



March 30, 2024

Submitted via email Janet.Carpenter@erg.com

Ms. Janet Carpenter, Contractor
Eastern Research Group, Inc.
New Mexico Environment Department
1190 St. Francis Drive, Suite N4050
Santa Fe, New Mexico 87505

Dear Ms. Carpenter,

HF Sinclair Navajo Refining LLC (HFSNR) would like to submit the following responses to the New Mexico Environmental Department (NMED) Request for Information (RFI) for Strategic Water Supply, issued January 19, 2024. As instructed, HFSNR has structured the responses by referring to the category and question numbers given in the RFI. Responses are provided in the attachment.

HFSNR appreciates the opportunity to provide responses to the RFI and looks forward to NMED review.

Sincerely,

Michael W. Holder
Environmental Specialist
HF Sinclair Corporation



HF Sinclair Navajo Refining LLC Response to New Mexico Environmental Department Strategic Water Supply Request for Information

Background

HF Sinclair is an independent petroleum refining company with domestic operations across the Southwest, Pacific Northwest, Plains, and Rocky Mountain region. Our entry into the refining industry in New Mexico was first marked by the purchase of the Navajo Refinery complex in Artesia and Lovington in 1969. We are proud to have operated within the state of New Mexico for nearly 50 years, and employ approximately 575 dedicated individuals in Eddy, Lea, and Bernalillo Counties. The Navajo and Lovington Refineries can process over 100,000 barrels of crude oil per day – which is primarily sourced from New Mexico crude fields – and manufactures enough diesel fuel to meet the states daily demand. Our petroleum products are sold on a wholesale basis and delivered to several markets across the state, as well as in Texas, Arizona, and Mexico.

In addition to our petroleum operations, we also manufacture renewable diesel and operate a pretreatment unit in Artesia, New Mexico. HF Sinclair has invested \$800-900 million in low-carbon fuel production, which included the construction of two renewable diesel units and one renewable feedstock pretreatment unit, and purchase of an existing renewable diesel unit from Sinclair Oil, all of which make HF Sinclair one of the largest producers of renewable diesel in the Southwest. See Figure 1 for a general site location map.

Category A: General Information

- 1) For each individual or organization that is responding to the RFI, please identify the name, title, affiliation, email address, and phone number.

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- 2) Please identify a primary contact if you are replying on behalf of multiple individuals or organizations.

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- 3) Please describe your experience as it relates to the sourcing, treatment, delivery, storage, and/or use of treated brackish or produced water.

While the Artesia refinery is currently the last active petroleum refinery in New Mexico, this facility also processes and produces renewable energy sources from the renewable diesel unit (RDU) and processes feedstock in the pretreatment unit (PTU). By the nature of crude extraction processes, the facility processes some produced water within the crude. Participation in the Strategic Water Supply (SWS) program by investigating opportunities for reuse of industrial wastewater use would be a valuable example of how industrial facilities may participate in such sustainable programs.

The HF Sinclair Artesia Refinery, Renewable Diesel Unit and Pretreatment Unit facilities (“Artesia facilities”) currently obtain source water from groundwater wells (HFSNR-owned or purchased from the Cities of Artesia and Lovington). Under the SWS program, the Artesia facilities could also become a user of treated brackish/produced water as a supplement or substitution for groundwater sources, resulting in more available freshwater for City of Artesia and/or City of Lovington community uses.

The Artesia facilities include on-site wastewater treatment. Currently treated wastewater is discharged to either the City of Artesia Publicly Owned Treatment Works (POTW) or Oil Conservation Department (OCD)-permitted underground injection control (UIC) wells. The Lovington facility discharges treated wastewater to the City of Lovington POTW. The Artesia facilities already have treatment infrastructure in place which supports the potential opportunity to provide treated effluent as a viable reuse water source for other users. However, additional evaluation would be needed to assess the necessity for additional treatment technology to meet reuse data quality objectives that may be established as part of the SWS.

- 4) Please summarize any proposed strategies or conceptual projects for sourcing, treatment, delivery, storage, and/or use of treated brackish or treated produced water (if applicable).

Proposed projects include:

- Determination of treatment requirements of Artesia facilities wastewater (which is traditionally “cleaner” than produced water) to consistent levels suitable for long-term water supply to water-intensive industries that may be established as part of the SWS (e.g., hydrogen, electric vehicle, solar panel, and microchip manufacturing). Reuse of the Artesia facilities treated effluent would also potentially reduce/replace the volume of discharge to UIC wells.



