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Bureau of Land Management

BLM

Preliminary
Environmental Assessment
DOI-BLM-CO-N05-2015-0019-EA

Natural Soda Inc. Plant Expansion

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U.S. Department of the Interior
Bureau of Land Management
Northwest District
White River Field Office
220 East Market St
Meeker, CO 81641

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1. INTRODUCTION

1.1. Identifying Information

Project Title: Natural Soda Inc. Plant Expansion

Legal Description: Sixth Principal Meridian
Township 1 South, Range 98 West
Sections 25, 26, 27, 34, 35, and 36

Applicant: Natural Soda Inc.

NEPA Document Number: DOI-BLM-CO-N05-2015-0019-EA

Casefile/Project Number: COC-0118326-01, COC-0118327-01, COC-0119986-01, COC-37474

1.2. Background

In 1986 the Wolf Ridge Corporation submitted a mine plan to construct a 125,000 tons per year (tpy) commercial scale nahcolite (sodium bicarbonate) in-situ solution mine on their federal sodium leases. The submittal initiated the "Wolf Ridge Corporation Mine Plan for a Nahcolite Solution Mine" Environmental Impact Statement (Wolf Ridge EIS). The Wolf Ridge EIS contains four Alternatives which analyze the impacts from the following range of scenarios:

- Production rates of 50,000 py, 125,000 tpy, and 500,000 tpy of sodium bicarbonate.
- Water usage from 60 to 446 gallons per minute (gpm) (88 to 674 acre feet per year).
- Annual number of well construction from 2 wells to 88 wells per year on single well pads.
- Evaporation ponds from 1 (5 acres disturbance) to 5 (93 acres disturbance).
- Total life of project disturbance range from 43 acres to 960 acres.

The Record of Decision was signed in November 1987. The operation has gone through several changes in name and ownership and is currently owned and operated by Natural Soda Inc. (NSI).

Potentially significant impacts to air quality, groundwater quantity and quality, cultural resources, and riparian-wetland habitat along Yellow Creek and were identified under the 500,000 tpy Alternative.

Construction of the facility commenced in 1990 Natural Soda Inc. and in-situ sodium bicarbonate solution mining operations have been in continual operations since 1991. The operation and facilities are located at the termination of Rio Blanco County (RBC) Road 31 (Appendix A: Figure 1) in the Piceance Creek Basin, approximately 37 miles west and south of Meeker, Colorado. NSI's current mining operations involve solution mining from five available mining well pairs. A plant expansion completed in spring of 2013 was designed to increase plant

capacity from 125,000 tons per year to 250,000 tons per year. Production for 2014 was approximately 183,000 tons and is anticipated to increase to the new plant capacity within the next year. Approximately 2,068,000 million tons of sodium bicarbonate was mined from 1991 through 2014.

Solution mining of the nahcolite occurs at a depth of greater than 1,900 feet in a 35 to 40 foot thick depositional horizon of nahcolite, oil shale, and nahcolitic-halite identified as the Boies Bed. In the active mining area the Boies Bed assays between 80 to 85 percent nahcolite.

Sodium bicarbonate is recovered by in-situ solution mining an interval bounded on the top by the Dissolution Surface and on bottom by the Boies bed floor using a combination of vertical and horizontal wells. Hot water is pumped through the horizontal wells dissolving the nahcolite, natural occurring bicarbonate, as it circulates. The sodium bicarbonate enriched solution is recovered from the cavity by the use of submersible pumps and enters the process plant where the solution is transferred through four cooling tanks promoting the precipitation of sodium bicarbonate crystals. The bicarbonate crystals are de-watered, and dried. Dry product is sized by screening and sent to appropriate storage bins until bagged or bulk loaded into trucks for transportation to customers. Trucks also transport the final product to NSI's railroad loadout three miles west of Rifle, Colorado, approximately 52 miles from the mine site. Make-up water is added to the barren solution after the removal of the sodium bicarbonate crystals. The barren solution is then reheated and returned to the mining cycle forming a continuous close circuit process.

