related to power failure, loss of cooling water, or a fire. To minimize unscheduled shutdowns and startups and associated emissions due to flaring, the refinery design includes two independent sources of power to mitigate the risk of power failure, and an Emergency Generator and a UPS (Uninterruptable Power Supply) for critical equipment. In addition, the proposed refinery does not have a Cooling Tower, which as described above is a source of some of the largest excess VOC emissions. The process units will be liberally spaced for isolation and segregation in the event of fire.

As detailed in Chapter 4 of the Air Quality Technical Report (December 2007), normal operation for the flare was designed for a loading rate of 15 lbs/hour (65.7 tons/year). However, to account for potential process upsets and startup/shutdown activities that could increase emissions releases, a loading rate of 500 lbs/hour (2,190 tons/year) was used to calculate potential air emissions from the flare. The loading rate of 500 lbs/hour is over 30 times the normal operation loading rate of 15 lbs/hour. The potential flare emissions were also calculated based on operating the flare 24 hours a day, 365 days a year [See Flare Example NOx calculation in Appendix C of the Air Quality Technical Report (December 2007)]. Therefore, potential emissions from startups, shutdowns and equipment malfunctions would be greater than air emissions during routine operations. Potential air emissions during upset conditions were conservatively estimated for the proposed refinery.

Table 4-23 Upset Emissions from Large Refineries[1]

Refinery	Production Capacity (bbl per day)	VOC Emissions (lbs/yr)	SO_2 Emissions (lbs/yr)	H_2S Emissions (lbs/yr)	CO Emissions (lbs/yr)	NOx Emissions (lbs/yr)
Atofina (Port Arthur, TX)	175,068	24,600	5,012,808	95,983	43,323	16,808
BP Products North America (Texas City, TX)	437,000	294,206	219,857	6,721	498,955	18,952
Chalmette Refinery (Chalmette, LA)	182,500	294,298	1,050,746	2,632	10,880	8,276
Citgo (Lake Charles, LA)	324,300	72,088	351,406	3,181	380	1,750
Exxon (Baytown, TX)	523,000	188,538	598,756	6,821	591,139	57,613
Exxon Refinery (Beaumont, TX)	348,500	346,541	247,846	3,945	695,345	6,863
Exxon-Mobil (Baton Rouge, LA)	491,500	122,778	1,435,604	3,223	13,381,005	163,054
Flint Hills (East & West) (Corpus Christi, TX)	259,980	3,800 37,156	36,495 84,803	0 2,967	10,780 260,516	6,804 1,717
Motiva (Norco, LA)	219,700	36,286	25,086	194	44,456	153,263
Motiva (Port Arthur, TX)	250,000	390,852	97,871	2,764	10,688	12,735
Murphy Oil USA (Meraux, LA)	95,000	26,082	135,716	28	165,782	23,030
Phillips 66 (Borger, TX)	143,800	80,517	243,756	1,757	252,401	47,524
Premcor (Port Arthur, TX)	255,000	56,706	407,486	4,739	15,088	10,910
Valero (East & West) (Corpus Christi, TX)	134,000	31,524 52,974	455,990 613,268	4,546 6,515	29,246 118,232	3,293 39,154
Western Refinery (El Paso, TX)	90,000	8,518	141,196	1,541	411	487

[1] For Texas refineries, 2003 upset data was gathered and compared to Texas 2002 emissions inventory data.
For Louisiana refineries, 2001 and 2002 upset data was gathered and compared to Louisiana emission inventory data for 2001 and 2002.

4.13.1.7 Global Climate Change

Estimated Greenhouse Gas Emissions from the Proposed Refinery

Construction and operation of the proposed petroleum refinery would generate greenhouse gas emissions. Carbon dioxide (CO_2) is the primary greenhouse gas emitted by refineries with lesser amounts of methane (CH_4) and nitrous oxide (N_20). The main sources of greenhouse gases from refineries are from the combustion of fuels in boilers, burners, heaters and flares. There will also be some fugitive greenhouse gas emissions from equipment leaks, seals, gaskets and valves.

Methods to calculate greenhouse gas emissions from existing petroleum refineries are based on the types of refinery processes and energy use at each facility. These methods use detailed operating and energy use information. In order to fully calculate greenhouse gas emissions from the proposed refinery, detailed refinery-specific information would be needed. That information will not be available until after the refinery has been in operation, generally a year after startup shakedown. Since this type of data is not available for a proposed refinery in preliminary design, another method was developed to estimate greenhouse gas emissions from this proposed refinery by comparing greenhouse gas emissions from existing refineries. Greenhouse gas emission data from existing refineries in Canada was used for this analysis because of the similarities in facilities and because the data are readily available. The emissions are expressed in terms of carbon dioxide (CO_2) equivalent, a unit of measure used to allow the addition of or the comparison between gases that have different global warming potentials. A metric tonne or tonne equals 1,000 kilograms. A comparison of the proposed refinery to similar facilities can provide an approximation of the likely greenhouse gas emissions.

An estimate of greenhouse gas emissions was prepared by comparing the proposed refinery to refineries in Canada of similar size and feedstock. Greenhouse gas emissions were reported for 19 petroleum refineries in Canada in 2005. Greenhouse gas emissions from these 19 facilities ranged from 106,661 to over 3 million tonnes in CO_2 equivalent per year. The average greenhouse gas emissions from Canadian refineries in 2005 were slightly over 1 million tonnes (CO_2 equivalents). The facility found to be most similar to the proposed refinery is the Prince George Husky oil refinery in British Columbia. In 2005, the Husky facility processed 10,000 bbl per day of light crude oil, which is the same capacity as the proposed refinery. The Husky refinery processes light crude oil from British Columbia, whereas the proposed refinery oil will refine synthetic crude which has already been refined once in Alberta. The Husky refinery also has additional greenhouse gas-emitting refinery processes such as a catalytic cracker. The refineries will also have comparable product mixes, primarily gasoline and diesel, although the Husky refinery does produce heavy fuel oil which will not be produced by the proposed MHA Nation Refinery. The Husky refinery has been used to estimate greenhouse gas emissions from the proposed refinery because the facilities have the similar capacity (the Husky facility expanded in 2006), and both facilities use relatively light feedstocks. As described in Table 4-24, the George Husky refinery emitted 106,719 (rounded to 107,000) metric tonnes greenhouse gases in 2005.

Table 4-24 Projected Annual Greenhouse Gas Emissions from the Proposed Refinery Estimated from Prince George Husky Refinery 2005 Data

Gases	Sum in metric tonnes	Metric tonnes in CO_2 equivalent
CO_2	106,000	106,000
CH_4	33	700
N_20	1	300
Totals:		**107,000**

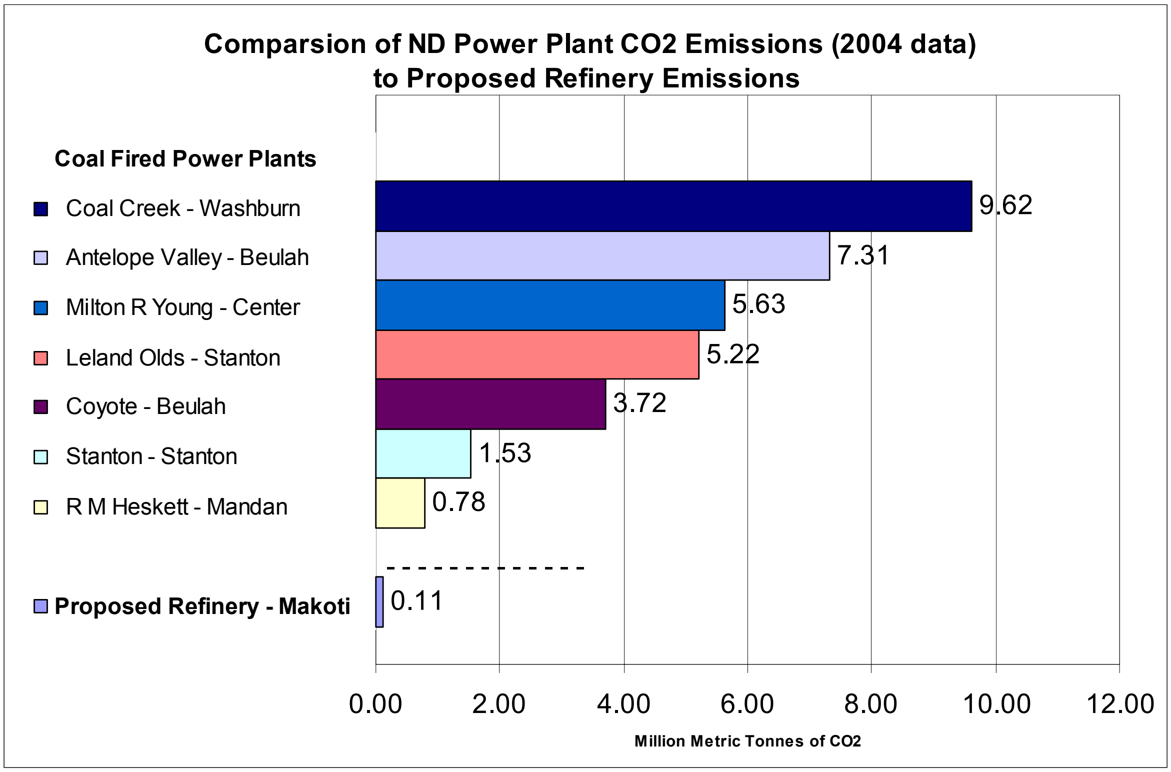
Source: Environment Canada website: 2005 Greenhouse Gas Sources and Sinks

To put the annual estimated 107,000 metric tones of CO_2-equivalent emissions from the proposed refinery into a context that is easy to conceptualize, EPA used a greenhouse gas equivalencies calculator to identify equivalent emissions. (See http://www.epa.gov/cleanenergy/energy-resources/calculator.html. The annual estimated 107,000 metric tones of CO_2-equivalent emissions from the refinery is the equivalent of:

- CO_2 emissions from the energy use of 31,414 homes for one year;
- CO_2 emissions from burning 1,859 railcars worth of coal; and
- CO_2 emissions from 65,187 passenger vehicles for one year.

To put the proposed refinery's estimated emissions of 107,000 tonnes annually in further perspective, individual coal fired power plants in North Dakota emitted between 780,000 and 9,620,000 tonnes per year, based on 2004 data. In North Dakota, electrical power generation emitted 31.7 million tonnes of CO_2 in 2004. CO_2 emissions for the entire state of North Dakota were estimated at 47.6 million tons in 2004. Emissions in North Dakota were determined for five categories in millions of metric tones: 1.0 commercial, 7.7 industrial, 1.3 residential 5.9 transportation and 31.7 electrical power. Figure 4-2 below compares the estimated 107,000 tons of CO_2 emissions from the proposed refinery with North Dakota power plants based on 2004 data.

Figure 4-2 Comparison of Projected CO_2 Emissions from the Proposed Refinery and Existing North Dakota Power Plants



Power Plant emissions from eGRID2006 Version 2.1 Plant File (Year 2004 Data), EPA database

It is also noteworthy that activities associated with the chain of commerce and full life-cycle of the proposed refinery's process inputs and outputs may emit greenhouse gases, e.g., the production of synthetic crude or end-use by consumers. These activities are shown in Table 4-25

Table 4-25 Indirect Greenhouse Gas Emissions from Proposed Refinery

Process Inputs	Source
Electricity	Coal-fired power plant
Synthetic crude	Tar sands mining, initial refining, and pipeline transportation
Field butane, biodiesel, other feedstocks	Production and transportation
Natural gas	Production, processing and compression
Process Outputs	**Source**
Gasoline, diesel fuel, propane	Used as fuel by consumers
Product transportation	Truck and rail transportation

Environmental Effects of Global Climate Change

The estimated 107,000 tonnes (in CO_2-equivalents) emitted from the proposed refinery will have an incremental impact on atmospheric greenhouse gas concentrations and global climate change, when added to the past, present, and reasonably foreseeable future human activities affecting greenhouse gas concentrations and climate. While modeling can predict a slight increase in global temperature associated with the proposed refinery's emissions[6], it is generally not useful to link specific climatological changes or other environmental effects to a single emissions source, as such linkages are difficult to isolate and understand. A more useful approach to understanding the cumulative impact of the proposed refinery's emissions involves consideration of the following factors: 1) the magnitude of the facility's greenhouse gas emissions compared with other emission sources, 2) the refinery's greenhouse gas emissions in the context of total greenhouse gas emissions at the state or regional and national and global scales, and 3) the impacts associated with climate change generally.

The first factor, the comparative magnitude of the refinery's emissions with other emission sources, is discussed above in the section estimating the refinery's emissions. As to the second factor above, the facility's estimated 107,000 tonnes of annual emissions will occur in the context of total State of North Dakota CO_2 emissions which were estimated at 49.9 million tonnes in 2004. See the Energy Information Administration (under the Department of Energy), Emission Detail by State at: http://www.eia.doe.gov/oiaf/1605/state/state_emissions.html. United States emissions for the year 2005 were recently estimated to be 7.2 billion tonnes. See the *Emissions of Greenhouse Gases in the United States 2006*, DOE/EIA-0573 (2006), November 2007, available at: http://ftp.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/ggrpt/057306.pdf. Annual global scale greenhouse gas emissions for the year 2004 were recently estimated to be 26.9 billion tonnes. See the *International Energy Outlook 2007*, DOE/EIA-0484(2007), May 2007, available at: http://www.eia.doe.gov/oiaf/ieo/pdf/0484(2007).pdf. The third factor, the impacts associated with climate change, are generally discussed in detail in Chapter 3.

In addition to the climate change information in Chapter 3, projections of climate change effects in the Great Plains region include increased temperatures and increased precipitation in some areas. (See Ojima DS, Lackett JM. 2002. *Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change -- Central Great Plains*). The modeled minimum temperature increase by the 2090s is over 7 °F (3.9 °C). Modeling shows both increases and decreases in precipitation over the Great Plains region, although there appears to be a slightly wetter trend in the region, especially by 2090. The snow season in the Great Plains is projected to end earlier in the spring, reflecting greater warming in winter and spring. An EPA study drew similar conclusions and further noted, "[g]roundwater levels also could be reduced by lower spring and summer recharge." (EPA, *Climate Change and North Dakota,* Sept. 1998, EPA 236-F-98-007d). Prairie pothole wetlands are very dependent upon the precipitation regime, and therefore climate change forecasts are predicted to result in drier wetland systems, with reduced productivity and habitat degradation. (Johnson, W. Carter, et.al. 2005. *Vulnerability of Northern Prairie Wetlands to Climate Change.* BioScience. October 2005/Vol 55 No. 10.).

These changes may affect, either positively or negatively, many sectors in the Great Plains, including agriculture, ranching and livestock, natural systems, and water. (See Ojima and Lackett 2002). Changes in winter moisture may impact cool season invasive species, the extent of certain

[6] An increase in global temperature from the proposed refinery's greenhouse gas emissions was modeled using the Model for the Assessment of Greenhouse-gas Induced Climate Change, available at http://www.cgd.ucar.edu/cas/wigley/magicc . For different climate sensitivities, the upper bound prediction for the amount of warming that the TAT refinery would contribute was 0.0000012 degrees C. See Technical Report for further explanation.

vegetation on the range, shallow aquifer recharge, stream flow timing, and forage availability. Winter temperature increases may impact the incidence of pest outbreaks, soil organic matter, plant community composition and invasion of exotics. Increases in summer temperatures and precipitation may impact hail, tree invasives and fire management. Agricultural areas with marginal financial and resource reserves (e.g., the U.S. northern plains) are especially vulnerable to climate change (Antle et al. 2004). Unsustainable land-use practices will tend to increase the vulnerability of agriculture in the Great Plains to climate change (Polsky and Easterling 2001).

A comprehensive summary of the health and environmental effects of climate change is on EPA's Climate Change, Health and Environmental Effects website at http://www.epa.gov/climatechange/effects/index.html. The website also includes links to more detailed information on impacts to specific resource areas such as human health, agriculture and water resources.

Assessment of Mitigation Measures

This section describes potential measures to both reduce and offset greenhouse gas emissions produced by refinery operations. Refinery operations that will result in emissions of carbon dioxide, nitrous oxides and methane include the flaring of waste gases and the operation of process heaters and boilers. Additional refinery processes that may release greenhouse gas emissions include hydrogen production for use in the refinery hydrotreater and fugitive emissions.