- Evaluation of the potential to be a zero-discharge facility; meaning, use of treated produced water for refinery feed water but also having the ability to reuse the facility effluent on-site.
- Evaluate potential for treated effluent to be reused for agriculture applications or for discharge to a surface water to support groundwater recharge for future availability. As shown in Figure 2, there are potential agriculture application opportunities as well as local drainages and the Pecos River for surface discharge near the Artesia facilities. However, agriculture and surface water application would likely require additional treatment and regulatory considerations.
- Evaluate the potential for treated effluent/brackish water/produced water to support potential hydrogen generation at the Artesia refinery.
- Evaluate the potential for reuse of treated effluent to be used in oil field applications. The Artesia facilities are already engaged in reuse activities and are permitted to sell treated effluent for reuse for oil & gas exploration and production uses. The potential project would be to further evaluate potential end users and logistics of providing the water.
- Evaluate the potential for reuse of treated effluent/brackish/produced water to be used for refinery applications.

Strategies include:

- Potential reuse of treated facility effluent by other industrial end users, with focus on water-intensive manufacturing in New Mexico. A strategy could be to make use of existing industry pipeline infrastructure to reach end users.
- Potential use of external brackish/produced water supply for Artesia refinery source water (make-up water), PTU, RDU, and/or commercial hydrogen units. However, use of treated brackish/produced water may require some form of pretreatment.
- Besides SWS for industry, the Artesia facilities treated effluent could be used for agricultural application (pecan orchards) or recharge for Pecos River.
- Strive to reach zero discharge at the Artesia facility with use of treated produced water from SWS and transfer of treated effluent to reuse facilities.
- Promotion of renewable fuels options to assist New Mexico in meeting carbon intensity reductions required under the Clean Fuel Standard (HB 41) via operation of APTU/RDU.

Category B: Technical and Feasibility Information

- 1) Given your technological approach, what scale of throughput is achievable, and what associated post-treatment water quality is possible?

The average flow of treated wastewater discharge to the UIC wells is about 550 gallons per minute (gpm). It is assumed that some or all of the UIC well flow would be available for water reuse.



Treated effluent quality data is collected as per the UICI-8 permits. Data for selected parameters of concern is summarized as follows:

- Total Dissolved Solids (TDS): 4,800 mg/L average (based on 2019 to 2023 dataset)
- Bacteria (e., coli) – data not available but expected to be non-detect as facility sanitary wastewater is routed to the City POTW.
- NORM/radium – data not available but expected to be non-detect
- Organics: below TCLP levels per 40 CFR 261.24(b)

- 2) What level of technical detail (e.g., technical specification) is needed to produce water of sufficient quality and quantity for water-intensive, non-discharging processes or industries?

HFSNR would need to know the water quality specifications of the potential end users in order to evaluate if the current treated effluent would need further treatment. Additionally, HFSNR would need to have a full water quality analysis of potential treated brackish/produced water in order to assess if pretreatment would be needed prior to using as a source water for facility processes (e.g., refinery/RDU and PTU make-up water RDU).

- 3) Please specifically identify New Mexico city/county locations where components of such a project (i.e., source, treatment, use) are most technically viable.

Viable locations for water reuse sources and end users where HFSNR would be a participant are within the Cities of Artesia and Lovington and within Eddy and Lea counties. Local area drainage and agricultural fields are shown in Figure 2. Figure 3 provides an overview of the location of the Artesia facilities as well as the location of the injection wells and current pipelines.

- 4) What are the energy requirements, energy sources, or other energy-related considerations needed for sourcing, treatment, delivery, storage, and/or use of brackish or produced water?

While the Artesia facilities do have an on-site wastewater treatment system, if the treated effluent was to be distributed as a reuse source for industrial use, agricultural use or for groundwater recharge via direct discharge to the Pecos River, additional treatment of the effluent may be necessary which would require additional energy. Any candidate waste stream may likely require the same combination of supplemental treatment to address the target parameters. For example, some form of advanced oxidation (for organics) and reverse osmosis (for dissolved solids). The relative size and capacity of each treatment unit may differ depending on which stream(s) are evaluated (e.g., refinery WWTP effluent will require the most robust treatment while the cooling tower blowdown will have less treatment).