Mining occurs in blocks that contain several parallel mining well pairs called mining panels. Extraction of up to 40 percent of the nahcolite reserve could occur in the well field area of these mining panels (Appendix A: Figure 1). Existing cavities are extended to within 100 feet of the lease boundary and in the case where the horizontal well pairs are perpendicular to the lease boundaries the well pad locations are located off lease. These off lease well pads and access require a right of way. Panel length may also vary. Extraction of the nahcolite in the panels may occur to within 100 feet of the lease boundary. Cavities are mined until the operational limitation of the cavity is met or 220 tons of sodium bicarbonate per foot of cavity length are extracted. Operational limitations of a mining well pair can be: lowered recovery temperatures, less saturated solution at the recovery well, or excessive chlorides being mined. The size and shape of the mined area cannot be accurately mapped with current technologies. A mathematical spread sheet using relative leaching ratios is utilized to estimate cavity growth. In an attempt to have uniform cavity growth, the point of injection would periodically be moved. The moves help accomplish distribution of the nahcolite recovery within the cavity. Moves are based on evolving mining results and recovery distribution knowledge.

Current mining technique uses submersible pumps to recover the saturated brine. This enables the injection flow rate to be balanced with the recovery flow rate, preventing pressurization of the cavity and the Dissolution Surface (DS). Average brine flow rate through the existing processing facility is approximately 1,900 gallons per minute (gpm). Current water usage ranges from 160 to 200 gpm depending on time of years and amount of production.

Monitoring of four water bearing zones (Perched, A-Groove, B-Groove, and the Dissolution Surface) is accomplished by using twenty existing dedicated monitoring wells located at sites; up-

gradient (with respect to ground water flow), immediately down gradient, and down gradient of the mining area. Water level is continuously monitored in the Dissolution Surface (DS) and B-groove wells located near active mining. Water quality (WQ) samples are taken monthly from the B-groove and Dissolution Surface near active mining. Immediate up and down gradient Perched, A-groove, B-groove and Dissolution are taken quarterly. Remote down gradient samples are taken annually. In addition, DS monitoring wells 1-3A, EX-2, 4A-1V, 90-2, DS-2, DS-3 and DS-4 along with B-Groove monitoring wells BG-4, BG-5, and BG-6, have pressure transducers that continually read and send the data to the processing plant's operational computer. This enables the operators more precise control on the brine injection and recovery balance.

1.3. Purpose and Need for Action

The purpose of the Proposed Action is to allow NSI to excise their sodium lease rights and to manage the exploration and development of sodium resources on public lands in a manner that avoids, minimizes, reduces, or mitigates potential impacts to other resource values. The need for the action is to respond to a request to enable increased annual production of sodium resources from existing federal leases in accordance with the requirements of the Mineral Leasing Act of 1920 (MLA), the Federal Land Policy and Management Act of 1976 (FLMPA), National Environmental Policy Act of 1969 (NEPA), 43 CFR 3500, and all other applicable laws, rules, regulations, standards, policies, and guidelines. The BLM is required to facilitate the recovery of known Federal sodium reserves; to make Federal sodium reserves accessible for development; and to foster and encourage the orderly development of domestic sodium reserves.

1.4. Decision to be Made

Based on the analysis contained in this EA, the BLM will decide whether to approve or deny NSI's proposed plant expansion and if so, under what terms and conditions. Under the National Environmental Policy Act (NEPA), the BLM must determine if there are any significant environmental impacts associated with the Proposed Action warranting further analysis in an Environmental Impact Statement (EIS). The Field Manager is the responsible officer who will decide one of the following:

- To approve NSI's plant expansion with design features as submitted;
- To approve NSI's plant expansion with additional mitigation added;
- To analyze the effects of the Proposed Action in an EIS; or
- To deny NSI's plant expansion

1.5. Conformance with the Land Use Plan

The Proposed Action is subject to and is in conformance (43 CFR 1610.5) with the following land use plan:

Land Use Plan: White River Record of Decision and Approved Resource Management Plan (ROD/RMP)

Date Approved: July 1997

Decision Language: "Facilitate the orderly and environmentally sound development of sodium resources occurring on public lands." (Pages 2-6 and 2-7)

2. PUBLIC INVOLVEMENT

2.1. Scoping

NEPA regulations (40 CFR 1500-1508) require that the BLM use a scoping process to identify potential significant issues in preparation for impact analysis. The principal goals of scoping are to identify issues, concerns, and potential impacts that require detailed analysis. Scoping is both an internal and external process.