Greenhouse gas emissions from refinery operations can be reduced by designing and operating the facility to improve energy efficiency. For example, rather than flaring waste gases emitted from process units, the facility may be designed to capture the hydrocarbon gas streams and reroute the gas back into the refinery fuel gas system. This capture system would likely reduce greenhouse gas emissions by decreasing the facility’s demand for external natural gas and by reducing the formation of carbon dioxide from the process of flaring waste gases. In addition, the Energy Star publication *Energy Efficiency Improvement and Cost Saving Opportunities for Petroleum Refineries* describes energy efficiency design technologies and operation processes which could reduce the amount of combustion needed for various processes, thereby reducing the proposed project’s greenhouse gas emissions.[7] For example, the facility can be designed to operate with a high efficiency fire box design for process heaters and boilers to ensure that proper combustion gas retention times are achieved; include adequate thermal insulation of all heated lines to minimize heat loss; and refinery operations can include a rigorous leak detection system to provide for repair of leaking pipes, valves flanges and fitting, pumps and compressors.

The facility will need to comply with any CAA requirements applicable at the time the facility is constructed and in operation. Currently, there are no federal regulatory standards directly limiting greenhouse gas emissions.[8] However, there are a number of voluntary measures available to address greenhouse gas emissions, including EPA voluntary programs such as Climate Leaders or Gas STAR. For example, once refinery operations have commenced, the facility could conduct a

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[7] (Worrel and Galitsky, 2005, Energy Efficiency Improvement and Cost Saving Opportunities for Petroleum Refineries: An ENERGY STAR Guide for Energy and Plant Managers. Ernesto Orlando Lawrence Berkeley National Lab. University of California. http://www.energystar.gov/ia/business/industry/ES_Petroleum_Energy_Guide.pdf)

[8] Since the issuance of the April 2, 2007 Supreme Court opinion in Massachusetts, et al. v. EPA, 549 U.S. (2007), EPA has been evaluating the potential effects of the Court’s decision with respect to addressing emissions of greenhouse gases under the mobile and stationary source provisions of the Clean Air Act. Thus, this EIS for an individual project does not reflect, and should not be construed as reflecting, the type of judgment that might form the basis for a positive or negative finding, permitting decision or regulation under any provision of the Clean Air Act.

greenhouse gas emissions inventory audit to determine where there are opportunities to reduce greenhouse gas emissions under various voluntary programs. In addition, there are several organizations in the United States that develop and implement greenhouse gas offset projects involving agricultural landfill methane, agricultural soil carbon, forestry, renewable energy, coal mine methane, and rangeland soil carbon. Specifically, there are examples of voluntary soil carbon offset projects in the upper mid-west portion of the United States that have involved applying grassland conservation tillage or rangeland soil carbon management methods. In this type of project, soil carbon offsets can be issued on a per-acre, per-year basis. Then, the offset rate depends on the regional soil and crop management improvements. For example, conservation tillage offsets in Illinois have been issued at a rate of 0.6 metric tonnes of CO_2 equivalent per-acre, per-year. At this issuance rate, it would take approximately 180,000 acres of conservation tillage improvements to offset the estimated 107,000 metric tonnes per year of greenhouse gas emissions projected from the refinery. Other rangeland soil carbon management projects in the North Dakota/South Dakota region have included an issuance rate of between 0.12 tonnes of CO_2 equivalent per-acre, per-year on improved lands and 0.52 tonnes of CO_2 equivalent per-acre, per-year on previously degraded lands. Using that range of issuance rates, 200,000 to 900,000 acres of rangeland would need to be under soil carbon management improvements to offset the 107,000 metric tonnes per year of greenhouse gas emissions project from the refinery. Assuming the refinery chose to pursue this type of offset project, the net greenhouse gas emissions once the refinery is operational would affect the amount of acreage required to offset the emissions.

4.13.2 Construction Alternatives

4.13.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the MHA Nation would not construct or operate the clean fuels refinery. Consequently, implementation of this alternative would have no new effects on air quality.

4.13.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Under this alternative, the MHA Nation would construct and operate the clean fuels refinery. The refinery would be the same facility as described for Alternatives 1 and A. Consequently, implementation of this alternative would have the same direct and indirect effects as those described for Alternatives 1 and A.

4.13.2.3 Alternative 4 — Modified Proposed Action

Implementation of this alternative would result in the same effects as described in Alternatives 1 and A. The revised site refinery layout, pipelines and power lines would be constructed, so effects attributed to these facilities would be the same.

4.13.2.4 Alternative 5 — No Action

Under this alternative, the MHA Nation would not construct or operate the clean fuels refinery. Consequently, implementation of this alternative would have no new effects on air quality.

4.13.3 Effluent Discharge Alternatives

The effluent discharge alternatives would have no additional effect on air quality. These alternatives involve the discharge of effluent to surface or ground waters.

4.13.4 Cumulative Impacts

The power plants located near Beulah, North Dakota, roads and agriculture are the main sources of air quality impacts in the airshed surrounding the proposed refinery. As demonstrated in the modeling analysis and the Class I and II area air quality analysis, the refinery would have minimal impacts on cumulative air quality within the surrounding airshed. No changes are anticipated in the area regarding the air emissions from roads and agricultural practices. Emissions from the power plants around Beulah are anticipated to be reduced over time due to EPA's regulations requiring them to install BART over the next five years to reduce SO_2 and NO_2 emissions. Cumulative impacts from air emissions are expected to decrease in the area over time, even though there are several future energy development projects planned in the surrounding airshed. There is a proposed 500 MW power plant at Gascoyne that is currently in the State permitting process. For more information on the permit, contact the NDDH, Division of Air Quality. There is also a proposed coal gasification plant located in South Heart. Currently, there is no specific information available regarding air emissions from this facility, since the facility has not yet applied for a PSD permit. Recently, there has been a resurgence of oil and gas development in the area, and several exploratory wells are being drilled. Depending on the success of the exploratory wells, additional development may occur. It is anticipated that the Bureau of Land Management (BLM) and BIA will examine air impacts for this new oil and gas development including quantification of the level of potential level of the development. Other new sources of air pollution in the planning stages are ethanol plants, one located in Gascoyne. The cumulative air impact analysis did not specifically include the recently proposed ethanol plants, because emissions from the ethanol plant combined with the refinery and other sources are not expected to be significant in the airshed surrounding the proposed site. VOCs, NO_x and CO are the main air emissions of concern from ethanol plants.

The MHA Nation's Environmental Program plans to install and operate a new "ambient" air quality monitoring station near the proposed refinery site. The ambient monitoring station will not specifically monitor air emissions from the refinery. Instead the monitoring station will collect background air quality data near the site for SO_2, NO_2, $PM_{2.5}$, and meteorological conditions prior to construction and operation of the refinery. Air quality data for the same pollutants will be monitored during operation of the refinery and compared to the background data to verify the modeling results of minimal impacts from the refinery to the NAAQS.

4.14 Socioeconomics

Primary socioeconomic effects of the project (both positive and negative) would occur on the Reservation and in Ward County. Communities that would contribute to the available work force, housing, infrastructure, and goods and services include Minot and New Town, located approximately 30 miles from the site, and the smaller towns of Makoti, Parshall, Plaza, and White Shield.

4.14.1 Alternatives 1 and A – Original Proposed Actions

Implementation of these alternatives would allow the MHA Nation to pursue economic development opportunities in keeping with its tribal sovereignty. In addition, the Project would provide economic benefits to Ward County and communities within the county. The economic benefits from construction activities would occur over the 18 to 24 month construction period. Impacts from the operation of the refinery would occur for the life of the refinery which could be well over 20 years.

4.14.1.1 Population and Housing

A substantial portion of the construction workers are expected to be members of the MHA Nation. The rest of the workforce is expected to live in or around Minot. A labor force availability study (North Dakota Department of Commerce 2002) indicated that workers are willing to commute to a job within a 60-mile radius of their residences. Portions of the Reservation, Minot, and several counties are within the 60-mile radius. Consequently, the construction workers are expected to commute to the refinery site daily to work and it is not anticipated that the Project would require an influx of new employees into the region. Therefore, there would be no substantial local or regional population impacts and little demand for new permanent housing. In the event that some workers do migrate into the area for the construction period, the relatively small number of such workers is unlikely to affect temporary housing stock. A sufficient supply of temporary housing stock including rental, motels, and recreational vehicle (RV) sites is located in Minot, as well as smaller communities near the refinery site.

4.14.1.2 Economy and Employment

The primary economic impact would be the economic benefit to the Reservation from the sales of gasoline, diesel, and propane, which are projected to earn a net profit of an estimated $100 million annually over the estimated 20 or more year life of the Project. In addition, there would be economic benefits to the MHA Nation and Ward County through payroll earnings over the life of the Project, which would be spent on items such as housing, food, goods and services.

During the construction phase of 18 to 24 months, economic benefits would occur from the construction payroll, and construction expenditures on equipment and supplies from local area vendors. The construction and operation of the project is expected to have minimal influence on the Ward County economy. In terms of payroll earnings and construction expenditures, the economic benefit from the Project is small relative to the economy of the county, which is regional center of economic activity.

The MHA Nation has proposed to grow forage for a buffalo herd on approximately 279 acres of the Project site that would not be used for the refinery operations. If implemented, forage obtained from this portion of the parcel would reduce the costs of purchasing forage from other sources.

The construction and operation of the refinery and associated pipelines and electric transmission lines would require a labor pool that would be hired through the MHA Nation and through private contractors. It is anticipated that contractors and the required workforce would be available in the Reservation and nearby Minot. The majority of the construction and operation workforce would be local-hire employees. The completion of the Four Bears Bridge project in the summer of 2005 resulted in a substantial pool of available construction workers in the region.

The number of workers at the peak construction period would be 800 to 1,000 workers, the majority of which are expected to be local hires. The average worker would be paid $55/hour, resulting in an average annual wage of $106,000.

The Fort Berthold Community College currently offers a 2-year program for construction trades. The program would provide instruction to local workers in the skills required for the proposed project.

The permanent workforce for the operation and maintenance of the proposed refinery is summarized in Chapter 2. Operation of the refinery would require about 86 permanent personnel, primarily management staff, supervisory staff, and operators. Maintenance would be performed by contract personnel. The majority (350 workers, or 88 percent) of the contract workers would be turnaround maintenance tradesmen that would work at the plant for one month annually. Other contract workers would consist of daily and shift workers involved in security or maintenance. There would not be any anticipated new employees for the pipelines, other utilities, or railroad.

4.14.1.3 Facilities and Services

Construction and operation of the project have the potential to affect existing community facilities and infrastructure. Temporary activities, such as importation of construction materials and work force would have effects on existing infrastructure and may require installation of new facilities. Operation of the project would have minimal effects on facilities and services. The refinery would provide some of its own infrastructure such as fire protection, emergency health care services, ambulance service, and site security, which would be provided as construction begins and as operations continue. These services would minimize the effects on established services in the local communities.

The project would require highway access to the site and pipeline and rail access for feedstocks and product shipments. Installation of these transportation facilities would reduce impacts. Additional traffic on project area highways would increase the potential for automobile accidents and spill of materials. See section 4.11 a complete discussion of transportation impacts.

Attendance of community schools in the project area could experience a short-term increase during the construction period; however, minimal increases would be observed during project operations.

4.14.2 Construction Alternatives

4.14.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, BIA would accept the 468.39 acres into trust status without construction and operation of the clean fuels refinery. Consequently, the MHA Nation would not earn the $100 million annually over the estimated 20 or more year life of the Project. This would be inconsistent with the Tribes' pursuit of economic opportunities as described by the project purpose and need in Chapter 1. The MHA Nation, however, could decide to use the entire 468.39-acre project site to produce forage for their buffalo herd, or they could have the land included in the Farm Pasture Leasing Program. The production of forage from the parcel would reduce the costs of purchasing forage or grazing leases from other sources.

4.14.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Under this alternative, BIA would not accept the 468.39 acres into trust status. The MHA Nation would still be able to develop a clean fuels refinery on this property without the trust status. The social and economic effects described for Alternatives 1 and A would occur under Alternative 3. However, MHA Nation would pay taxes on the commercial operation to the county. The production of feed from 279 acres of the project site parcel also would occur under this alternative, so there would be the same economic benefit from reduction of forage purchases from other sources.

4.14.2.3 Alternative 4 — Modified Proposed Action

Implementation of this alternative would result in the same effects as described in Alternatives 1 and A. The revised site refinery layout, pipelines and power lines would be constructed, so effects attributed to these facilities would be the same.

4.14.3 Alternative 5 — No Action

Under this alternative, the refinery would not be constructed, the BIA would not accept the 468.39 acres into trust status, and the EPA would issue no environmental permits. The MHA Nation would continue to own the property outside of trust status. The entire 468.39-acre project site would continue to be used for agricultural purposes similar to those that have been occurring on the property for decades. Consequently, the MHA Nation would not earn the $100 million annually over the estimated 20 or more year life of the Project. This would be inconsistent with the Tribes' pursuit of economic opportunities as described by the project purpose and need in Chapter 1.

4.14.3.1 Effluent Discharge Alternatives

The additional effluent discharge alternatives would have no effect on socioeconomics. These alternatives involve the discharge of effluent to surface or ground waters. It is not expected that any of the additional alternatives would involve any of the components of the refinery that would affect socioeconomics noticeably. However, as previously discussed, there would be socioeconomic impacts if the irrigated lands were classified as a RCRA hazardous waste LTU or if a RCRA corrective action was needed.

4.14.4 Cumulative Impacts

Cumulative impacts to social conditions and the economy of the Reservation and Ward County resources would likely result from other planned or foreseeable development activities in addition to the construction and operation of the proposed refinery. There is potential that the increased economic stability of the MHA Nation would stimulate further industrial, residential and commercial development in the Reservation and Ward County. These cumulative and indirect impacts may have positive or negative effects on the economy and social conditions within the Reservation and Ward County.

4.15 Environmental Justice

4.15.1 Alternatives 1 and A — Original Proposed Actions

EPA's evaluation of potential impacts of the project included the potential extent of impacts to air, water and the surrounding community. EPA concluded that the area within a 1-mile radius of the project site may experience some changes in conditions associated with releases and/or potential releases of contaminants to air, surface water, ground water and soils resulting from the proposed project. None of these impacts, however, are expected to be above levels of concern to human health, except for unplanned or extraordinary events. Further, air quality impacts would diminish rapidly with distance from the refinery site, and NPDES discharge limits are required to be protective of aquatic life, drinking water, agriculture and wildlife uses at the point of discharge, which is within the refinery site. Thus, no increased area beyond the 1-mile radius was needed to evaluate these impacts from air emissions and wastewater discharges. In addition, it is expected that many of the impacts will be negligible and/or short term (i.e., potentially higher during the construction phase than during normal refinery operations).

The area within this 1-mile radius includes lands located inside the boundaries of the Fort Berthold Indian Reservation as well as non-Reservation lands. There are a total of six residences located within this same 1-mile radius. The four zip code areas beyond the 1-mile radius of the project site are not expected to experience measurable environmental or human health impacts. For a complete analysis of the potential environmental and human health impacts, please see the other sections in Chapter 4; particularly Ground Water in Section 4.2, Air in Section 4.13, and Health and Safety in Section 4.16.

The two primary exposure pathways from refinery operations are from air emissions and effluent discharges. As stated in the Air Quality Analysis, there are no anticipated significant adverse human health effects from refinery air emissions. This conclusion is based on direct inhalation of predicted refinery emissions rather than ingestion exposures and is therefore less certain with respect to food chain risks. Nonetheless, the potential for bioaccumulative effects of the predicted refinery emissions based on their physical and chemical properties is considered to be low, and no significant adverse human health effects are anticipated from the food chain exposure pathway.

The NPDES permit would require that wastewater discharges from the proposed refinery are protective of multiple uses including: aquatic life, drinking water, agriculture and wildlife uses. The discharge limits take into account indirect pathways of exposure, such as humans eating fish, cattle or bison, and wildlife eating fish or other wildlife. No direct impacts to fish as a result of refinery construction and operations are expected, given that no fisheries are located in proximity to the proposed refinery site.