Of the treatment unit operations, reverse osmosis (RO) would likely be the greatest contributor to additional operating cost and energy demand. Assuming additional treatment needs include RO pretreatment (advanced oxidation/ultrafiltration) and the RO, the added system would likely require 16,000 to 20,000 kWh of electricity for every million gallons of water treated. Typical operating costs for large-scale RO treatment systems (power, chemicals, labor, etc.) average \$4.00-\$8.00 per thousand gallons treated (or \$0.17-\$0.34 per barrel). Design and installation of a tertiary treatment system would likely require 3-4 years and cost safely in the millions of dollars. Using very rough estimates on a system that could treat effluent discharged to the wells (about 550 gpm or 0.8 mgd), the capital investment would likely be \$12 to \$20 million. To achieve a simple ROI of five years, HFSNR would have to sell water somewhere between \$0.55 and \$1.00 per barrel (break-even costs). These are very rough calculations and subject to major refinement and don't account for a several costs that can't be identified at this stage (i.e., costs upstream of the RO system, costs to pump any reuse water to its ultimate point of storage/distribution). It should also be noted that additional treatment could result in the reject stream exceeding hazardous levels, which would preclude its injection in the current UIC wells. Costs for additional permitting or alternate disposal would also need to be evaluated.

Additional energy requirements would also be associated with the construction of a facility for use in increased on-site hydrogen production.

In the scenario that the Artesia facilities participate as a user of treated brackish/produced water, as long as the treated brackish/produced water meets quantity and quality specifications, additional energy requirements would be minimal.

- 5) What approaches and development procedures would be employed to protect existing fresh water sources within aquifers that are likely to overlay deeper brackish aquifers?

N/A

- 6) Describe other product streams (e.g., critical minerals) and waste streams (e.g., salt) and how these products and waste streams could be developed and/or managed, including how any wastes would be disposed of or repurposed.

The Artesia refinery includes an on-site hydrogen plant. There may be potential to increase hydrogen production such that excess hydrogen could be provided to the open market. Alternatively, a commercial hydrogen plant could be constructed by others for reuse of the refinery effluent. However, the hydrogen production process does produce a brine waste stream that will require proper disposal, which may be challenging.



- 7) Please describe the nature and extent of any impediments to the development and utilization of treated brackish and/or produced water resources related to insufficient information, data availability, and monitoring capabilities.

For the Artesia facilities to utilize treated brackish/produced water sources, data would be needed to ensure water quality would consistently meet facility supply specifications. The Artesia facilities regularly monitor facility effluent quality and quantity, as required by the discharge/disposal permits. These data could be provided for consideration for future reuse or further treatment needs if provided as reuse water.

- 8) What are the key technical challenges, if any, associated with sourcing, treating, delivery, storing, and/or using brackish or produced water and what potential solutions could there be that would facilitate the development of brackish and produced water resources? To the extent possible, please identify any New Mexico specific technical challenges.

Current technical challenges are:

- Depending on the facility locations, creating new storage and distribution systems to receiving industries may be challenging and cost prohibitive.
- Ensuring treatment of brackish/produced/industrial effluent water is of sufficient quality and consistent quantity for industrial applications. Water-intensive industries cannot risk delays or interruptions to water supplies, therefore consistent volume, quality, and infrastructure will need to be robust and secure. More detailed information is needed.
- While reuse of treated brackish/produced water is currently being evaluated for use outside the oil production industry there are regulatory challenges for reuse of industrial effluent. NMED will likely need to assist potential industrial effluent providers with regulatory options for reuse.

Category C: Economic Information

- 1) The State of New Mexico is interested in purchasing treated brackish water or treated produced water for specific end uses. Please explain how you would determine what a reasonable price for treated brackish or treated produced water would be. Pricing information should account for final water quality and quantity.

In the provider role, HFSNR would strive to meet market pricing. However, pricing would also be dictated by the cost of additional treatment (if needed), operations and maintenance, as well as a reasonable provider fee. See also response to Category B. 4 question.

- 2) How should the State of New Mexico structure contract terms (e.g. duration) to facilitate private sector investment and access to capital to build and operate the



infrastructure to source, treat, deliver, store, and/or use brackish water or produced water?