Internal scoping was initiated when the project was presented to the White River Field Office (WRFO) interdisciplinary team on 12/8/2014. External scoping was conducted from 12/8/2014 until 12/21/2014 and was initiated by a press release and posting of this project on the WRFO's on-line National Environmental Policy Act (NEPA) register on 12/8/2014. INFORM Colorado, an interested party, was notified of the proposed project on 12/10/2014.

Scoping comments were received from: U. S. Fish and Wildlife Service (FWS); Rio Blanco County; Associated Governments of Northwest Colorado; the towns of Meeker, Rangely, and Rifle; Club 20; Colorado Northwestern Community College; Colorado Mining Association; and one individual. The FWS expressed concerns of bird mortality associated with the facility's pond/s. The remaining comments cited the positive regional economic impacts of the proposed project.

2.2. Public Comment

The Preliminary EA and the unsigned Finding of No Significant Impact (FONSI) will be available for a 14-day public review and comment period beginning March 13, 2015.

3. PROPOSED ACTION AND ALTERNATIVES

3.1. Proposed Action

3.1.1. *Project Components and General Schedule*

Natural Soda Inc. (NSI) is proposing to construct an additional processing facility and associated infrastructure adjacent to their existing processing facility (Appendix A: Figure 1) that would increase the current plant design capacity from 250,000 tons per year (tpy) to 500,000 tpy of sodium bicarbonate. The new facilities would be designed conceptually to be similar to existing facilities. Solution mining operations of the well field would continue in a similar manner as in the present with an increase in the number of producing wells required to maintain a reliable feed source for the expanded facility.

Processing Facilities
The Proposed Action would increase the long term disturbance associated with the footprint of the processing facility from 27 acres to 44 acres. This additional area of disturbance would include warehouse and packaging, truck load out, tank farm, and could include an additional waste water pond (Appendix A: Figures 2 and 3). The new processing building, screening silo, boilers, and cooling towers would be located within the existing foot print if feasible. If

construction and design constraints do not allow for this, the new processing building would be constructed in the proposed warehouse and packaging area. Associated facilities and estimated disturbance are listed in Table 1. Lay down areas for equipment and construction supplies would be in existing and proposed facility disturbance areas.

Table 1. Disturbance Associated with Expansion of the Processing Facility

Facility	Existing Long Term Disturbance[1] (acres)	Total New Disturbance[2] (acres)	Short Term Disturbance[3] (acres)	Long Term Disturbance' (acres)
Current Facilities[4] and Proposed Processing Building Screening and Silos Boilers and Cooling Towers	27	0	0	27
Warehouse and Packaging Load out area, Tank Farm, Waste Water Pond, Parking Lot	0	20	3	17
Total	27	20	3	44

[1] Long term disturbance refers to acreage that would not be reclaimed until the end of mining operations (greater than 20 years).
[2]New disturbance is the sum of the short term and long term disturbance.
[3]Short term disturbance refers to acreage temporarily disturbed for construction; these areas should be reclaimed within 2 to 5 years.
[4] From Table 5

Well Field Development and Disturbance

Increased production from 250,000 tpy to 500,000 tpy would require drilling an additional two production well pairs in the years 2015 and one additional production well pair the following years. Typical disturbance per production well pair would be approximately two acres. The average life of each production well pair would be approximately seven years. In addition to the production well pairs, an average of one exploration/monitoring hole could be drilled each year. Disturbance of each exploration/monitoring hole would be 0.75 acre. Annual average total disturbance associated with access for drilling activities is anticipated at 0.25 acres (assumed access road average width of 20 ft). Access would be designed and constructed to meet the intended use. Interim reclamation of production well pads and monitoring wells would reduce the disturbed area to approximately 1.25 acres and 0.25 acres, respectively. At the end of the well pair life the wells would be plugged and abandoned and the well pad reclaimed. Production pipelines from the wells to the processing facilities would be overland insulated surface pipelines supported above the ground on wooden blocks, used pipe, stanchions, or a combination of all three. Installation of the pipeline and pipeline support would involve little to no surface disturbance and would follow or branch off of existing corridors. Table 2 summarizes 20 years of the estimated increase in well field disturbance required for the proposed expansion from 250,000 to 500,000 tpy. Total well field disturbance for the 500,000 tpy would be 124 acres, the

sum of Tables 2 and 6, and is summarized in Table 3. All wells would be located within the well field area identified in Appendix A: Figure 1; the BLM would conduct site-specific NEPA reviews as well locations are identified via Mine Plan modifications.