The area surrounding the site may realize both positive and negative socioeconomic impacts associated with the project. For instance, increased economic activity associated with the project may lead to increased employment and income. Conversely, this area may also experience negative impacts to social cohesiveness resulting from a change in population and demographics, increased traffic, and increased pressure for housing. These negative impacts, however, are expected to be minor and will not disproportionately affect communities with EJ indicators. In addition, the negative impacts are likely to be short-term during the construction phase and subside once full-time operations begin, due to higher employment levels under construction than during the operation phase. For a complete analysis of potential socioeconomic impacts, please refer to Chapter 4, Socioeconomics in Section 4.14. The primary economic impact of the Proposed Action would be the economic benefit to the Reservation from the sales of refinery products, such as gasoline, diesel, and propane. The Tribes have estimated a net profit of $100 million annually over the 20 or more year estimated life of the project. In addition, the refinery would provide economic benefits to several communities, including Parshall and New Town, located on the Reservation approximately 10 and 30 miles, respectively, from the site. Makoti and Plaza, the towns closest to the refinery, are located outside the Reservation boundaries. Local communities would contribute to the available work force, housing, and infrastructure, and provide goods and services for refinery workers. Furthermore, it is expected that a substantial portion of the construction workers would be members of the MHA Nation. For additional social impact analyses, please see the following sections of Chapter 4 of the FEIS: Cultural Resources in Section 4.9, Land Use in Section 4.10, Transportation in Section 4.11, and Aesthetics in Section 4.12.

With respect to impacts throughout the State of North Dakota, it is likely that there will be both short- and long-term positive impacts associated with increased economic activity. These impacts, while significant on a local level, are expected to be small relative to the entire state economy.

Table 4-26 summarizes the type and nature of potential impacts to communities that have been identified as having indicators of an EJ community and to the state of North Dakota. The table shows negative impacts as (-), positive impacts as (+), and combined positive and negative impacts as (±). Negligible impacts are represented as (NG). The table identifies all impacts regardless of significance and does not represent only those impacts that disproportionately affect communities with EJ indicators.

Using EPA's criteria for evaluating EJ claims, it is concluded that there would be no disproportionately high and adverse effects on the communities in the four zip code areas surrounding the proposed refinery including Tribal communities located on Reservation lands within these areas. Ensuring that there would be no disproportionately high and adverse effects on communities surrounding the proposed refinery also ensures that communities located further away from the proposed refinery would not be subjected to any disparate adverse impact from the refinery.

For more information, see EPA's EJ Tier One Analysis for the Mandan, Hidatsa, and Arikara Nation's "Clean Fuels Refinery" Project, December, 2007. See also the responses to comments regarding impacts to wildlife and human health in Appendix E.

Table 4-26 Summary of Impacts to EJ and Reference Communities

	Environ-mental Impacts (Air and Water)	Human Health Impacts	Socioeco-nomic Impacts	Summary of Impacts
Communities Identified with EJ Indicators				
58756 (includes Makoti)	NG	NG	±	Impacts are expected to occur with releases and/or potential releases of contaminants to air, surface water, ground water and soils resulting from the proposed project, though these impacts are expected to be negligible and to occur within either the boundaries of the refinery or a radius of 1 mile; socioeconomic impacts are likely to be both positive and negative in this community
58771 (includes Plaza)	NG	NG	±	Impacts are expected to occur with releases and/or potential releases of contaminants to air, surface water, ground water and soils resulting from the proposed project, though these impacts are expected to be negligible and to occur within either the boundaries of the refinery or a radius of 1 mile; socioeconomic impacts are likely to be both positive and negative in this community
58770 (includes Parshall)	NG	NI	±	Socioeconomic impacts are likely to be both positive and negative in this community
59779 (includes Ryder)	NI	NI	±	Socioeconomic impacts are likely to be both positive and negative in this community
Reference Community: State of North Dakota				
North Dakota	NI	NI	+	Socioeconomic impacts will be positive associated with the increased economic activity, although these are expected to be very small relative to state wide socioeconomic indicators

+: Positive Impact; -: Negative Impact; NI: No Impact; NG: Negligible impacts

4.15.2 Construction Alternatives

4.15.2.1 Alternative 2 — Transfer to Trust, No Refinery

Under this alternative, the MHA Nation would not construct or operate the clean fuels refinery. Although the property would be accepted into trust status, the MHA Nation would continue to use the property for agricultural purposes. Land uses at the refinery site would remain the same as they currently are. Consequently, there would be no local jobs and other economic benefit generated through construction and operation of the refinery. Also the MHA Nation would not earn the $100 million annually over the estimated 20 or more year life of the Project.

4.15.2.2 Alternative 3 — No Transfer to Trust, Refinery Constructed

Implementation of this alternative would result in the same environmental effects as described for Alternatives 1 and A. The effects would be the same because the refinery would be constructed and operated as indicated under Alternatives 1 and A. However, if the refinery site is not accepted into trust by the BIA, the refinery is likely to generate less income for the MHA Nation. One of the main issues would be state fuels taxes. The specific arrangements would be negotiated between the MHA Nation and the State of North Dakota. If the Tribes and the State reach agreement the economic benefits of the refinery would be very similar to those described for Alternatives 1 and A. Consequently, the same disproportionate economic benefits discussed under Alternatives 1 and A would occur with implementation of this alternative.

4.15.2.3 Alternative 4 — Modified Proposed Action

Potential effects to EJ communities for the refinery project under the Modified Proposed Action would be the same as those described under the Alternatives 1 and A.

4.15.2.4 Alternative 5 — No Action

Under this alternative, the MHA Nation would not construct or operate the clean fuels refinery. Land uses at the refinery site would remain the same. Consequently, implementation of this alternative would have no discernable effects to EJ communities in the affected area.

4.15.3 Effluent Discharge Alternatives

4.15.3.1 Alternative B — Partial Discharge through an NPDES Permit and Some Storage and Irrigation

With this alternative, surplus treated wastewater would be disposed of through land application to irrigate crops or discharged through NPDES permitted outfalls. For the same reasons presented for Alternatives 1 and A, implementation of this alternative would not result in adverse effects to the EJ communities in the affected area that would be disproportionate relative to the surrounding area.

4.15.3.2 Alternative C — Effluent Discharge to an UIC Well

Under this alternative, all wastewater would be discharged to an UIC well after treatment in the refinery's water treatment plant. A Class I UIC well permit requires the disposal of water into a deep aquifer that is of too poor quality to be a source of drinking water. Consequently, the water disposed in the well would be isolated from all sources or potential sources of drinking water for the long term. Because the aquifer used for disposal would be completely isolated, implementation of this alternative would not result in adverse effects to the EJ communities in the affected area that would be disproportionate relative to the surrounding area.

4.15.3.3 Alternative D — No Action

Under this alternative, the MHA Nation would not construct or operate the clean fuels refinery. No NPDES discharges would occur and land uses at the refinery site would remain the same. Consequently, implementation of this alternative would have no discernable effects to EJ communities in the affected area.

4.15.4 Cumulative Impacts

No cumulative impacts were identified for EJ. No reasonably foreseeable actions were identified that would have effects in the affected area that would overlap in time or space with the direct and indirect effects discussed above.

4.16 Health and Safety

This section addresses health and safety impacts associated with the proposed MHA Nation Refinery project. The proposed refinery would be located in a rural setting with the closest community of Makoti approximately two miles away. The types of impacts considered in this section are those resulting from exposure to chemicals and from accidents caused by working with equipment related to refinery construction and operation. Other health and safety issues are also examined, including potential impacts to receptors living off-site.

For all alternatives that involve refinery construction, there is potential for impacts to occur to the health and safety of people and to the environment during both construction and operation of the refinery. Impacts associated with construction activities would be comparable to any major industrial construction project. These impacts would be largely confined to the project site, although they would also occur at construction sites for storage tanks, pipelines, and transmission lines and along delivery routes for supplies and equipment. The occurrence of impacts to health and safety during operations would extend throughout the projected 20 years or more of refinery operations and, for some impacts, into the time period assumed necessary to decommission the refinery and reclaim the site.

Health and safety impacts would be largely confined to the project site, but would also occur along supply routes and at locations where support facilities are operating. In addition, during refinery operations and decommissioning, chemicals present in emissions to the air from the project site may migrate downwind, and chemicals in effluents discharged to the environment may move downgradient from the project site. The current area of influence for these chemical effects is estimated to be within the project site fence line, and within the refinery process area in particular, as emissions tend to be less concentrated beyond that point and effluents would be regulated under the conditions of an effluent discharge permit.

The refinery has been designed to avoid many of the types of exposure that could lead to these potential impacts and to minimize other types of exposure. Typical refinery-related impacts to human health may include damage to specific organs or tissues from excessive direct exposure to hydrocarbons, metals, and other site-related chemicals. Increased risk of specific types of cancer from long-term exposure to lower concentrations of these chemicals is another potential impact to human health. Such chronic health impacts are typically caused by repeated and long-term direct contact with such chemicals. Ecological receptors, such as plants and animals, can be similarly impacted, although their impacts are typically evaluated at the population level rather than for individuals (except for threatened, endangered, or other special-status species).

In addition to health impacts, safety concerns are present at the site. Examples of safety issues include: physical injury from the operation of heavy equipment during construction; exposure to hazards associated with cleaning of equipment during operation and turnaround maintenance, such as the steam used for cleaning tanks; and slip/trip/fall hazards around the refinery facility. These safety issues are similar to those commonly found at other large industrial facilities. Such safety concerns, as well as many health concerns, could be minimized, because refinery construction and operation are usually subject to the requirements of OSHA, which establish protocols to ensure occupational safety and health. It is the MHA Nation's intent to apply OSHA regulations during construction and operation of the proposed refinery.

The nature and scale of health and safety impacts associated with the proposed MHA Nation Refinery may be evaluated in a number of ways. EPA typically examines health risk in the context of increases in the incidence of cancer and non-cancer (or systemic) disease. For risk to exist or to be increased due to releases of chemicals, there must be a complete pathway between the source of the contaminant and the human or ecological receptor. Further, once exposed to the chemical, the receptor must exhibit susceptibility to the chemical by demonstrating one or more measurable adverse effects (i.e., disease, reduced growth, mortality). Several points of departure regarding protection of human receptors are described later in this section. Additionally, impacts to the environment and ecological receptors have generally been discussed in other sections of this document, but the impacts of chemicals on plants and animals, some of which may be harvested and eaten by people directly or that may be fed to livestock and subsequently consumed by people, are considered here. Such impacts would be considered significant if they provide an important exposure route to humans or cause plant or animal populations to decline.

Under the refinery construction alternatives (Alternatives 1, 3, and 4), part of the land would be used for cultivation of forage to be fed to the MHA Nation buffalo herd. Under Alternatives 2, the entire parcel would be used for forage production, and the refinery would not be built. Under Alternatives 5, there would be no change from current use of the land. Under Alternatives 2 and 5, there would be no impacts from new chemicals brought to the site for the refinery; the ongoing potential for accidents during use of agricultural equipment would be the only health and safety concern.

A more detailed discussion of potential health and safety concerns is provided in the sections that follow.

4.16.1 Alternatives 1 and A—Original Proposed Actions

4.16.1.1 Refinery Emissions and Effluents

During construction, the primary chemicals present on-site would be fuels for construction vehicles and possibly substances used to minimize airborne particulates. During refinery operation, the diversity and volume of chemicals that are present on the site would be considerably greater. Specifically, the refinery chemicals will include large volumes of diverse hydrocarbons (e.g., benzene, butane, crude oil, ethane, gasoline, light and heavy diesel fuel, gasoline, isobutene, isobutylene, iso-octane, kerosene, methane, naphtha, and propane), small amounts of metals (e.g., selenium, chromium), and other chemicals (e.g., alcohols, ammonia, CO, hydrogen sulfide, nitrogen oxides, sodium hydroxide, and sulfur dioxide), all of which are potentially harmful to human health and the environment at certain concentrations.

Refinery Air Emissions and Sources

The MHA Nation proposes to construct and operate a 13,000 BPSD of synthetic crude oil clean fuels refinery. Additional feedstock for the refinery would include 3,000 BPSD of field butane, 6 MMSCFD of natural gas, and 300 bbl of bio-diesel or 8,500 bushels per day of soybeans. From the feedstock, the refinery would produce about 5,750 BPSD of diesel fuel, 6,770 BPSD of gasoline, and 300 BPSD of propane.

Table 4-15 provides a summary of the estimated annual criteria pollutant emissions for the refinery. Total estimated emissions are approximately 207 tons per year, with the largest estimated quantities consisting of the following: NOx, CO, non-methane-ethane VOCs, SO_2, and PM_{10} and $PM_{2.5}$. HAPs estimated to be released include benzene, cyclohexane, ethylbenzene, formaldehyde, n-hexane, Polycyclic Aromatic Hydrocarbons (PAH), toluene, and total xylenes.

According to the air quality technical report (December 2007), all production emission sources at the proposed refinery are assumed to operate continuously (24 hours/day, 7 days/week and 52 weeks/year). The primary sources of air pollutants include the hydrocracking unit and various heaters and boilers that serve the refinery’s processes and general facility heating requirements. Other emissions would result from a soybean/oilseed oil extrusion process and a bio-diesel production process, also included in the proposed project. In addition, an emergency generator and fire pump would operate periodically for testing and maintenance. Fugitive emissions at the refinery would include VOC emissions from processes and material handling (e.g., tank farm, rail loading, truck loading), and fugitive dust (PM_{10}) from vehicle traffic during the construction and operation phases of the facility.

Refinery Water Effluent and Sources

The refinery would generate three types of wastewater: (1) sanitary wastewater, (2) uncontaminated (non-oily) wastewater, and (3) process wastewater and potentially contaminated (oily) stormwater. Under Alternatives 1 and A, each of these streams of wastewater would be handled separately and receive different levels of treatment.

EPA has developed draft NPDES effluent limits for wastewater discharges anticipated at the refinery. These limits have been developed based on criteria to protect aquatic life, drinking water quality, and wildlife. Table 4-2 in this chapter lists the EPA draft effluent limitations for refinery process wastewater and contaminated (oily) stormwater for the following effluent characteristics: flow, Biochemical Oxygen Demand (BOD), total suspended solids, chemical oxygen demand, oil and grease, phenolic compounds, several metals, and VOCs. Uncontaminated (non-oily) stormwater discharges would also be covered under the permitted NPDES outfall.

Other Contaminants Present at the Facility

In addition to those contaminants emitted from the construction and operation of the facility, the current status and quality of the various environmental media (e.g., surface water, air, and ground water) are presented in Chapter 3, Affected Environment. Some media at the refinery site are already impacted by certain contaminants, thereby presenting the potential for additional human health exposures. Specifically, surface water concentrations of arsenic exceed both the aquatic and human health criteria in the East Fork of Shell Creek. In addition, other constituents in the East Fork of Shell Creek are at levels above concentrations typically found in undeveloped areas. Existing ambient air quality has been monitored for SO_2 and PM_{10} in an area 25 miles (40 kilometers) south of the project site in White Shield, North Dakota, which is close to most of the existing emission sources. NO_2 has been monitored in Beulah, North Dakota, which is 47 miles (76 kilometers) south of the project site. While maximum annual average concentrations of SO_2 (4.8 $\mu g/m^3$), PM_{10} (11.6 $\mu g/m^3$), and NO_2 (7.1 $\mu g/m^3$) show these pollutants have been detected, none exceed NAAQS or North Dakota Ambient Air Quality Standards. Ambient background concentrations of SO_2, PM_{10}, NO_2 and CO were all considered in the NAAQS impact analysis (Table 25, Greystone 2004). For ground water, ten ground water monitoring wells on the project site were sampled, and quarterly sampling events indicated that all PCBs and pesticides were at non-detectable levels, RCRA metal concentrations were below MCLs in all samples, and very low concentrations of some VOCs were detected in some samples, but were non-detectable in duplicate samples.

4.16.1.2 Fate and Transport of Emissions and Effluents

Air emissions and water discharges from the facility construction and operations would result in the release of contaminants via air dispersion and deposition and water discharges to the surrounding environmental media. The fate and transport of each contaminant would likely differ depending on the specific chemical properties and where the dispersion, deposition, and discharges occur. This section discusses the air emissions and effluent discharges under both the construction and operational phases of the facility, and the potential fate and transport in the various environmental media, including air, water, and soil. Chemical transport properties such as volatility, solubility and sorption potential are important factors to consider for the fate and transport into the various media. There would be minimal exposure to chemical hazards other than dust and heavy equipment emissions during construction. During refinery operation, however, air and water exposure pathways would be used by a much greater number of chemicals, as discussed below. Exposure to the chemicals present during operational phases of the project could be through direct contact, or these chemicals could be dispersed to air, water, and soil resulting in indirect exposures to receptors through the food chain pathway.

Air Pathway

Under the construction phase, the primary emissions would be from mobile sources (vehicles) and dust generation. Specific contaminants would include CO, NOx and PM_{10}. This would result in emissions to the air and likely local dispersion and deposition to the surrounding soil and surface water. Humans are likely to be exposed via inhalation or incidental ingestion of soil and/or surface water.