HFSNR proposes, as a provider, that initial contract terms may be for a two-year period. After demonstration of system integrity, contracts could be renewed for a longer period with cost adjustments to keep with market rates.

As a potential user, the Artesia facilities would be able to consider utilizing either on-site treated effluent or outsourced treated brackish/produced water if the cost is competitive with current freshwater rates. Additional financial benefits may also be considered in conjunction with rate comparisons. Any need for pretreatment of source waters will also need to be considered.

- 3) In addition to the treated water, what other opportunities exist to create revenue streams from resources recovered from the treatment of brackish water or treated produced water?

The Artesia refinery includes an on-site hydrogen plant. There may be potential to increase hydrogen production such that excess could be provided to the open market. Alternatively, a commercial hydrogen could be constructed by others for reuse of the refinery effluent. However, the hydrogen production process does produce a brine waste stream that will require proper disposal, which may be challenging.

- 4) When considering whether a project is economically feasible, what criteria do you use to determine if a project is viable?

HFSNR will consider initial project capital and operation costs, the return on investment (ROI) and the timeframe for the ROI.

- 5) What industries or processes would be appropriate end users of treated brackish water and/or treated produced water to ensure adequate demand?

The Artesia facilities would be candidates as end users, as long as the treated water met unit source water quality specifications.

Other viable end user options could be for agriculture or direct discharge to surface water to support groundwater recharge and future allocations. Additionally, reuse of treated effluent/brackish/produced water could be beneficial in oil field applications.

- 6) What are the key economic challenges associated with sourcing, treating, delivering, storing, and/or using treated brackish or produced water in those industries or process and what potential solutions would reduce the costs of the development of brackish and produced water resources? For any solutions, what is holding back their implementation?



The cost of potential pretreatment for alternative water supplies versus current freshwater supply will need to be evaluated and may be cost prohibitive. Also identifying and securing consistent users may be an economic challenge associated with sourcing and storing treated waters. If user demand is not reliable or consistent, the ability and cost for storage of treated waters would need to be evaluated. See Table 1 for a summary of estimated costs for HFSNR to provide treated water to potential users.

Table 1. Summary of Select Potential Reuse Options and Costs

Potential Project	Estimated Cost of Treated Water	Estimated Volume per Day Available
HFSNR provides treated effluent for agriculture or surface discharge uses	\$0.55 to \$1.00 per barrel	550 gpm
HFSNR provides treated effluent for reuse in commercial hydrogen production	\$0.55 to \$1.00 per barrel	550 gpm
HFSNR provides current effluent for reuse in oil field applications (assumes no additional treatment or infrastructure needed)	No additional cost	550 gpm

Category D: Regulatory and Policy Issues

- 1) What types of State policies, State laws, or State regulations could be employed to overcome key challenge(s) you previously identified?

The Artesia and Lovington refineries are currently regulated by City of Artesia, City of Lovington, NMED, EPA, and the New Mexico Oil Conservation Division for discharge of treated wastewater. Permits from these agencies determine maximum allowable discharge flow and concentration (quality). For use outside of oil production activities, regulations for the treatment levels and uses by the NMED need to be put in place for industrial wastewater reuse. The lack of regulation and current prohibitions on use serve to discourage reuse of this resource stream.

- 2) What other types of public/private economic development partnerships could be forged to incentivize first-movers to invest in the development of treated brackish and produced water resources?

There could be partnerships between municipalities who provide water to industrial water users and those generating and treating the produced or brackish water. This type of partnership could provide a valuable alternate source of treated water for reuse through the municipalities, potentially providing an additional revenue stream in addition to water conservation/reuse opportunities. Additionally, partnerships with reuse water providers and commercial hydrogen plants could support increased hydrogen production.



- 3) How should the State prioritize SWS funding to support investment for sustainable and responsible economic development across New Mexico? What areas show the most promise for such investments based on available resources?

Due to the location of the refineries who could not only be a source of reuse water but also a user of treated produced water and the location of produced water sources, the southeast area of New Mexico should be prioritized.

- 4) What else should we know or consider in developing the request for proposal and project-specific concept papers?

NMED should expand the SWS beyond traditional produced water to include other treated oil and gas discharged waters/effluent from refining. Given the extended life of the refinery, consistent availability of effluent, and the need for water in current petroleum production in NM, industrial wastewaters could also provide a consistent and viable reuse water source.