The sodium bicarbonate reserves within NSI's existing leases would allow for the recovery of sodium bicarbonate well beyond 20 years. With changes in market conditions, operating and mining technologies it is anticipated additional modification to the Mine Plan would occur prior to the end of the 20 years. Future Mine Plan modifications would require additional NEPA review.

Table 2. Estimated 20 Year Well Field Disturbances Required to Support Increased Production From 250,000 tpy to 500,000 tpy

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026 to 2034	Total
Annual New Production Well Pairs	2	1	1	1	1	1	1	1	1	1	1	9	21
Annual New Exploration/ Monitoring Wells[1]	1	1	1	1	1	1	1	1	1	1	1	9	20
Estimated Annual Disturbance (acres)[2]	5	3	3	3	3	3	3	3	3	3	3	27 (3 acres annually)	62
Estimated Annual Long Term Disturbance[3]	3	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	(1.75 acres annually)	-
Cumulative Total Well Field Disturbance[4]	3	4.75	6.5	8.25	10	11.75	13.5	12.75	13.25	13.75	14.25	18.75[4]	18.75[5]

[1] Includes disturbances associated with access for all wells production and exploration/monitoring.
[2] Total disturbance for well construction, assumed well disturbance for each type of well.
[3] Remaining un-reclaimed disturbances after interim reclamation. Assumes all exploration/monitoring and access are retained as monitoring. Production well pads would be reclaimed at end of 7 year average well life. Long term disturbance refers to acreage that would not be reclaimed until the end of mining operations (greater than 20 years).
[4]Year 2022 and forward reflects plugged and reclaimed production well pads (7 year well life). Assumes monitoring wells remain until end of project or need for well (20 years plus).
[5] Un- reclaimed well field pad disturbance at year 2034.

The length of the drilling radii for horizontal well bores could require location of the well pad in the well field area (Appendix A: Figure 1) located off of NSI's existing leases. This would allow for the maximum recovery of the sodium resources from the leases. All off lease well pads and access would require a realty authorization. Development of the horizontal production well pads would likely be adjacent to each other.

Project Disturbance

Total surface disturbance of project since commencement of operation in 1990 is approximately 130 acres. Approximately 64 acres of these 130 acres are considered long term disturbances (facilities, facility access, and monitoring wells). Table 3 contains the estimated disturbances from the project's start in 1990 through 2034 for the 500,000 tpy production rate. An estimated 144 surface acres (124 acres for well field development and 20 acres for facility expansion) of the BLM lands over a 20 year time frame would be directly impacted.

Table 3. Estimated Acres of Disturbances Through 2034 for 500,000 tpy

Location	Long Term Disturbance (acres)	Short Term Disturbance (Acres)	Un-Reclaimed Acres 2034
Proposed Facilities	17	3	17
Current Facilities	27	0	27
Existing Access (RBC 31) [2]	30	0	30
Current Well Field and Exploration/Monitoring Wells	7[2]	66	7
250,000 tpy Well Field[3]	5[3]	62	18.75[3]
250,000 to 500,000 tpy Well Field[5]	5[3]	62	18.75[4]
Total	81	193	118.5

[1] Long term disturbance refers to acreage that would not be reclaimed until the end of mining operations (greater than 20 years).
[2]From Table 5
[3]Monitoring wells and access to monitoring wells
[4]From Table 4
[5]From Table 2

Mining Methods

Current NSI mining methods would continue to be utilized. This consists of a production well pair of horizontal injection and recovery wells. The targeted mining interval is within the saline zone of the Parachute Creek Member of Green River Formation at a depth of greater than1,900 feet below the ground surface. Various methods of mining have been also employed to recover the sodium resource, including directionally drilled vertical, slant, and horizontal production wells. In addition, currently unknown mining methods and technological advances may be identified and employed in the future. A modification to the Mine Plan and NEPA review would be required prior the implementation of mining methods and technologies not included in the approved Mine Plan.

