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MEMORANDUM

TO: Kimberly Fischer, Hydrologist
North Dakota State Water Commission

FROM: Scott A. Lange, PE
Project Manager

DATE: January 26, 2017

RE: Meridian Energy Group Water Appropriation Public Informational Meeting Questions
SEH No. MERID 135471 14.00

SEH received your December 22, 2016 email which condensed the comments and concerns provided to the State Water Commission during the public comment period for the Meridian Energy Group (Meridian) Water Appropriation Permit Application No. 6858. SEH has taken your questions and numbered them for quicker reference. Below are responses provided by Meridian to all questions, while noting that some of the items are not explicitly related to the Water Appropriations Permit Application and will not become a topic during the February 8, 2017 Information Meeting to be held in Medora, North Dakota.

1) How will the water be used in the refinery?

Water drawn from the Dakota Formation will be treated to provide water with the quality required for make up to the cooling system, boiler feed water system, process water, and utility water needs of the refinery. Additionally, the use of surface water run-off as a possible source of raw water is being considered to reduce the overall cost of raw water treatment.

- Cooling System. The refinery design is maximizing the use of air cooling in order to keep to a minimum the water requirements for cooling purposes. In addition, as long as water quality is suitable, water used by the cooling system will be recycled to minimize make up water requirements.
- Steam Generation: Onsite processes will use heat integration as much as possible to minimize steam for heating needs. As with the cooling system, the intent is to recover any condensation in the system to be reused for steam generation and minimize make up water needs to the steam generation system.
- Process Water: The main process water user is the desalter within the atmospheric distillation unit. The refinery design includes recycling of treated wastewater back to the refinery processes to minimize the raw water make up needs.

2) Provide an overview of how water will be used starting with the formation and details on how the water will be treated.

Water will be drawn from the formation, treated with a Reverse Osmosis (RO) unit to provide plant process/cooling/steam water.

3) Will the refinery use a wet or dry scrubber and how will it affect the water quantity needed?

The current refinery design does not include the use of either a wet or dry scrubber to control air emissions.

4) Will a plume be created by the refinery?

A visible plume may be created from the cooling water towers. Since the refinery will maximize the use of air cooling, and the cooling towers will be designed with drift eliminators, Meridian anticipates any visible plume from the cooling water towers to be minimal.

5) What waste products will be created and how will they be handled?

The waste product from the treatment of brine water drawn from the Dakota Formation will be the reject from the RO process. It is currently estimated that RO reject will account for about 40% of the refinery water demand. Management of the RO reject is currently under evaluation with several possible methods being considered, which include:

- Onsite injection back into the Dakota Formation via a permitted underground injection well.
- Offsite injection.
- Onsite evaporation.

6) Will an onsite injection well be drilled or will waste travel by pipeline or truck to an offsite injection well?

See item number 5.

7) Onsite waste storage?

At this time, Meridian does not anticipate that onsite waste storage will be required to handle RO reject. This will be finalized once test wells are drilled and management of RO reject is fully defined. The exact details of handling the treatment water brine are yet to be determined. If the disposal process is with onsite wells, evaporation, or offsite piping; there will be little to no storage as the disposal will happen in real time. If trucking is involved with the disposal process, some tanked storage will be needed.

8) Is the water volume requested for both Phase 1 and 2?

Yes.

9) What is the timing for the phases?

It is anticipated it will take one to five years to transition from Phase 1 to Phase 2.

10) Concern about how much water is actually needed.

Water need was calculated based on the make-up water demand and making some assumptions on the level of loss during raw water treatment and the amount of treated wastewater than can be recycled. The make-up water demand will be in the order of 150 to 300 gallons per minute. The treated water recovery rate through the RO system is anticipated in the 40- to 60% rate, and will be confirmed once test well(s) are drilled. Based on these assumptions, we settled on a request of 400 gpm from the formation.

11) The originally stated projections of water requirements appear to be four times less than the volume included in the application.

See item number 10.

12) The volume of water requested is significantly less than the water volume used by the Tesoro Refinery in Mandan.

The Davis Refinery design includes plans to recycle treated wastewater, to the extent feasible, as raw water for plant processes in order to minimize the draw of water from the Dakota Formation as well as the need for wastewater disposal. Additionally, the Tesoro Refinery is located near ample water sources and can use other cooling methods in their process.

13) Concern about the water quality in the Dakota aquifer, and impact of any release to the air.

Based on available groundwater data and because the intended treatment for the water drawn from the Dakota Formation is through a closed system which will not vent to the atmosphere, no impacts to air are anticipated.

14) Is the water quality from the Dakota aquifer safe for industrial use?

This is a suggested source of water for industrial purposes by the North Dakota Energy and Environmental Research Center at UND.

MRL/djg

c: William C. Prentice, Meridian Energy Group, Inc.
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