During operations, NOx, CO, SO_2, and PM_{10}/$PM_{2.5}$, as well as multiple HAPs (i.e., benzene, cyclohexane, ethylbenzene, formaldehyde, n-hexane, PAHs, toluene, and total xylenes) are expected to be emitted from the facility. These contaminants are a result of either the combustion process or products of incomplete combustion and would transport via advection [air movement, wind] and disperse into the atmosphere. An ambient air quality analysis was conducted using the ISCST3 model. The results of this analysis indicate that some deposition would occur to the surrounding soil and surface water, and humans and environmental receptors may be exposed to low levels of contaminants via the inhalation pathway or incidental ingestion of soil and/or surface water.

Water Pathway

Construction activities would disturb soils and potentially result in transport of sediment during precipitation events. This transport could enter nearby drainages or wetlands and cause adverse effects on surface water quality. Humans can be exposed via incidental contact with surface water. Construction activities are not expected to impact ground water quality. While there are potential impacts to soil from inadvertent spills of hazardous materials, protective measures such as BMPs, required by the Stormwater Construction General NPDES permit, the SWPPP, and the SPCC plan, would minimize contamination into soils and consequently shallow ground water at the site. No impacts to water quality in deeper aquifers are anticipated during construction activities.

During facility operations, all water effluent discharged from the outfalls would meet the refinery's NPDES permit effluent criteria. Any potential impacts would be a result of water discharge and oil spills and leaks. Contamination to ground water could result from the dissolution and mobilization of exposed oil and refined products by precipitation and subsequent downward migration into the underlying soils. However, design engineering and operating practices (e.g., spill response plans) would minimize impacts to surface and ground water quality.

Contaminants distributed via air emissions would undergo dispersion and deposition onto local surface water bodies including Shell Creek and East Fork Shell Creek drainages. If those surface water bodies are used as sources for drinking water, humans could be exposed via ingestion of potable water. If there are aquatic species residing in the surface water bodies, then humans could be exposed via ingestion of contaminated fish. If treated wastewater is used as a source of irrigation water, it is possible that the irrigated soil, ground water, vegetation, and animals could subsequently become contaminated. Thus, humans could be exposed via the food chain pathway.

Soil Pathway

Under the construction phase, the primary emissions would be from mobile sources (vehicles) and dust generation. This would result in emissions to the air and likely local dispersion and deposition to the surrounding soil. Humans are likely to be exposed via incidental ingestion of soil.

Once emitted during facility operations, contaminants would undergo dispersion and deposition onto the soil of the facility and surrounding area. Spills and accidents impacting soil may include: synthetic crude oil, refined petroleum products (e.g., gasoline, diesel), lubricating oils, hydraulic oils, or sludge contained in storage tanks or equipment. If crops are grown on this soil, it is possible that both the vegetation and the livestock that feed on this vegetation could uptake the contaminants. In addition, it is possible that contaminants could infiltrate into the underlying ground water. Humans could be exposed via incidental soil ingestion, ingestion of the various food crops or livestock, or ingestion of the ground water.

Food Chain Pathway

As discussed above, there would be some minor releases of chemicals to the environment via air, water, and soil pathways that would become available for uptake by receptors through the food chain. EPA completed a quantitative analysis of food chain risks posed by refinery emissions to determine the potential for adverse effects from these exposures. See the Qualitative and Quantitative Human Health Risk Assessment Technical Report for more information. The results of this analysis indicate that the releases would be greatest within the refinery process area and the area immediately surrounding the site. Chemicals that are airborne as individual molecules, adsorbed onto particulates, or absorbed by them can be inhaled by animals in the area influenced by the site. In addition, these airborne particles can be deposited to soil and surface water both within and beyond the site boundary. Chemicals that are suspended or dissolved in the water can be contacted directly by aquatic plants and animals, or ingested as drinking water by terrestrial animals either on the site or downstream from their point of origin. Such chemicals can also be deposited in the soil if they drop out of suspension as surface water flow decreases. Once in the soil, these chemicals can be taken up by plant roots, ingested incidentally by animals as they dig burrows, take dust baths, or feed on organisms in or covered with soil. Even if the chemicals are not ingested, they may pass through the moist skin or mucosa of some species, such as amphibians.

Once within a plant or animal, a chemical may be broken down to harmless components, excreted, or may remain intact and be stored in tissues such as hair, fat, fingernails, or bone. Chemicals that are stored in forage plants or prey animals are consumed when the plant or animal is eaten. Because a given predator typically eats numerous individual prey items, it could receive multiple doses of stored chemicals. This predator might in turn be eaten by another predator or by a person. The further up this "eat and be eaten" food chain chemicals move, the more concentrated they may become. Even at high concentrations, the chemicals may not affect their host organisms, as long as they are stored in tissue and physiologically unavailable. Alternatively, impacts to ecological receptors from stored chemicals may occur when the organism goes through a period of stress and uses up its body fat, releasing its store of chemicals. This may happen as birds near the end of a long migration, or big game reach the end of a long hard winter.

The risk characterization resulting from the quantitative evaluation of food chain risks (see Qualitative and Quantitative Human Health Risk Assessment Technical Report) indicates that both cancer and non-cancer risks are many times less than the lower end of EPA's target risk cancer range and target non-cancer hazard index, respectively.

4.16.1.3 Impacts to Human Health and the Environment

Human Receptors

Impacts to human health and the environment posed by Alternatives 1 and A are assumed to occur during two distinct components of the project: 1) construction, and 2) operation and maintenance of the clean fuels refinery.

The MHA Nation intends that all phases of the construction and operation and maintenance of the clean fuels refinery would be subject to safety and health regulations outlined by the U.S. Department of Labor, OSHA. OSHA assures the safety and health of workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health. As such, it is anticipated that workers involved in refinery construction and operation and maintenance would be protected by health and safety standards and work practices afforded through OSHA compliance.

Construction Impacts

Construction of the proposed project is expected to result in only temporary impacts to human health and the environment. As previously mentioned, construction activities may result in risks to worker health and safety. Compliance with OSHA standards and regulations, however, would minimize potential impacts to worker health and safety.

Nearby residents would be the most likely human receptors impacted by construction activities. Construction would begin with the stripping of topsoil, the grading of the refinery site, and the excavating of foundations and spaces for underground work. The most likely exposure pathway for off-site residential exposure associated with construction of the proposed project would include increased exposure to dust, emissions from construction equipment, and any entrained chemicals associated with windborne dust or surface erosion. Soil erosion from all construction activities is expected to be minimal, because the proposed project would be constructed following standard practices and permit conditions to control wind erosion by limiting the removal of vegetation, avoiding construction on steep and erosive slopes, revegetating or covering any topsoil that was removed and stockpiled, surfacing roads, and reclaiming areas in a timely manner. In addition, active construction sites would be watered, as necessary (except during periods of rain), to minimize the potential for wind erosion.

Increased vehicular traffic associated with construction of the clean fuels refinery under Alternative 1 is also a potential factor that could impact human health. The primary impacts to human health are a minimal increase in daily traffic, specifically heavy equipment and truck traffic, and an associated increase in risk of accidents during construction of the refinery. The addition of traffic control lights and nighttime lighting would help minimize the potential for increases in accidents.

Operation and Maintenance Impacts

During the operation and maintenance phase of the proposed clean fuels refinery, releases of various chemicals and hazardous materials during refinery operations are the most significant concern for impacts to human health. The proposed refinery would use a number of hazardous materials at the site to manufacture clean fuels. Transporting, handling, storing, and disposing of chemicals and hazardous materials inherently pose a risk of a release to soil, ground water, air, surface water, and sediment. In addition, air emissions generated during refinery operations associated with making clean fuels are a source of potential adverse impacts to human health. Finally, secondary release mechanisms (e.g., plant uptake of contaminants from soil impacted by air deposition) are also of concern, which also may be irrigated using water from refinery operations under Effluent Discharge Alternative B.

The following sections discuss potential impacts to human health due to potential releases from the refinery of hazardous constituents by various mechanisms. Because limited data are available, quantitative evaluations of the risks posed to human health by release of hazardous constituents are only addressed for direct or indirect exposure to air emissions from refinery operations. A qualitative discussion is provided for other release mechanisms.

Transportation

Increased vehicular traffic associated with operation of the clean fuels refinery under Alternative 1 would be a potential factor that could impact human health. The primary impacts to human health relate to increases in daily traffic, specifically heavy equipment and truck traffic, and an associated increase in risk of accidents. These and related issues have been discussed earlier in this chapter.

On Site Releases

Various chemicals, synthetic crude oil, and refined products would be stored at the refinery facility in aboveground storage tanks, containers, or drums. The movement and storage of synthetic crude oil and processed product within the tank farm, processing area, and product loading area is part of the complex bulk product distribution, refining, and storage system on the refinery. The complexity of the refining process and amount of stored oil, product, and chemicals moving through the system provides opportunities for accidents, spills, leaks, and losses from simple volatilization.

Petroleum products may be released to the environment as managed releases, or as unintended by-products of industrial, commercial, or private actions or accidents. Spills could also occur from corrosion of containers, piping, and process equipment; and leaks from seals or gaskets at pumps and flanges. The overall spill hazards associated with the handling and transport of processed fuel oils at the MHA Nation Refinery are expected to occur less than at refineries using older technologies. It is anticipated that if a spill occurred, it would be either a human or a mechanical error.

Most spills would likely involve either crude or bulk fuels (e.g., distillates), such as fuel oils. Consistent national statistics regarding type and magnitude of release are lacking for many stages in the overall oil refining and distribution system. The main exceptions involve larger leaks and spills, especially those in coastal areas or on larger rivers and streams.

Soil contamination could occur during the construction and operation of the refinery. Contaminated soils would typically include natural materials such as soils, subsoils, overburden, or gravel that have been contaminated with synthetic crude oil; refined petroleum products, such as gasoline and diesel fuels; lubricating oils; and hydraulic oils or sludge contained in storage tanks or equipment. The immediate potential effect would be direct contamination of the soil, which could result from the release of fuels and oil at the refinery site and along the pipeline corridor, or from accidents during delivery of product. The anticipated causes of spills on land could include traffic accidents, operational errors, corrosion, mechanical failures, and vandalism.

In general, oil or petroleum product dumped or spilled onto soils can saturate the soil matrix. This type of concentrated contamination can be problematic to remediate. If oil or petroleum product is introduced at any depth within the soil matrix, natural weather and biodegradation processes can be rendered less effective and the chances may increase that some of the oil or petroleum product may contaminate ground water, if present. Because many oil or petroleum product components have densities lower than or close to that of water, the lighter non-aqueous phase liquids (LNAPLs) generally pose less potential for ground water pollution than most chlorinated solvents (e.g., PCBs or TCE), which are denser than water (denser non-aqueous phase liquids [DNAPLs]) and are found at numerous industrial sites.

Ground water resources in proximity to the refinery could be affected by leaks and spills, particularly if a spill occurred directly above or close to shallow underlying ground water. Adverse impacts to drinking water quality of individual well users and public supply systems are not anticipated under this alternative and are discussed further in the Ground Water section of this chapter.

The Town of Plaza uses a well completed in the Fox Hills-Hell Creek aquifer located approximately four miles from the refinery site. Impacts to the Fox Hills-Hell Creek aquifer in terms of water quality would be insignificant due to its great depth and hydraulic isolation from the shallow aquifers. Residents of Plaza use two additional ground water wells to meet the demand during high usage periods. These wells are completed at depths of 88 and 91 feet in Coleharbor Formation and are located approximately five miles northwest of the refinery. Impacts to water quality are expected to be negligible due to the low hydraulic conductivity of overlying soils and distance from the refinery property.

Residents of Makoti obtain water from two ground water wells completed in the Vang aquifer (buried valley aquifer) at depths of 22 and 41 feet. These wells are located approximately five miles northeast of the project site. Impacts to water quality are expected to be negligible due to the distance of these wells from the refinery site, the limited local extent of these aquifers, the low hydraulic conductivity of the overlying soils, and the existing degraded water quality in this formation.

The majority of the domestic wells used by individuals in the vicinity of the refinery are completed in surficial deposits, primarily the till. Six residences are located within one mile of the project area. Wells for two of these residences include the O__ well just north of Highway 23 and the S__ well located south of the proposed refinery property. Wells are completed at depths of 103 and 189 feet and the water has a brownish-red appearance with high TDS values. These residences haul in water for drinking and use the well water solely for cattle and horses. There are two water wells located at the east side of the property at the farm house. Neither of these wells is currently used, nor are they anticipated to be used in the future. Impacts to water well quality in the shallow till and buried valley aquifers from project discharges are not anticipated, primarily because all the discharged water would be of better quality (i.e., meeting the NPDES requirements) than the formation water in the shallow aquifers. Additionally, low volume of discharges and low hydraulic conductivity of the overlying till material would minimize the infiltration rates and volumes. As described earlier, potential impacts to shallow ground water might occur as a result of inadvertent spills or leaks, although protective measures, as provided in the SPCC plan, the SWPPP, and application of BMPs, would minimize introduction of undesired substances into soils and consequently into shallow ground water.

Treated Wastewater and Stormwater Discharges

The stream of wastewater containing hazardous constituents would consist of process wastewater that is collected from process units directly and potentially contaminated (oily) stormwater collected from the process area, product loading area, and tank farm. All process wastewater would be routed to the WWTU for treatment. There would be no direct discharge of untreated process wastewater to surface waters. Because all contaminated wastewater and stormwater would be treated prior to discharge under the NPDES Permit, the effects on surface water quality would be minimal. As a result, the impacts on human health of discharged treated wastewater and stormwater from the proposed refinery are expected to be negligible.

Air Emissions

Impacts to ambient air quality were evaluated using existing monitoring data available for the Reservation and surrounding areas, projections of criteria and HAP emissions from the refinery, and air quality modeling. Existing air quality data are summarized in the Air Quality Section of this chapter. The air quality modeling overlaid projected emissions on existing conditions and quantitatively estimated the potential near-field and far-field effects. Near-field effects are those that occur within a 10-km radius of the project, and far-field effects are those that occur at the Class I areas described in Chapter 3. The modeling was built on recent modeling done by EPA for PSD purposes in North Dakota. It included analyses that compared concentrations of criteria air pollutants with the NAAQS, the Class I or Class II increments, and AQRV. The modeling also included an analysis that compared concentrations of HAPs with risk based concentrations for the inhalation pathway.

Refinery Air Emissions

The primary sources of air pollutants (criteria and hazardous) would be the various heaters and boilers that serve the refinery's processes and general facility heating requirements. A soybean/oilseed oil extrusion process and a bio-diesel production process would also be included. The air quality technical report (December 2007) provides a detailed discussion of the sources of air pollutants evaluated in the air quality analysis and the processing and modeling of the emissions data.

The cumulative effects analysis contained in the air quality technical report (December 2007) evaluated the potential effects of the refinery on regional air quality. Criteria pollutant background concentration data were also used to assess these impacts. The cumulative effects modeling analyses demonstrated that the refinery would have negligible impacts on the quality of air. The air quality technical report (December 2007) provides a detailed discussion of the cumulative effects analysis, including the inputs for the modeling and resulting outputs.

Under the proposed alternatives, the MHA Nation would construct and operate the clean fuels refinery. Table 4-15 provides a summary of the estimated annual criteria pollutant emissions for the refinery. These criteria pollutants include NOx, CO, VOCs, SO_2, PM_{10} and $PM_{2.5}$.

EPA has established NAAQS for ozone, NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, and airborne lead. These standards were developed to protect public health and welfare with an adequate margin of safety. The NAAQS and State of North Dakota's ambient air quality standards are presented in Chapter 3 in Table 3-15. These are the regulatory limits that concentrations of pollutants must not exceed during the specific averaging period for an area to be considered in attainment for air quality. The modeled results showed the potential emissions of criteria pollutants from the refinery are below all NAAQS.

EPA has also established increment standards for both Class I and Class II areas. These increment standards were developed to restrict deterioration of air quality for SO_2, NO_2, and PM_{10} and are presented in Chapter 3 in Table 3-16. The maximum modeled emissions did not exceed the increment standards for either the Class I (Table 4-20 and Table 4-21) or Class II areas (Table 4-17).

Based on air emission modeling for the proposed refinery, Table 4-22, presented earlier in this chapter, summarizes the estimated maximum HAP ambient concentrations in micrograms per cubic meter ($\mu g/m^3$) of air. The results of HAP ambient impact modeling and current health-based inhalation risk estimates are shown in the Clean Fuels Refinery Site-Specific Air Emissions Modeling section of this chapter.

The treated wastewater discharges associated with Alternative A would have no effect on air quality. The discharge of effluent to surface water or ground water does not involve any of the components of the refinery that would affect air quality emissions.