Directionally drilled horizontal wells could be either injection or recovery wells and could vary in horizontal length from 800 feet to 2,500 feet. Upon well completion, solution mining begins and the mining area is developed. Various types of well pair configurations have been used to develop cavities as follows: one method uses two horizontal wells, which are interconnected at a strategic point; another method utilizes one long horizontal well and a single or multiple vertical well(s) that intersects the horizontal well. A third, less preferred, method utilizes horizontal wells which are connected into existing horizontal wells at various angles. The proposed plan does not cover every type of configuration available, but tries to indicate the wide range of diversification required to meet production.

Vertical production could be located at strategic points along cavities formed by using the directionally drilled horizontal wells. To ensure the cavities are developed symmetrically, these wells could be orientated and located based on the dip, thickness, and purity of the Boies Bed. These wells may be alternated from injection to recovery and back to control cavity growths and shape. Additionally, vertical wells may be mined as an independent interval, providing an alternative to horizontal borehole mining. The vertical wells provide a larger directional-drilling target that can act to create a sump for settling insoluble material which aids in the recovery of more saturated solutions. Well construction would be similar to vertical wells used for horizontal borehole mining but with an additional string of casing. This mining method also offers research and development opportunities and may improve the efficiency and predictability of horizontal mining.

Any of the above mining methods may be used with controlled leaching techniques. For example, undercutting is a common solution mining practice, in which an inert fluid cap is placed near the top of the mining interval to improve the vertical to horizontal leach rate. Cap material is commonly propane, methane, air, nitrogen, or other inert gas. High-pressure jets can also improve cavity shape by cutting vertical or horizontal slots in the targeted zone prior to mining. Low pressure jetting during the mining phase can also be used to improve the cavity shape. Improved cavity shape enhances subsidence control and resource recovery. Mining control with respect to current preferred technology (dual horizontal wells) is accomplished with retreat mining by establishing multiple injection points through plugging and perforating the injection casing.

Fluid flow through the cavities may be accomplished through injection pressure where no significant leakage is anticipated or detected. In areas prone to communication, submersible pumps would be used, as applicable, to lift the pregnant solution and avoid pressurizing the formation below the Dissolution Surface Aquifer. Mining is anticipated to continue until the cavities are exhausted. Excessive halite or temperature drop are the primary indicators of cavity exhaustion. New solution mining technologies may be employed as needed to improve efficiencies, maximize recovery, maintain cavity control and stability, and overcome adverse geological conditions.

Future mining methods may employ these solution mining methods in various combinations. As with any long range mine plan, modifications may be necessary as mining methods are changed as new technologies are developed and implemented. All modifications would be reviewed and

approved by the required Federal, State, and local agencies (e.g., BLM, Environmental Protection Agency, Colorado Department of Public Health and Environment (CDPHE), Colorado Division of Reclamation and Mine Safety, and Rio Blanco County) prior to implementation.

Water

Water for mining and processing is supplied from water supply wells 90-1 and WSW-2. Two additional wells (WSW-3 and WSW-4) drilled and completed in 2014 are anticipated to be added to the water supply system by early 2015. Once WSW-3 and WSW-4 are connected, the 90-1 well would be taken off line and utilized as an A-Groove monitoring well. Two future exploration/monitoring wells would be converted to additional water supply wells to ensure a continuous, adequate raw water supply for full production of the expanded facility. Estimated average water usage is not expected to exceed 430 gallons per minute (gpm) or 694 acre-feet per year.

Water used directly in the mining, crystallization, and surface cooling operations is treated to remove hardness. The raw water is filtered and softened in a water softener unit to remove calcium and magnesium ions. The softener includes a common brine tank to regenerate the resin beds. Softener regeneration wastes drain to the waste water pond. To minimize the water load on the waste water pond, plant water balance is monitored and managed so that waste volume is minimized. The softened water is stored in a 72,000 gallon carbon steel tank located in the process tank farm.

Bottled drinking water is supplied from off-site. Softened process water is supplied to showers, toilets, sinks, safety showers, and other service applications. Plumbing for these systems is such that a potable water treatment system can be added at a later date.

An evaporative cooling tower and distribution system is in service for process cooling requirements. A system is provided to chemically treat the cooling water to prevent scaling and bacteria growth in the cooling water system. The cooling water blowdown system drains to the waste water pond.

A domestic sewage disposal is part of the current facility. The criteria for design of the sewage disposal system were based on CDPHE guidelines. A Rio Blanco County permit was obtained for the sewage disposal system. The existing system would be expanded to meet regulatory requirements.

A pond is located on site for containment of process water and disposal of waste stream. As mentioned above an additional waste water pond could be necessary in the future. The current pond consists of two compartments of approximately three and seven acres. The smaller compartment is provided to contain plant spills or excess process solution overflow. The solutions collected in this compartment are pumped back to the plant for recycling. The larger compartment contains utility waste streams such as cooling tower blow down, boiler blow down, and water softener regeneration purge. In unusual circumstances, the waste water compartment may accommodate overflow from the process compartment. The waste water pond is netted and has a double liner with a leak detection system. The primary liner (top) is made of 60 mil high density polyethylene (HDPE). The secondary liner is made of 40 mil HDPE. Drainage netting was used between the two liners to assist flow of potential leakage from the primary liner to a

sump between the liners, where the leakage would be recycled. This design limits potential leakage through the 40 mil liner. The lined earthen dike separating the two compartments is three feet lower than the perimeter dike of the pond. The pond is a maximum depth of ten feet, not including three feet for freeboard. An increase in sodium bicarbonate production could potentially result in more wash-down and process water. An increase in pond volume, up to seven surface acres, could be necessary to accommodate the increase in sodium bicarbonate production; this additional pond would allow for more flexibility when emptying a pond for maintenance and clean-out.

NSI's mine has been designed as a zero discharge facility in regard to wastewater. Water produced during drilling is conveyed via truck to the waste water pond and no discharge is anticipated. NSI files annual stormwater reports pursuant to Permit No. COR 34-0751.

Disturbed areas associated with access roads, the well field, and plant site are reclaimed as soon as practical following construction. Erosion control measures, such as contour furrowing and water bars, are utilized to minimize erosion until such time that a vegetative cover is established. The product handling and load-out areas would be paved with asphalt or concrete. They are sloped to prevent precipitation runoff from these areas. Since a potential exists for precipitation falling on these areas to become enriched with sodium bicarbonate, this water is directed to containment structures and subsequently removed to the waste water ponds for disposal. Surface runoff is regulated by the NSI Storm Water Discharge Permit.

Air Emissions

Air pollution emission sources include: a natural gas-fired boiler, flash dryers, air classifier bag-houses, and dust collectors. The expansion would include the addition of three new gas-fired steam boilers with associated equipment. New boilers would have best available technology (BAT) emission controls. These boilers burn natural gas in a low nitrogen oxides (NO_x), low pressure steam boiler to heat brine pumped to the well-field. The boiler emission reduction is possible through the use of a low-NO_x burner and flue gas recirculation (FGR). One of these new boilers would be utilized as a backup for the entire processing facilities.

The access road is paved and load out would be paved to limit vehicle dust emissions. Disturbed areas are stabilized as soon as possible. Processing facilities utilize baghouses, filters, and dust collectors to limit emissions. Air Pollution Emission Notices (APEN) submitted by NSI would be approved by the CDPHE prior to startup. Natural Soda Inc. would continue to operate within the emission levels as approved by the CDPHE

Personnel

Construction of the new plant would require up to 150 temporary contract employees. The workers would reside in Rifle and Meeker during the construction phase of the expansion project. Estimated construction activities would last approximately 10 months beginning the spring 2016. Some minor construction activity in preparation for the expansion could commence in 2015. Peak construction workforce demand would begin one month following the start-up of the expansion construction and continue for about seven months.

With the expanded manufacturing facilities, NSI would add 30 full-time employees to its payroll over the next 4 years, reaching total employment of 100; 85 full time employees at the plant and

15 off-site, by 2018. It is anticipated 60 to75 percent would live in Meeker and the remaining employees would reside in communities from Rifle to Grand Junction and Basalt. Another 10 to 15 transportation contractors would be employed in full-time support of moving product from the plant to warehousing and rail loadout located in Rifle, Colorado.