Regional Air Emissions

The power plants located near Beulah, North Dakota, roads, and agriculture are the main sources of air quality impacts in the airshed surrounding the proposed petroleum refinery. As demonstrated in the modeling analysis and the Class 1 and II area air quality analysis, the refinery would have negligible impacts on cumulative air quality within the surrounding airshed. No significant changes are anticipated in the area regarding the air emissions from roads and agricultural practices. Emissions from the power plants around Beulah are anticipated to be reduced over time as one power plant has announced plans to modernize pollution equipment. However, there are several new sources of air pollution in the airshed surrounding the proposed petroleum refinery that are in the planning stages including a new power plant and an ethanol plant.

Livestock Grazing and Forage Production

The area surrounding the site is used extensively for agriculture purposes, and approximately 279 acres of the site would be used to produce buffalo forage. Air modeling results indicate that the area of maximum emissions deposition would be at or near the proposed project fence line and within the refinery process area in particular. These results suggest that small amounts of the emissions may be deposited on the forage crops and fields in the immediate vicinity of the refinery. In addition, the crops on the trust land may be irrigated with wastewater from the proposed refinery under Effluent Alternative B. As a result of direct contact or plant uptake, forage crops may be an indirect mechanism for exposing human receptors to chemical and hazardous constituents emitted from the refinery.

Qualitative and Quantitative Evaluation of Human Health Risks Posed By Air Emissions

Petroleum refineries produce a variety of air emissions, with the types and amounts varying due to the process operations, controls and feedstock. Common air emissions from a petroleum refinery include hazardous emissions, such as benzene, toluene, ethylbenzene, xylene, VOCs; and criteria emissions such as NOx, SO_2, CO, and PM. There can be adverse health effects associated with excessive exposure to hazardous and criteria pollutants, such as cancer, respiratory irritation, and damage to the nervous system. These potential hazards associated with refineries have resulted in increased concerns for residents of communities located in close proximity of refineries. The following sections further discuss potential adverse health effects associated with petroleum refineries. Additional information is contained in the Qualitative and Quantitative Human Health Risk Assessment Technical Report on the CD-ROM enclosed with this FEIS.

4.16.1.4 History of Health Risks Posed By Refineries

History of Risks Posed By Refinery Air Emissions

The last major refinery built in the U.S. was in 1976. All existing refineries have had to modify existing facilities to meet new environmental regulations specific for refining commencing in the early 1980s. Process equipment to be used by the proposed refinery has been designed in order to meet specific regulatory requirements, and control equipment has been improved to substantially remove more emissions than was previously possible with older technology. The proposed MHA Nation Refinery would have the advantage of being able to utilize these modern processing and controls in meeting regulatory requirements and minimizing effects to nearby communities and the environment. The facility would also be refining synthetic crude that has already been partially refined in Canada.

Petroleum refineries in the U. S. have reduced criteria emissions by 77 percent between 1970 and 1997 (American Petroleum Institute 2005). Since 1970, CO and SO_2 emissions from petroleum refineries and related facilities have declined by 85 percent and more than 63 percent, respectively, since 1970. During this same period, NOx and VOCs declined by more than 50 percent. Hazardous emissions from petroleum refineries have declined by similar amounts. Releases dropped by 34 percent between 1988 and 1997, with benzene levels dropping by 51 percent (American Petroleum Institute 2005). According to EPA's Toxic Releases Inventory Program, petroleum refineries account for approximately 3 percent of all of the nation's toxics releases (American Petroleum Institute 2005). These reductions are associated with the use of innovative technologies and a continual movement toward further reductions. The use of state-of-the-art control technologies by new refineries would allow these facilities to operate with significantly reduced emissions as compared to older refineries.

The ATSDR has performed several public health assessment studies addressing impacts to human health and the environment related to oil refineries. Most of these studies involved closed facilities with limited historical air emissions data available, although the ATSDR has completed some focused studies on operating refineries for specific types of releases. Most of the studies on closed facilities indicated inconclusive results regarding historical health impacts, and various interest groups have highlighted the lack of information regarding the combined human health effects of the mixtures of chemicals released from refineries.

In the 1990 CAA Amendments, Congress mandated that the EPA carry out a human health risk and adverse environmental effects-based "needs test." This is referred to as the residual risk standard setting, a phase in which the EPA would consider the need for additional standards following regulation under section 112(d) of the CAA to protect public health and the environment. The EPA assesses the risks from stationary sources that emit air toxics after technology-based (maximum available control technology [MACT]) standards are in place. For the refinery industry, EPA has initiated a study of human health risk; however, the residual risk review has not been completed.

The EPA studied 155 U.S. refineries to assess potential cancer risks from air releases based on available information (Shaver 2003). The majority of the 155 refineries fell between the one in one-million (1x10-6) and one in ten-thousand (1x10-4) excess lifetime cancer risk range. As discussed in the National Contingency Plan (NCP) (55 *Federal Register* 8666, March 8, 1990), EPA's human health risk reduction goal and target risk range is to:

> "reduce the threat from carcinogenic contaminants such, that for any medium, the excess risk of cancer to an individual exposed over a lifetime generally falls within a range 10-6, in other words, an exposed individual would have an estimated upper bound excess probability of developing cancer from one in one-million, to 10-4, or an exposed individual would have an estimated upper bound excess probability of developing cancer from one in ten-thousand."

Approximately 10 of the 155 refineries exceeded 1x10-4, meaning there is one chance in ten-thousand of an additional cancer event occurring. Between 6 and 12 refineries of the 155 refineries were below 1x10-6, meaning there is one chance in one-million of an excess cancer event occurring (Walker 2002).

Based on EPA's target risk range information, most refineries appear to fall into a risk level between one in one-million (1x10-6) and one in one-hundred-thousand (1x10-5) for cancer risk. The majority of the cancer risks are attributable to very few compounds, with benzene being the main risk "driver," the inhalation pathway being the main means of exposure, and fugitive emissions (as opposed to stack emissions) being the dominant source of exposure (Walker 2002). There appears to be little correlation between process unit and risk. The main risk factor was found to be the proximity of a person to the emission source(s) (Walker 2002). It should be noted that the results shown above are preliminary, and additional data are needed for better assessments. A determination as to the need for any additional public health-based amendments for petroleum refining would be made once the EPA completes the residual risk review for petroleum refineries. The proposed MHA Nation refinery would be designed to comply with applicable MACT and associated health-based amendments.

Ponca City, Oklahoma Air Toxics Assessment

The Air Quality Division of the Oklahoma Department of Environmental Quality (ODEQ) conducted an assessment of the air toxic risk in Ponca City, Kay County, Oklahoma, in 2002 (Oklahoma Department of Environmental Quality 2004). The purpose of the study was to examine the accuracy of the National Air Toxics Assessment, which had indicated unusually high risk in Kay County. Ponca City has an existing oil refinery (about 10 times larger than the proposed refinery). A 20-kilometer square area was selected for analysis, which included all the major sources of air pollution in the immediate area.

The risk assessment was based on the following:

- 20 km squared study area
- Focus on VOCs and not semi-volatiles, particulates or metals
- Model inhalation risk only
- Exclusion of mobile and area sources

Most of the total volatile organic emissions were attributed to three industrial facilities in the assessment area:

- Petroleum refinery (187,000 bbl per day, 54 sources representing 1,535 tons/year)
- Petroleum tank farm (159 sources, 492 tons/year)
- Carbon black plant (15 sources, 200 tons/year)

Modeling was conducted as per the Regional Air Impact Modeling Initiative. The conclusion of the risk modeling was that there was no significant increased lifetime cancer risk from the volatile organic air toxics in the Ponca City area. The model predicted increased lifetime cancer risks in the range of one in one-hundred-thousand (1x10-5) to one in one-million (1x10-6) immediately next to the refinery.

Estimated volatile organic emissions from the MHA Nation Refinery would be about 40 tons per year, which is significantly less than the total volatile organic emissions from the three industrial sources in the Ponca City study (2,042 tons/year). In a general comparison, similar modeling of the MHA Nation Refinery would be expected to demonstrate similar results — no significant increased lifetime cancer risk from volatile air emissions. The terrain in the area of the Ponca City Refinery is similar (gently rolling prairie) to that of the MHA Nation Refinery, but with a higher number of adjacent and area human inhabitants.

ATSDR Review of the Literature on Adverse Health Effects Observed in Communities Living Near an Oil Refinery

ATSDR conducted a literature review in response to a request by EPA to assist in the evaluation of potential health effects to the local community from the presence of the proposed MHA Clean Fuels Refinery. The literature review targeted information pertaining to health of residents living near an existing oil refinery. The goal of the review was to identify references and information not already cited in the DEIS; detailed review and analysis of each reference was not provided. The search for additional literature was assisted by the Center for Disease Control and Prevention (CDC) Library Resources. Searches were performed of the National Library of Medicine's PubMed database, and experts in air quality were contacted as additional sources.

The review of newly acquired scientific articles on health studies of communities near oil refineries revealed that the oil refineries under study were operating with old technology that was not comparable to the newer technology of clean refineries. None of the existing oil refineries for which health studies had been performed were using the new clean technology. Because the newer clean refinery technology is designed to greatly reduce emissions of chemicals to the local environment compared to the existing old technology, exposures related to the old technologies do not adequately represent the potential exposures the might result from the newer clean technologies. For this reason, ATSDR concluded that the outcomes of the existing health studies were not applicable to technological processes at the proposed MHA Clean Fuels Refinery. Because of the lack of applicability, detailed review and analysis of the results of the existing health studies were not presented.

Researchers and experts in air quality and adverse health effects associated with refineries were also contacted to solicit information on chemicals the might be emitted by oil refineries. These contacts shared industry-specific reports for projects in western Canada during the years 2001-2006 and identified chemicals and compounds present in the oil industry that might be related to cancer risk. The chemicals selected were detected at multiple Canadian oil refineries that had recently evaluated the environmental and human health impacts of expansion and technical upgrades. The list of chemicals is included in the "ATSDR Literature Review and Summary of Potential Adverse Health Effects Associated with Living near and/or Working at an Oil Refinery", which is appended to this EIS in Appendix D. Chemicals are identified by class, including criteria air contaminants, such as CO, nitrogen oxides, and sulfur dioxide; VOCs, such as the compounds found in gasoline; and polycyclic aromatic hydrocarbons. Reviews of each of the major chemicals within these groups are included, covering their toxicity and potential adverse health effects to humans.

ATSDR Baseline Health Assessment of Asthma and Cancer for the Fort Berthold Indian Reservation

ATSDR compiled statistics on the present incidence of select cancers at the Fort Berthold Indian Reservation that will serve as baseline statistics for the population. Any future data collected after oil refinery operations can be compared with this baseline data. The North Dakota Health Department was contacted to acquire statistics on the current incidence of cancer for McLean, Mountrail, and Ward counties. Because the scientific literature on occupational studies of workers who have been exposed to high levels of oil or gasoline has indicated an increased incidence of cancers of the kidney and non-Hodgkin's lymphoma, these cancers served as the focus of the review. The reported age-adjusted average annual cancer incidence (per 100,000 population) for kidney cancer and non-Hodgkin's lymphoma in McLean, Mountrail, and Ward counties, North Dakota, between the years 1997-2004 were compiled. The reported incidence of these cancers among persons living in these three counties was found to be similar to the rates for all persons living in North Dakota. ATSDR concluded that because of the small population size in each of these three counties, the ability to statistically detect changes in cancer rates over time would be difficult.

The local IHS that provides healthcare to American Indians living on the Fort Berthold Indian Reservation was contacted for information on asthma prevalence. Only American Indians were included in the statistics; non-American Indians in outlying communities who could be exposed to chemicals released into the air but who would report to a different health care facility were not included in these statistics. Baseline incidence data on asthma for the population served by the IHS was compiled.

The North Dakota Health Department was also contacted to acquire baseline data on the prevalence of asthma among adults and children in North Dakota; data were not available on a county-wide basis. Data on the prevalence of asthma was based on self-reporting. Between 2001 and 2005, the prevalence rate of lifetime asthma among North Dakota adults was found to range between 9.1 percent and 11.1 percent. In 2005, the lifetime asthma prevalence rate among children in North Dakota ranged between 7.8 percent and 11.6 percent. The prevalence rates for adults in North Dakota were similar to the US and American Indian prevalence rates during the same period. ATSDR concluded that assessing asthma prevalence rates on a state-wide basis would hinder the statistical detection of changes in asthma incidence at the county-level. This conclusion suggests that subtle changes in asthma incidence in the study counties over time might not be detectable. The complete results of the Baseline Health Assessment are in the ATSDR Technical Report on the enclosed CD-ROM.

Refinery Employees Health Risk

Employees of the refinery would be exposed to more air emissions and hazardous chemicals than the general public, because of their proximity to chemicals and potential exposures during refinery operations. Six toxicological studies are discussed below regarding refinery worker health. There are limitations of these studies for use as a direct comparison because of numerous factors including: age of technology employed at studied facilities and use of clean fuels refinery tending to emit fewer contaminants.

A study of mortality among oil refinery and petrochemical employees was conducted for a group of 3,803 persons employed at the Norco Manufacturing Complex, a refinery/petrochemical manufacturing complex near New Orleans, Louisiana, for at least six months between January 1, 1973 and January 1, 1994, and retirees who were actively employed at the facility on January 1, 1973. Mortality from all causes including all cancers, heart disease, nonmalignant respiratory diseases, and liver cirrhosis was significantly decreased in the group regardless of the reference population used. The authors concluded that the decreased mortality rates found in the group probably reflects the healthy worker effect, relatively low workplace related risks, and the many benefits associated with continuing employment including greater access to health care (Tsai et al. 1997).

A long-term study investigated the possibility of increased death (mortality) among a group of 12,526 white male oil refinery workers over a 41-year period. The mean ages at time of death for this group were 53, 57, and 74 years of age, respectively, for active, terminated, and retired workers. This seems to indicate active workers are dying at an earlier age. However, the number of deaths within each group was not statistically increased. The Standardized Mortality Ratio (SMR) is a value that is used as an indicator that the number of deaths within a population of workers is normal or unusually high (due to work-related accidents, health problems, etc.). Simply put, the SMR compares the number of deaths that have occurred in a worker population (study group) to the number of expected deaths based on the general population (control group). Because each age group in a large population has a different rate of death, SMRs are usually reported as age adjusted. An SMR of 1.0 indicates there is no increase in mortality (number of deaths in the worker population is exactly the expected number). Likewise, an SMR greater than 1.0 indicates the number of deaths was higher than expected and an SMR lower than 1.0 indicates that the number of deaths was fewer than expected. In the group of oil refinery workers, the SMRs for all causes of death were 0.68, 1.04, and 0.89 for the three age groups noted above. The SMRs due to deaths from all types of cancer for this same group of workers was 0.85, 0.98, and 1.05. These SMRs indicate the death rate was not increased for either all causes of death or for deaths specifically due to cancer for any of the three age groups. It was noted that the SMR was actually decreased for active and terminated workers. However, this may simply reflect that the control group does not accurately represent or match the worker group (since the number of observed deaths should not be significantly lower than the number of expected deaths). Nevertheless, deaths from specific medical causes such as cerebrovascular, arteriosclerotic, and nonmalignant respiratory causes were lower in the worker group. Early retirees also showed excess deaths from nervous and sense organ diseases. Terminated workers showed varying degrees of higher SMRs than the active workers did for all categories except stomach cancer and cerebrovascular and arteriosclerotic heart disease (Wen et al. 1984).

The third study was an epidemiological study, which was conducted on workers in three major U.S. oil refineries and chemical facilities. The group consisted of 21,698 workers. No geographic site group showed consistently different rates for all major causes of death. Kidney cancer was the only cause of death whose rate was higher among workers than for the U.S. population. Mortality rates for potentially exposed workers were slightly higher than those for unexposed workers (Hanis et al. 1985).

In the fourth study, the brain cancer mortality rate in refinery and petrochemical workers was investigated. The study population consisted of 8,666 persons employed at a facility located in Baton Rouge, Louisiana, for at least one month between January 1, 1970 and December 31, 1977, and retirees who were alive on January 1, 1970. The authors noted that because of the small number of cases and the multiplicity of exposures experienced at the facility, a relationship between worksite exposures and brain cancer could not be established. The only conclusion that can be drawn from the study was that an excess mortality from brain cancer has not occurred when compared with the general U.S. population (Hanis et al. 1982).

To determine the risk of non-Hodgkin's lymphoma in petroleum workers, groups of petroleum workers in the United States, the United Kingdom, Canada, Australia, Italy, and Finland were identified. The combined multinational group consisted of more than 308,000 workers, and the observation period covered an interval of 60 years from 1937 to 1996. Results from individual studies, as well as from the pooled analysis, indicated that petroleum workers were not at an increased risk because of their exposure to benzene or benzene-containing petroleum products in their work environment (Wong and Raabe 2000).

The sixth report evaluated worker health data for exposure to gasoline in a variety of occupations. A discussion was presented of animal and human studies implicating gasoline as a carcinogen. Gasoline contained 30 to 40 percent aromatic carcinogens, primarily benzene, toluene, ethylbenzene, and xylene. Human exposures occurred in gasoline production, transport and dispensing. Skin contact, accidental ingestion and vapor inhalation were primary exposure routes. Vapor intoxication produced neurological effects and liver and kidney damage. Mortality studies of members of the Oil, Chemical and Atomic Workers International Union in Texas and of its members in Texas refineries showed increased rates of cancers of the digestive organs and peritoneum, respiratory systems, skin, stomach, pancreas, prostate, brain, and hematopoietic and lymphatic systems. The International Agency for Research on Cancer classified gasoline as a possible human carcinogen, and the EPA classified it as a probable human carcinogen. The author suggests that gasoline be considered a Class 1A carcinogen, that benzene limits in gasoline be reduced from current levels (2.5 to 5 percent) to ½ percent and that stage-II controls for gasoline vapor recovery in public gasoline pumps be implemented in all states (Mehlman 1990).

The numerous studies performed on workers in the petrochemical industry because of the potential for adverse impacts results, when taken as a whole, do not suggest clearly identifiable impacts to workers.

4.16.1.5 Clean Fuels Refinery Site- Specific Air Emissions Modeling

A hazardous and criteria ambient air impact analysis was performed for the proposed refinery. Modeling methodology and results are described in detail in the air quality technical report (December 2007) and briefly summarized below.

Criteria Pollutants Emission Modeling

Criteria emission prediction modeling was conducted for NO_2, CO, SO_2, ozone, $PM_{2.5}$, and PM_{10}. Modeled maximum ambient air impacts were compared with EPA established NAAQS for these parameters. Background concentration data were also used to assess these impacts. Table 4-15 summarizes the modeling results. In general, modeled impacts together with background concentrations represented about 5 to 39 percent of NAAQS. No direct correlation to human health impacts was assessed.

Hazardous Pollutants Emission Modeling

Hazardous emission modeling was conducted to determine human health impacts resulting from inhalation and was conducted for the following parameters:

- Benzene
- Cyclohexane
- Ethylbenzene
- Formaldehyde
- Hexane (-n)
- Polycyclic Aromatic Hydrocarbons
- Toluene
- Xylene

These are common parameters that are typically found in air emissions from petroleum refineries. Table 4-27 presents the results of the HAP ambient impact modeling and current health-based inhalation risk estimates. Modeling was conducted to assess non-carcinogenic health effects of substances (chronic reference concentration [RfC]) and cancer unit risk. The first three columns of this table show the estimated impacts from dispersion modeling. The fourth and sixth columns present the federal risk estimates that are used to determine the significance of the impacts. The fifth column presents the Unit Risk value. This value shows the estimated probability of cancer risk, from inhalation, for an ambient concentration of 1.0 microgram per cubic meter ($\mu g/m^3$) of the corresponding HAP. The value in the sixth column is a conversion of the Unit Risk value that represents the ambient concentration that would result in an estimated probability of cancer incidence, from inhalation, of one in one-million (1x10-6).

Because the hazardous emissions are correlated to chronic health effects (i.e., long-term exposure), only the estimated annual concentrations need to be assessed. Both the RfC and Unit Risk are related to lifetime exposure to a hazardous emission; therefore, assessing a one-year average concentration against these criteria is a conservative estimate of exposure over a lifetime. As Table 4-27 shows, the estimated ambient impacts are below the federal risk based concentrations.

Chronic Reference Concentration

In general, the RfC is an estimate of a continuous inhalation exposure for a chronic duration (up to a lifetime) to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects. The inhalation RfC considers toxic effects for both the respiratory system and peripheral to the respiratory system. The RfC values are chemical-specific, with a lower RfC value implying a greater toxicity of the substance. As an example, benzene with a RfC concentration of 30 µg/m^3 would have a higher toxicity than cyclohexane with a RfC value of 6,000 µg/m^3.

Table 4-27 Hazardous Air Pollutant Ambient Impact Analysis Results

HAP	Estimated Ambient Concentrations (µg/m³) 1-Hour	24-Hour	Annual	RfC[1] (non-cancer risk) (µg/m³)	Unit Risk[2] (excess cancer risk per 1.0 µg/m³) (µg/m³)$^{-1}$	1:1E+6 Risk Conc.[3] (cancer risk) (µg/m³)	Risk Estimate Source[5]
Benzene	4.04E-01	8.77E-02	1.32E-02	30	2.20E-06	4.55E-01	1
Cyclohexane	3.05E-01	6.63E-02	9.91E-03	6,000	-	-	1
Ethylbenzene	2.38E-03	5.20E-04	8.00E-05	1.000	-	-	1
Formaldehyde	4.36E-01	1.34E-02	1.81E-03	-	1.30E-05	7.69E-02	1
Hexane (-n)	3.50E-02	7.60E-03	1.14E-03	700	-	-	1
PAH[4]	6.22E-02	4.80E-04	5.00E-05	-	1.10E-03	9.09E-04	2
Toluene	1.52E-01	3.37E-03	6.00E-04	5,000	-	-	1
Xylene	1.06E-01	1.59E-03	2.70E-04	100	-	-	1

Notes:

1. Chronic Reference Concentration (RfC): An estimate of a continuous inhalation exposure for a chronic duration (up to a lifetime) to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects over a lifetime.
2. Unit Risk: The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 µg/m^3.
3. Unit risk value converted to a concentration that may cause 1 incident per 1,000,000 people exposed.
4. Polycyclic Aromatic Hydrocarbons
5. Risk Estimate Sources:
   1. USEPA Integrated Risk Information System (http://www.epa.gov/iris/ ; and
   2. California OEHHA/ARB Approved Risk Assessment Health Values (http://www.arb.ca.gov/toxics/healthval/healthval.htm)

The RfC concentration values for specific chemical parameters established by EPA and the California EPA's Office of Environmental Health Hazards Assessment (OEHHA)/Air Resources Board (ARB) (Table 4-22) are compared directly to the estimated annual concentrations resulting from the proposed refinery's hazardous emission modeling. The predicted annual ambient concentrations in µg/m^3 are significantly (3 to 8 orders of magnitude) lower than the RfC values for the listed parameters.

Unit Risk

Unit risk is defined as the lifetime cancer risk estimated to result from continuous exposure to a cancer-causing agent at a concentration of 1 µg/m^3. The Unit risk is converted to a comparable concentration that may result in 1 incident of cancer for every 1,000,000 people exposed. The calculation is as follows:

$$(1/\text{Unit Risk } (\mu g/m^3)\text{-}1)/1{,}000{,}000 = 1{:}1{,}000{,}000 \text{ Risk Concentration } (\mu g/m^3)$$

Comparing the estimated annual concentrations to the 1:1,000,000 risk concentrations shows that the estimated annual concentrations are below the 1:1,000,000 risk concentrations for cancer (Table 4-22). A 1:1,000,000 risk concentration means that there is one chance in 1,000,000 of an additional person developing cancer due to exposure to the parameter(s) being assessed.

Human Health — Air Impact Analysis Conclusions

Rationale for the position that the proposed refinery would not have significant adverse effects on the human health of the local and area communities include the following:

- The production volume (13,000 BPSD) of the proposed refinery is considered small in comparison to most other refineries in the U. S. The amount of emissions generated and discharged would be correspondingly less than what is typically produced from larger refineries.
- The refinery's primary feedstock would be synthetic crude, which has been upgraded (i.e., hydrotreated) prior to delivery to the refinery. This advanced treatment would remove contaminants from the crude that would reduce the potential for emissions further downstream in the refinery process. Contaminants that would be removed include sulfur, nitrogen, most metals, and various hazardous organic compounds.
- The refinery process would **not** include a fluidized catalytic cracking unit, which is the largest air-emitting unit in most refineries.
- The refinery process would not use an alkylation unit that utilizes either hydrofluoric acid or sulfuric acid. Such units are potential sources of hazardous chemical releases.
- Elevated flares would only be used for disposal of gases released during emergencies.
- Natural gas and fuel gases would be used for the refinery's boilers and heaters, with no use of fuel oils. Combustion of natural gases and fuel gases would result in lower emissions than that of fuel oil combustion.
- The refinery would use a highly efficient sulfur removal unit to remove sulfur from fuel gas burned in the refinery's process heaters.
- Ultra-low NOx burners would be used for control of NOx emissions from the refinery's boilers and heaters.
- Selective catalytic reduction (SCR) would also be used for control of NOx emissions in the refinery.
- Ammonia emissions from the SCR-equipped process heaters would be minimized.
- Floating roofs would be used on selected hydrocarbon liquid storage tanks (e.g., gasoline) for the control of VOCs.
- The refinery would utilize a stringent program for preventing VOC emissions by monitoring, detecting and repairing leaks in equipment such as valves and pumps.
- A vapor recovery system would be used to minimize the loss of VOCs from the tank farm, rail and truck loading docks, and the WWTP. This system would consist of floating roof(s), spherical and bullet storage tanks in the tank farm, and a separate pipe loop that would collect vapors at each tank, loading spot and the WWTP. Vapors collected by the system would be compressed, air cooled and returned to the process for recovery. This vapor recovery system would minimize fugitive emissions of VOCs from the refinery.
- Standard operating procedures would be developed and utilized in order to ensure consistent and effective operation of refining process equipment and control equipment. This would help to ensure emissions are controlled to the maximum degree possible, as dictated by the equipment design.
- The Ponca City assessment of air emissions risk conducted by ODEQ concluded that there was no significant increased lifetime cancer risk from volatile organic emissions.

Estimated volatile organic emissions from the proposed MHA Nation Refinery would be significantly lower than the emissions from the industrial sources in the Ponca City study. In a general comparison, the proposed MHA Nation Refinery would be expected to demonstrate similar results - no significant increased lifetime cancer risk from volatile air emissions.

- The qualitative analysis of acute and chronic human health risk at three Canadian refineries indicated negligible to low risk from direct and indirect exposures to refinery emissions. Because these refineries were determined to have negligible to low risk and they are significantly larger than the proposed MHA Nation Refinery, it is reasonable to conclude that human health risks from the proposed MHA Nation Refinery will, at most, be negligible to low.
- The site-specific quantitative risk analyses of criteria and HAPs performed for the proposed MHA Nation Refinery indicate that the magnitude of modeled air emissions and subsequent exposures were low enough that, when compared to risk based concentrations and previous health effects research for refineries, no correlation to adverse human health effects could be established.

Ecological Receptors

Chemicals taken up by ecological receptors may find their way into human receptors where they contribute to the impacts previously discussed, or they may affect the ecological receptor itself. The potential impacts of refinery chemicals on aquatic life are discussed above in the sections on water quality, wetlands, and aquatic life. In general, these impacts could result in decreased community diversity and biological resilience, as well as an increase in the populations of species that are highly tolerant of contaminants. During this process, individual organisms may experience toxic effects, such as deformities from abnormal development or tumors, decreased reproduction, or increased mortality. Eventually, impacts to ecological receptors may move from effects on individuals, to effects on populations, to changes in community composition and diversity, to reductions in ecosystem functions.

In terrestrial environments, contaminants may also bioaccumulate and increasingly impact species that are higher in the food chain. In this environment, although exposure to contaminants is primarily via ingestion of food and water, the impacts are similar to those in an aquatic setting in that individual animals may be affected, followed by impacts to the population, and then impacts to community structure and function, and ultimately to the ecosystem itself.

Because plants are at the bottom of food chains, they generally are not subject to impacts from high doses of chemicals that result from bioaccumulation. Rather, in both aquatic and terrestrial environments, particular plant species would tend to grow, grow poorly, or not grow at all as a result of exposure to chemicals in the soil, water, or air that surrounds them. Ultimately, this affects the composition and diversity of a plant community and the wildlife habitat it provides.

Ecological Receptors — Air Impact Analysis Conclusions

The rationale for the position that the proposed refinery would not have significant adverse effects on the ecological receptors of the immediate and surrounding area includes those factors given for impacts to Human Health, particularly the refinery process-related factors, plus the following:

- Impacts to ecological receptors were evaluated by combining the results of site-specific quantitative emissions modeling of criteria and HAPs for the proposed refinery with a food chain model that examined potential exposures at four locations in the immediate vicinity of the process area. To assess the potential for refinery emissions to adversely affect ecological receptors, maximum concentrations of chemicals in soils at each of these areas were compared to applicable ecological screening values (Table 4-12). Estimated maximum soil concentrations were all well below (i.e., at least four orders of magnitude) applicable ecological screening values.

- While some uncertainty arises from the fact that available screening values are primarily based on exposures to mammals only, effects to other terrestrial receptors such as birds, plants, and invertebrates are unlikely given the relatively low estimated maximum soil concentrations. These contaminant concentrations would not be detectable using standard analytical methods.
- Based on the relatively low estimated maximum soil concentrations, the refinery emissions would result in no significant loss or degradation of habitats in the immediate vicinity nor would they result in displacement, habitat fragmentation, or reduced availability of prey, which might affect larger terrestrial receptors.
- The impacts to aquatic receptors are primarily associated with potential exposures through wastewater discharges rather than air emissions.

4.16.2 Construction Alternatives

4.16.2.1 Alternative 2—Transfer to Trust, No Refinery

In the absence of refinery construction and operation, only chemicals and safety hazards associated with agriculture would be present at the site. Impacts from these would be the same as current impacts and not a result of this project. Thus, there would be no refinery chemicals, emissions, and effluents; no chemicals subject to uptake by receptors; no impacts on human health and the environment.

4.16.2.2 Alternative 3—No Transfer to Trust, Refinery Constructed

Alternative 3 differs from Alternatives 1 and A only in the trust status of the property. The difference in trust status would not alter any of the following: refinery chemicals, emissions and effluents or their fate and transport; receptors of chemicals directly or in emissions and effluents; impacts to human health and the environment. Therefore, the impacts from Alternative 3 would be the same as the impacts from Alternatives 1 and A with regard to health and safety.

4.16.2.3 Alternative 4—Modified Proposed Action

Alternative 4 differs from Alternatives 1 and A only in that the refinery facilities would be reconfigured on the site to minimize impacts on a wetland and swale and the wastewater holding ponds would be replaced with a tank. The difference in facility configuration would not alter any of the following: refinery chemicals, emissions and effluents, or their fate and transport; receptors of chemicals directly or in emissions and effluents; impacts to human health and the environment; or the mitigation measures needed. Therefore, the impacts from Alternative 4 would be the same as the impacts from Alternatives 1 and A with regard to health and safety.

4.16.2.4 Alternative 5—No Action

Similar to Alternative 2, only chemicals and safety hazards associated with agriculture would be present at the site in the absence of refinery construction and operation. Impacts from these would be the same as current impacts and not a result of this project. Thus, there would be no refinery chemicals, emissions, and effluents; no chemicals subject to uptake by receptors; no impacts on human health and the environment; and no need for mitigation as a result of this project.

4.16.3 Effluent Alternatives

4.16.3.1 Alternative B— Partial Discharge Through NPDES Permit and Some Storage/Irrigation

Under this alternative, surplus treated wastewater would be disposed of through land application to irrigate trees and crops on the project site, as practicable; otherwise, there would be discharge through NPDES permitted outfalls. Impacts to human health from discharging treated wastewater would be essentially the same as those discussed above under alternative A, although there would be less water discharged to surface water under alternative B.

Unlike the Alternatives 1 and, this alternative would involve irrigating crops potentially consumed directly by humans or crops used as forage for livestock that would be consumed by humans. As a result, there is a potential for exposure to contaminants in wastewater via food chain exposure pathways. Potential plant uptake of certain contaminants present in irrigated wastewater may result in accumulation of contaminants in soils or plant tissues at concentrations greater than those present in wastewater. In particular, uptake and storage of metals, such as mercury, chromium, and lead, in plant tissue could pose a risk to humans who consumed crops irrigated with wastewater from the refinery or who consumed livestock fed forage irrigated with wastewater from the refinery.

While it is unclear if these scenarios will occur, they represent an uncertainty that has not been quantitatively evaluated and must be considered when evaluating each alternative. Until such time as a quantitative analysis of the potential risks posed by discharge of refinery wastewater via irrigation of crops has been performed using actual site-specific data, it cannot be determined that alternative B will be protective of human health and the environment. Therefore, refinery wastewater effluent should not be used to irrigate food chain crops until a quantitative risk assessment is conducted.

The refinery wastewater is considered to be (by definition) a solid waste under RCRA. As such, all wastewater proposed to be used for irrigation should be treated to meet appropriate standards to protect human health and the environment. In addition, unless the wastewater is treated sufficiently, it will continue to be considered a solid waste containing hazardous waste constituents, and RCRA Corrective Action requirements would apply for the irrigated land parcel. This is because the irrigated land parcel would be considered a SWMU. Therefore, a RCRA TSD permit may establish additional treatment levels for irrigation water.

4.16.3.2 Alternative C—Effluent Discharge to an UIC Well

The injection of treated effluent into an UIC well would not change the quantities or types of pollutants emitted/discharged from the refinery site. However, injection could alter the fate and transport of chemicals in air, water, and soil pathways, thereby changing exposures to human and ecological receptors. Since the wastewater would first be treated in the WWTU and then injected into the well, it would be unavailable as a pathway for residual chemicals to reach receptors that are contemporary with the refinery. The injected wastewater would have to meet applicable RCRA UIC permit requirements.

4.16.3.3 Alternative D—No Action

Under this alternative, the proposed Refinery would not be constructed. Thus, there would be no refinery chemicals, emissions, and effluents; no chemicals subject to uptake by receptors; no impacts on human health and the environment; and no need for mitigation as a result of this project.

4.16.4 Cumulative Impacts

No cumulative impacts were identified for health and safety. No reasonably foreseeable actions were identified that would have effects in the affected area that would overlap in time or space with the direct and indirect effects discussed above.

4.17 Mitigation Measures, Controls and Selected Plans

The following section lists the mitigation measures developed to avoid or reduce the impacts of the proposed project and alternatives. The mitigation measures are listed by the types of impacts being mitigated and the phase of the project. Mitigation measures will need to be implemented throughout the construction, operation and closure of the proposed facility. There are three main types of mitigation measures: (1) mitigation/control measures that are incorporated into the design of the refinery, (2) practices or procedures implemented during construction and/or operation to control/limit impacts and (3) monitoring and inspection programs to ensure that the controls and mitigation measures are performing and assure a rapid response if problems develop. The discharge and/or emission limitations from environmental permits are not considered mitigation measures and, therefore, are not included in this section. For more information on these environmental permits please see the water and air resource sections in this Chapter.

Some of the mitigation and control measures are required by a federal environmental statute or permit, while others are recommended. For mitigation measures and plans that are recommendations, the refinery operator may or may not implement those measures.

Table 4-28 summarizes the permits, plans and mitigation measures for the proposed alternatives, and describes whether or not the measures are required. Table 4-29 summarizes the monitoring, inspecting, and reporting activities for the refinery construction alternatives, including information on whether or not the activity is required, reporting requirements, if any, and potential follow-up actions.

4.17.1 Design and Operating Measures to Prevent and Contain Spills and Leaks

The following measures will prevent, limit or control contamination of surface water, soil and ground water from leaks and spills from the refinery.

- Design and operate the refinery to prevent or reduce the likelihood of spills, leaks, and other releases. [Included as part of the proponent's proposal (Alternative 1 and A and all other construction alternatives. Would be a condition for the acceptance of the land into Trust for the purpose of constructing the clean fuels refinery]
- Design and construct curbing, secondary containment, and paving of vulnerable areas. [Included as part of the proponent's proposal (Alternative 1 and A) and all other construction alternatives.]
- Separate oily and non-oily stormwater management systems. Stormwater from areas with potentially oily stormwater, such as the process and loading areas, would be contained through curbing and gutters and conveyed to the wastewater treatment system. [Included as part of the proponent's proposal (Alternative 1 and A) and all other construction alternatives.]
- Double wall tanks or double-lined ponds would be installed for any units that contain contaminated (oily) or potentially contaminated (oily) wastewater. [Mix of required and recommended actions. Requirements under RCRA TSD permit for ponds and some tanks, for all construction alternatives except 4 and A. Recommended for Alternative 4

and A, and in general for all tanks storing oily or hazardous materials. Double-bottomed tanks are recommended, but not required for any construction alternatives.]

- Develop and implement, SPCC and FRPs and other emergency response plans to prevent, contain, and remediate spills. Workers would also be well trained for implementation of these plans. [Required]
- Leak detectors to prevent infiltration from the evaporation and holding ponds. [Required by RCRA TSD permit for Alternatives: 1 and A, 1 and B, 1 &C, 3 and A, 3 and B and 3 and C. Recommended for Alternatives 4 and A, B, and C as tanks are used instead of surface impoundments.]
- Conduct routine inspections of facilities to evaluate whether there are spills or leaks and take corrective actions, as appropriate. [Required for tanks, pipes and containment regulated by the SPCC and FRPs and under the stormwater permit. Additional equipment and facilities inspections would also be required for all construction alternatives except 4 and A under the RCRA TSD permit.]
- All HWMUs are required by RCRA to be adequately protected from 100-year flood events.

4.17.2 Measures During Construction to Protect Surface Water and Reduce Soil Erosion

- Develop a SWPPP in accordance with the NPDES construction stormwater permit. The SWPPP would identify areas that have potential for pollutants entering into the stormwater systems at the facility and BMPs to minimize pollutant introductions from those identified sources. [Required by the NPDES stormwater construction permit]

4.17.2.1 General Erosion and Sediment Control During Construction

The following are standard mitigation measures to reduce impacts to surface water and reduce prevent soil erosion during construction. These measures are mix of required and recommended actions, depending on the specific permit condition in the NPDES stormwater construction permit and SWPPP.

- A sedimentation and erosion control plan would be used throughout construction to minimize land disturbing activities. Any runoff from the construction areas would flow through sedimentation and erosion control devices before entering any surface water body.
- Keep the area of disturbance to a minimum at any given time through avoidance of disturbance and concurrent reclamation.
- Divert surface runoff from undisturbed area around the disturbed area.
- Retain sediment within the disturbed area.
- Route runoff through the disturbed area using protected engineered channels and culverts so as not to increase sediment load.
- Use adequate sediment ponds, with or without chemical treatment.
- Use riprap, straw dikes, check dams, mulches, temporary vegetation, or other measures to reduce overland flow velocities, reduce runoff volume, and retain sediment.
- Retain stabilizing vegetation on unstable soils to the extent possible.

- Avoid continuous disturbance that provides continuous conduit for routing sediment to streams.
- Inspect all erosion control structures at least every 14 days and after any precipitation or snowmelt event that has the potential to cause surface erosion.
- Repair erosion, clogged culverts and other hydrological controls in a timely manner.
- If BMPs do not result in compliance with applicable standards modify or improve such BMPs to meet the controlling standard of surface water quality.

4.17.2.2 Roads, Sediment Control during both construction and operation

The following are standard mitigation measures to reduce impacts to surface water and reduce prevent soil erosion from roads. All of measures in a section are part of the proponent's proposal. The last five measures are also typical BMPs that could be required under the SWPPP required by both the stormwater construction permit and the NPDES permit during operations.

- Restricting the length and grade of roadbeds;
- Surfacing roads with durable material;
- Creating cut and fill slopes that are stable.
- Revegetating the entire road prism including cut and fill slopes.
- Providing adequate road cross drainage to reduce erosion.
- Installing properly designed ditches, water-bars, cross drains, culverts, and sediment traps to pass peak flows from pre-defined precipitation storm events.
- Creating and maintaining vegetative buffer strips, and constructing sediment barriers (e.g. straw bales, wire-backed silt fences, check dams) during the useful life of roads.
- Periodically maintaining erosion control structures to prevent blockage or impedance of drainage or significant alteration of the intended purpose of the structure.

4.17.3 Protect and/or Reduce Impacts to Waters of the US, Wetlands and Riparian Habitat

4.17.3.1 Streams, Ponds, Riparian Habitat

These measures are mix of required and recommended actions, depending on the specific permit conditions in the NPDES stormwater construction permit, NPDES refinery permit, and the CWA 404 permit(s) (nationwide or individual permit).

- To the extent possible maintain vegetation within 50 feet adjacent to streams, creeks and ponds.
- Install stream crossings to maintain bankfull dimensions of width, depth, and slope.
- Where pipelines cross streams, creeks and ponds, install and maintain automatic shutoff valves.
- All reasonable precautions shall be taken to ensure that turbidity is kept to a minimum, and violations of surface water standards are prevented.
- Re-established riparian vegetation as soon as practical following operation or building activities.

- Conduct ambient stream monitoring during operation for erosion and channel down cutting.

4.17.3.2 Wetland Construction Mitigation

Wetland construction methods would be in accordance with applicable permit conditions. To avoid or minimize impacts on wetlands, the construction contractor would implement measures during the construction and operation of the proposed petroleum refinery and pipeline facilities. The measures may include, but are not limited to, the following requirements. There may be additional requirements in the stormwater construction permit and the CWA 404 permit(s) (nationwide or individual permit).

- Construction equipment operating within the ROW should be limited to that equipment necessary for clearing, excavation, pipe installation, backfilling, and restoration activities. All equipment should use upland access roads to the maximum extent practicable.
- Equipment operating within saturated wetlands would be low-ground-weight equipment.
- Temporary erosion and sedimentation control measures would be installed immediately after the initial disturbance of wetland soils and would be inspected and maintained regularly until final stabilization.
- Sedimentation controls would be installed across the construction ROW, as needed, within wetlands to contain trench spoil.
- Grading of riparian vegetation and pulling of tree stumps would be limited to the area directly over the trench line unless additional grading or stump removal is required for worker safety.
- In unsaturated wetlands, the uppermost 12 inches of topsoil along the pipeline trench should be segregated from the underlying subsoil.
- A site-specific wetlands mitigation plan would need to be developed and approved by the USACE for any wetlands that are impacted through a CWA Section 404 permit. The mitigation plan would include the specific location, acres of wetlands and uplands that would mitigate wetland impacts. The plan would also identify the wetland plant communities that would be created or restored, site hydrology, and maintenance of the mitigation site.

4.17.4 Measures to Protect Surface and Ground Water During Refinery Operations

- Conduct routine water quality monitoring of the effluent at all outfalls. [Required for all discharges under NPDES and UIC permits (Alternatives A and C). For Alternative B, the portion of effluent discharged through the NPDES permit would be required to be monitored. Monitoring of the wastewater land applied would be a mix of recommended actions and requirements under RCRA TSD permit. The TSD permit could include some monitoring and reporting requirements.]
- Design, install and implement a ground water quality monitoring program for the Project Area to provide an early warning of potential contamination. A Ground Water Protection Program as discussed with the MHA Nation could include monitoring and reporting. [Required by the RCRA TSD permit for all construction alternatives except 4 and A, recommended for Alternative 4 and A.]

- If erosion occurs at the outfall locations, an energy dissipater would be installed at the end of the outfall pipe to reduce potential erosion impacts from high volume discharge periods. [Recommended]

4.17.4.1 Design and Operating Measures for Alternative B – Land Application

The following mitigation measures are in addition to the other mitigation measures and controls. These measures are only applicable to refinery construction alternatives combined with effluent discharge Alternatives B (partial discharge under the NPDES permit and land application).

- Development and implementation of an effective irrigation farm management plan for irrigation alternatives. The plan would include procedures for determining agronomic and loading rates for the crops being grown. The plan should also be protective of human health and the environment. [Mix of recommended and required measures for these alternatives. Some requirements under the solid waste disposal regulations.]
- Upon operation of the refinery, test effluent quality to determine the concentrations of any hazardous constituents, if any, in the treated wastewater. No hazardous waste would be permitted to be land applied.
- Upon operation of the refinery, test effluent quality for sodium, calcium, and magnesium concentrations to determine appropriate salinity limitations for irrigation. [Recommended as good agronomic practice and to minimize impacts to soil from irrigation.]
- Implement a ground water monitoring program to assess potential and actual impacts to soils and ground water from land application operations. The results of the monitoring would be used to modify the irrigation farming operations and treatment if necessary. [Mix of required and recommended monitoring. Some monitoring would be required by the land disposal regulations for RCRA solid waste.]
- Conduct annual soil testing to determine salinity and key nutrient levels in the soil. If testing shows high levels of salinity or deficient key nutrients, implement one or more of the standard soil treatment methods to counter sodium buildup from the use of saline irrigation water. [Recommended as good agronomic practice and to protect long-term soil productivity.]

4.17.5 Facility Design Considerations to Protect Birds

- Electrical transmission lines would be constructed to minimize collision and electrocution risks to birds, according to APLIC, Edison Electric Institute's Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006 and Edison Electric Institute's "Mitigating Bird Collisions with "Power Lines: The State of the Art in 1994."
- Cobbles would be placed on the side slopes of all wastewater/storage ponds to discourage plovers from nesting. [This is a recommendation that the Tribe has committed to in writing, although there would be no regulatory requirement to implement this measure. However, if a species on the Federal List of Endangered and Threatened Species or a species protected under the Migratory Bird Treaty Act were to become oiled there could be enforcement actions under the ESA, the Migratory Bird Treaty Act by the FWS, or other applicable laws.]
- Any ponds/tanks with potentially contaminated (oily) water would be netted. [This is a recommendation that the Tribe has committed to in writing, although there would be no

regulatory requirement to implement this measure. However, if a species on the Federal List of Endangered and Threatened Species or a species protected under the Migratory Bird Treaty Act or other applicable laws were to become oiled there could be enforcement actions by the FWS.]

4.17.6 Cleanup of Contamination, Closure of the Refinery

- Obtain financial assurance or bonding for cleanup and closure of the facility. [Financial assurance would be required for all HWMUs and for releases from SWMUs if the facility is regulated as a TSD facility for all construction alternatives except 4 and A where the facility would be a generator only. RCRA financial assurance requirements do not extend to closure and dismantling of process or product units. Financial assurance or bonding is recommended for all alternatives. The money would pay for corrective action and other cleanup activities.]
- Work with tribal authorities on establishing requirements for solid waste land application units (Alternative B only, concerning irrigation of wastewater). [The requirements for solid waste land application units on tribal lands are self-implementing. However, in order to ensure full implementation, the MHA Nation would need to establish an effective program that is protective of human health and the environment.]

4.17.7 Human Health Risks and Safety Mitigations

Mitigation of Emission/Effluent Fate and Transport

Adhering to OSHA standards during construction and following typical BMPs would minimize exposure to chemicals on the site and the distribution of chemicals and particulates via air, water, or soil. Examples of typical BMPs include use of silt fences and straw bales to minimize erosion, watering or chemical compounds to minimize dust, and storage of fuels in lined and bermed areas. The measures mentioned above as mitigation to protect water resources and soil are applicable and would serve to minimize the human exposure of chemicals that are on site and the potential for these chemicals to move off site during construction.

During refinery operation, the diverse chemicals that are used on the site would be contained in tanks or other storage vessels and handled according to OSHA standards. As noted above in the discussion of mitigation measures to prevent contamination of water resources and soil, double liners and berms would be used to contain any inadvertent spills, and shut-off valves would be installed at strategic locations in pipelines to minimize the volume of any spill. Careful monitoring of pipeline flows would enable early detection of spills. During fluid transfers, particular care would be taken to avoid spills by ensuring use of proper techniques through training and careful oversight. During turnarounds when tanks are cleaned and catalysts are replaced, proper protective equipment for workers and cautious procedures would minimize exposure to chemicals and the release of these chemicals into the air, water, or soil. Use of netting on the two effluent holding ponds, as well as on the evaporation pond if it has poor water quality, would prevent contaminants in these waters from entering the food chain via water birds that might be attracted to these ponds. In addition to mitigating the exposure of people to chemicals and the transport of chemicals to the environment via air, water, or soil, care must also be taken to mitigate impacts from accidents associated with equipment operation and the use of steam to clean the tanks. The establishment of proper procedures that are compliant with OSHA standards, training workers to follow these procedures, and provision of strict oversight to ensure compliance with procedures would largely prevent adverse impacts. Mitigation of impacts from refinery decommissioning and reclamation would be similar to measures taken during turnarounds for equipment, and during construction for removal of equipment and reclaiming the site.

Mitigation of Impacts to Receptors

Even though exposure to chemicals at the refinery and in the air and water that leave the refinery would be minimized, people working to construct or operate the refinery and plants and animals in habitats on or near the refinery would still be exposed to chemicals and physical safety hazards that might harm them. Although some adverse effects are expected to occur, no significant adverse impacts are projected. In addition, data on a number of older refineries have indicated that their workers suffered no significant adverse health effects, and adverse health effects at this new refinery, the first major refinery to be constructed since 1976, should be even less likely. Nonetheless, until the MHA Nation Refinery is operating and sufficient data on people's individual health and plant/animal populations have been collected, the impacts to human health and the environment discussed above would continue to be only projections and would contain significant uncertainty.

The following are recommended actions for minimizing human exposure near the refinery.

- The existing farm house should no longer be used as a residence.
- The farm house well should not be used for drinking water purposes after refinery operations commence. The well needs to be properly capped for the land to be accepted into trust status. Since the DEIS was published, this well has been decommissioned.
- Implement OSHA requirements to ensure occupational safety and health.

4.17.8 Acceptance of Land into Trust Status

Under Alternatives 1 and 4, BIA would accept 468.39 acres of fee land into trust for the purposes of constructing and operating a clean fuels petroleum refinery and producing buffalo forage on the Fort Berthold Indian Reservation. Under Alternative 2, BIA would accept 468.39 acres of fee land into trust for the same agricultural purposes used to date but not to construct and operate a clean fuels petroleum refinery on the Fort Berthold Indian Reservation. Under Alternative 3, BIA would not accept 468.39 acres of fee land into trust; however, the Tribe could still construct and operate a clean fuels petroleum refinery. Under Alternative 5, no action would be taken to accept the land into trust and the Tribes would not construct and operate a clean fuels refinery.

The following would be conditions of the BIA accepting the 468.39 acres of fee land into trust for the purposes of constructing and operating a clean fuels petroleum refinery and producing buffalo forage (Alternatives 1 and 4).

- The well on the property near the residence is properly removed/sealed by a contractor certified by the North Dakota State Water Well Association. This will be verified with by the Regional Environmental Engineer.
- Any title objections raised by the Field Solicitor in an Interim Title Opinion that would interfere with contemplated use of the land will need to be cleared by the Tribes. This may include items such as unpaid taxes.
- Financial assurance arrangements are in place and are sufficient to adequately remediate any contamination due to operation or closure of the refinery.
- There is appropriate monitoring of soils, ground water, surface water, and air for contaminant releases.
- It is possible that the Department may also request an indemnification agreement with the MHA Nation holding the United States harmless from refinery operations and potential contamination from operation of the refinery.

The following would be conditions of the BIA accepting the 468.39 acres of fee land into trust for continued agricultural use (Alternative 2).

- The well on the property near the residence is properly removed/sealed by a contractor certified by the North Dakota State Water Well Association. This will be verified with by the Regional Environmental Engineer.
- Any title objections raised by the Field Solicitor in an Interim Title Opinion that would interfere with contemplated use of the land will need to be cleared by the Tribes. This may include items such as unpaid taxes.

4.18 Irreversible and Irretrievable Commitment of Resources

An irreversible or irretrievable commitment of resources would occur when resources would be consumed, committed, or lost as a result of the project. The commitment of resources would be irreversible if the project started a process (chemical, biological, or physical) that could not be stopped. As a result, the resource or its productivity or its utility would be consumed, committed, or lost forever. Commitment of a resource would be considered irretrievable when the project would direct eliminate the resource, its productivity, or its utility for the life of the project and possibly beyond.

4.18.1 Irreversible Commitment of Resources

- Removal of ground water for all construction alternatives.

4.18.2 Irretrievable Commitment of Resources

- Loss of vegetative cover until the refinery is decommissioned and reclaimed.
- Loss of wildlife habitats for the life of the refinery.
- Loss of crop or forage productivity until the refinery is decommissioned and reclaimed.
- The addition of an industrial facility to the rural landscape.

4.19 Unavoidable Adverse Effects

Several of the effects described in the resource sections above would be unavoidable. In particular, there will be unavoidable adverse effects from spills and leaks to soil and ground water underneath the refinery. There will also be impacts to wetlands either directly as a result of the construction or through changes in hydrology and water quality. Proposed mitigation measures and permits would reduce these adverse impacts.

Table 4-28 Selected Environmental Permits, Plans and Mitigation Measures

Environmental Permit, Plan or Mitigation Measure	Requirement or Recommendation by Alternative				
	Alts 1&A, 3 Initial Design	Alt 4&A Modified Design	Alt B ½ Land application, ½ Effluent discharge	Alt C UIC injection well	Alts 2, 5 & D No refinery
NPDES Permits					
NPDES permit, refinery operation					
Discharge effluent limits	Permit requirement	Same as 1&A	Required for discharges, recommended for land	None for process water	N/A
Monitoring of effluent quality, may also include downstream water quality monitoring	Permit requirement	Same as 1&A	Required for discharges, recommended for land application	None for process water	N/A
BMPs, separation of contaminated and uncontaminated storm water	Permit requirement	Same as 1&A	Required for discharges, recommended for land application	Potentially required, depends on design of storm water system	N/A
Develop a SWPPP (Storm Water Pollution Prevention Plan)	Permit requirement	Same as 1&A	Required for discharges, recommended for land	Potentially required, depends on design of storm water system	N/A
NPDES general storm water construction permit					
Develop a SWPPP (Storm Water Pollution Prevention Plan) Typical measures include: silt fences, erosion protection	Permit requirement	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Closure					
General refinery closure & reclamation plan Plan to decommission the refinery	Recommended	Same as 1&A	Same as 1&A	Same as 1&A	N/A
RCRA closure plan Specific hazardous waste management units (HWMU) closure requirements including monitoring and financial assurance	TSD Permit requirement	Recommended	Same as 1&A	Same as 1&A	N/A
Bonding/ Financial Assurance Financial assurance for cleanup and closure	TSD Permit requirement	Recommended	Same as 1&A	Same as 1&A	N/A
Take corrective actions Quickly clean up spills and leaks	Partially required under RCRA TSD permit	Recommended, some requirements as RCRA generator	Same as 1&A	Same as 1&A	N/A

Environmental Permit, Plan or Mitigation Measure	Requirement or Recommendation by Alternative				
	Alts 1&A, 3 Initial Design	**Alt 4&A Modified Design**	**Alt B ½ Land application, ½ Effluent discharge**	**Alt C UIC injection well**	**Alts 2, 5 & D No refinery**
Air Quality Protection Requirements					
Minor source preconstruction permit required if construction begins after the deadline in the proposed rule for minor sources in Indian country	Potential future permit, depending on final regulations	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Existing new source performance standards (NSPS) for petroleum refineries. EPA may develop an air FIP.	NSPS Apply; FIP may be developed	Same as 1&A	Same as 1&A	Same as 1&A	N/A
When finalized, revisions to petroleum refinery NSPS will apply and may also require an operating permit (Part 71) for the facility.	Potential new NSPS and operating permit, if NSPS finalized	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Unit emissions monitoring to be required through mix of NSPS, future minor source permit or FIP.	Specifics to be developed after new regulations final	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Tribal air quality monitoring near proposed site	Recommended	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Mitigation Plans					
Wetlands mitigation plan Plan to replace or mitigate any wetlands filled by project (fill and other impacts)	Required by COE 404 individual permit and recommended by Executive Order	Recommended by Executive Order	Same as 1&A	Same as 1&A	N/A
Wildlife mitigation measures Cobbles to discourage plovers, netting of ponds with oily water, bird friendly power line construction specifications, as necessary	Recommended by FWS	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Ground water					
Project ground water quality monitoring program	TSD Permit	Recommended	SA-1	SA-1	N/A
Tribal ground water protection program	Recommended	SA-1	SA-1	SA-1	SA-1
Irrigation					
Irrigation farm management plan -- Agronomic irrigation rates for the crops being grown, hydraulic loading considerations to ensure no runoff and crop	N/A	N/A	Recommended	N/A	N/A

Environmental Permit, Plan or Mitigation Measure	Requirement or Recommendation by Alternative: Alts 1&A, 3 Initial Design	Alt 4&A Modified Design	Alt B ½ Land application, ½ Effluent discharge	Alt C UIC injection well	Alts 2, 5 & D No refinery
Irrigation water and soils monitoring plan -- Monitoring wastewater and soils for environmental and agronomic purposes, monitoring for runoff.	N/A	N/A	Partially Required by solid waste regulations & TSD permit	N/A	N/A
Refinery operations plans					
Refining of synthetic crude only	Included as part of Refinery proposal	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Recycling of wastewater, operation of wastewater treatment plants for all alternatives	Included as part of Refinery proposal	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Inspections for spills or leaks from process units & tanks	Partially required under RCRA TSD Permit and by RCRA container regulations	Partially required by RCRA container regulations	Same as 1&A	Same as 1&A	N/A
Refinery design and construction plans					
Double-liners and leak detectors, evaporation and holding ponds.	TSD Permit requirement	No ponds	TSD Permit	TSD Permit	N/A
Double-walled tanks	TSD Permit requirement	Required, Generator regs.	Required, TSD	Required, TSD	N/A
Separate oil and non oily stormwater handling systems	Partially required by NPDES permit	Same as 1&A	Same as 1&A	Recommended	N/A
Controls to prevent mixing of uncontaminated stormwater with potentially contaminated stormwater	Partially required by NPDES permit	Same as 1&A	Same as 1&A	Partially required by NPDES stormwater permit	N/A
Emergency and spill response plans					
Spill Prevention, Control, and Countermeasure, Plans (SPCC) -- Oil Pollution Act	Required	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Facility Response Plan (FRP) – Oil Pollution Act	Required	Same as 1&A	Same as 1&A	Same as 1&A	N/A
CAA Risk Management Plan Hazardous Materials	Required – CAA	Same as 1&A	Same as 1&A	Same as 1&A	N/A
Superfund Emergency Plan	Required – CERCLA	Same as 1&A	Same as 1&A	Same as 1&A	N/A

Environmental Permit, Plan or Mitigation Measure	Requirement or Recommendation by Alternative				
	Alts 1&A, 3 Initial Design	Alt 4&A Modified Design	Alt B ½ Land application, ½ Effluent discharge	Alt C UIC injection well	Alts 2, 5 & D No refinery
Hazardous Waste Contingency Plan (HWCP)	TSD Permit requirement	RCRA generator requirement	Same as 1&A	Same as 1&A	N/A
Transportation Act (HMTA) Response Plan	Required – HMTA	Same as 1&A	Same as 1&A	Same as 1&A	N/A
RCRA TSD Permit					
Waste Management Plan	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
Waste Analysis Plan	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
Inspection Plan	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
Training Plan	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
Health and Safety Plans	Required TSD Permit	OSHA portion required	Same as 1&A	Same as 1&A	N/A
Surface Impoundment Design, Construction, and Operation Plans	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
RCRA Post-Closure Plan	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
Air Monitoring Plan	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
Quality Assurance / Quality Control Plans	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
RCRA Tank Design, Construction, Operation and Closure Plans	Required TSD Permit	Partially required as RCRA Generator	Same as 1&A	Same as 1&A	N/A
Containers Management Plan	Required TSD Permit	Partially required as RCRA Generator	Same as 1&A	Same as 1&A	N/A
Waste Minimization / Pollution Prevention Plan	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A
RCRA Corrective Action Plan	Required TSD Permit	Recommended	Same as 1&A	Same as 1&A	N/A

Table 4-29 Monitoring, Inspecting, Reporting and Follow-up

Description	Alternatives[9]	Required?	Who Monitors?	Monitoring Frequency	Reason for Monitoring	Report Monitoring to	Enforced by?
NPDES permits							
NPDES permit during refinery operations Monitoring of effluent quality, may also include downstream water quality monitoring	Alts 1, 3, 4 with A Alts 1, 3, 4 with B Alts 1, 3, 4 with C	Yes Yes N/A	Refinery	Generally monthly, varies by parameter, as specified in permit	Protect water quality. Determine if effluent water quality is in compliance with permit	EPA and TAT Environmental Division	EPA
Facility inspections – Implementation of BMPs, and SWPPP (Storm Water Pollution Prevention Plan	Alts 1, 3, 4 with A Alts 1, 3, 4 with B Alts 1, 3, 4 with C	Yes Yes Yes[2]	Refinery	As specified in plans	Prevent/reduce contamination of water. Evaluate implementation of BMPs and SWPPP	Maintain records on site	EPA
NPDES general storm water construction permit – Inspect/monitor implementation of SWPPP (Storm Water Pollution Prevention Plan) Typical measures include: silt fences, erosion protection	All refinery construction alternatives	Yes	Refinery	As specified in plan	Determine if SWPPP is being properly implemented and if the plan is sufficient to protect water quality.	Maintain records on site	EPA
Closure							
General refinery closure & reclamation plan – Monitoring of soil and ground water Inspection of the site during closure	All refinery construction alternatives	Recommended	Refinery	As specified in plan	To determine if the site is sufficiently cleaned up and reclaimed to return to agricultural use.	N/A	N/A
RCRA closure plan – Specific hazardous waste management units (HWMU) closure requirements including monitoring and financial assurance	Alts 1, 3, with A Alt 4 with A Alts 1, 3, 4 with B Alts 1, 3, 4 with C	Yes Recommended Yes Yes	Refinery	As specified in plan Recommended As specified in plan As specified in plan	Determine if hazardous waste units have been successfully closed and if cleanup has been sufficient (as needed)	EPA Recommended EPA EPA	EPA N/A EPA EPA

[9] Alternatives 1 and 3 = Initial refinery site layout, Alt 4 = Modified Design layout. Alts 2, 5 = No refinery constructed
Alternative A = NPDES permit for wastewater discharge, Alt B = wastewater discharge ½ Land application + ½ Effluent discharge, Alt C = UIC injection well
[2] Required by regulation for Alternatives 1, 3 and 4 with discharge Alt C (injection of wastewater)

Monitoring, Inspecting, Reporting and Follow-up

Description	Alternatives[9]	Required?	Who Monitors?	Monitoring Frequency	Reason for Monitoring	Report Monitoring to	Enforced by?
RCRA – Hazardous Waste							
RCRA Large Quantity Generator – Inspection of hazardous wastes accumulation areas	All refinery construction alternatives	Yes	Refinery	Weekly	Determine if wastes properly stored and contained	Maintain records on site	EPA
RCRA Large Quantity Generator Inspection of hazardous waste tanks under RCRA	All refinery construction alternatives	Yes	Refinery	Daily	Determine if hazardous wastes are properly contained; e.g., no spills or leaks, covers and valves properly operating.	Maintain records on site	EPA
RCRA Large Quantity Generator Closure monitoring of hazardous waste storage areas	All refinery construction alternatives	Yes	Refinery	Required during closure of facility	Determine if the area(s) used to temporarily store hazardous wastes have become contaminated	EPA	EPA
Air Quality							
Air Title V CAA permit, NSPS subpart Ja	All refinery construction alternatives	Likely, when regulations final	Refinery	As specified in permit	Unit emissions monitoring	EPA	EPA
New Source Performance Standards (NSPS)	All refinery construction alternatives	Yes	Refinery	As specified in standards	Unit emissions monitoring to be required through mix of NSPS, future minor source permit and/or FIP	EPA	EPA
Tribal air quality monitoring near proposed site	All refinery construction alternatives	Recommended	TAT Environmental Division	As described in TAT air 105 grant work plan	Determine air quality in the vicinity of the refinery	EPA	N/A
Misc. Monitoring							
Ground water quality monitoring program for refinery	All refinery construction alternatives	Recommended	Refinery	Quarterly recommended	Determine if ground water has become contaminated and the extent of contamination and help evaluate remedial options	Recommended to TAT Environ. Division & EPA	N/A

Monitoring, Inspecting, Reporting and Follow-up

Description	Alternatives[9]	Required?	Who Monitors?	Monitoring Frequency	Reason for Monitoring	Report Monitoring to	Enforced by?
UIC -- Underground Injection Control Permit – monitoring of pressure, flow rate, volume, fluid chemistry	Alts 1, 3, 4 with A Alts 1, 3, 4 with B Alts 1, 3, 4 with C	N/A N/A Yes	Refinery	Quarterly	Determine compliance with UIC permit and assess performance of measures to protect ground water	EPA	EPA
Irrigation water and soils monitoring plan Monitoring of wastewater, soils and ground water for environmental and agronomic purposes, monitoring for runoff.	Alts 1, 3, 4 with A	N/A			-	-	N/A
	Alts 1, 3, 4 with B	Partially required by TSD Permit	Refinery	As specified in plan	Determined if soil and ground water will be contaminated by irrigation -	Maintain records on site	N/A
	Alts 1, 3, 4 with C	N/A				-	N/A
Misc. Inspections							
Inspections for spills or leaks from process units & tanks	All refinery construction alternatives	Generally required[11]	Refinery	As specified in plans and permits	Determine presence of spills and leaks. Check the integrity of tanks and containment.	EPA and maintain records on site	EPA

[11] Inspection requirements for spills and leaks required by the NPDES permit, the SPCC plan and facility response plans. Inspections are also required under RCRA for tanks associated with hazardous waste generation