Traffic
During peak construction activity pickup and car traffic could increase more than 70 roundtrips per week above the current level. Busing of construction workers would also be encouraged. Increase in commercial truck activity for delivery of construction material would be intermittent and of shorter duration.

Weekly product truck traffic would average 371 roundtrips at the operational capacity of 500,000 tpy. Pickup and car traffic would average approximately 420 roundtrips per week. The majority of the traffic would be along Rio Blanco County roads 31 and 5 then to Colorado highway 13 and a minor amount to Colorado highway 64.

Reclamation
During the operational phase of the mine, NSI would conduct continuous reclamation activities in order to maintain a minimal impact to the ground surface. As of 2013, all well pads have undergone reclamation to some extent. Monitoring well locations are graded and seeded to the greatest extent possible while continuing to allow access for sampling and minor maintenance. Production well pads are also re-graded and reseeded to the maximum extent possible and still allow room for larger rigs to operate when needed. Reclamation activity would occur per NSI's Reclamation Plan.

3.1.2. ***Design Features***

1. Sodium Lease COC118327-01 and COC119986-01 Stipulations (See Appendix B)

2. "Natural Soda 2014 Mine Plan Modification 5000,000 Tons per Year" Sections 6 through 8.
    a. Section 6 relates to the Mining Process
    b. Section 7 relates to the Processing Facilities
    c. Section 8 relates to Reclamation

3. When working on lands administered by the BLM WRFO, notify Craig Interagency Dispatch (970-826-5037) in the event of any fire.
    a. The reporting party will inform the dispatch center of fire location, size, status, smoke color, aspect, fuel type, and provide their contact information.
    b. The reporting party, or a representative of, should remain nearby, in a safe location, in order to make contact with incoming fire resources to expedite actions taken towards an appropriate management response.

4. The applicant and contractors will not engage in any fire suppression activities outside the approved project area. Accidental ignitions caused by welding, cutting, grinding, etc. will be suppressed by the applicant only if employee safety is not endangered and if the fire can be safely contained using hand tools and portable hand pumps. If chemical fire

extinguishers are used the applicant must notify incoming fire resources on extinguisher type and the location of use.

5. Natural ignitions caused by lightning will be managed by Federal fire personnel. The use of heavy equipment for fire suppression is prohibited, unless authorized by the Field Office Manager.

6. Piled vegetation retained for reclamation as part of forest management mitigations shall be located at least twenty five feet from other receptive fuels.

3.1.3. *BLM Required Conditions of Approval to Mitigate Impacts to Cultural, Paleontological Resources*

7. The applicant is responsible for informing all persons who are associated with the project that they will be subject to prosecution for knowingly disturbing archaeological sites or for collecting artifacts.

8. If any archaeological materials are discovered as a result of operations under this authorization, activity in the vicinity of the discovery will cease, and the BLM WRFO Archaeologist will be notified immediately. Work may not resume at that location until approved by the AO. The applicant will make every effort to protect the site from further impacts including looting, erosion, or other human or natural damage until BLM determines a treatment approach, and the treatment is completed. Unless previously determined in treatment plans or agreements, BLM will evaluate the cultural resources and, in consultation with the State Historic Preservation Office (SHPO), select the appropriate mitigation option within 48 hours of the discovery. The applicant, under guidance of the BLM, will implement the mitigation in a timely manner. The process will be fully documented in reports, site forms, maps, drawings, and photographs. The BLM will forward documentation to the SHPO for review and concurrence.

9. Pursuant to 43 CFR 10.4(g), the applicant must notify the AO, by telephone and written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, pursuant to 43 CFR 10.4(c) and (d), the operator must stop activities in the vicinity of the discovery and protect it for 30 days or until notified to proceed by the AO.

10. The applicant is responsible for informing all persons who are associated with the project operations that they will be subject to prosecution for disturbing or collecting vertebrate or other scientifically-important fossils, collecting large amounts of petrified wood (over 25lbs./day, up to 250lbs./year), or collecting fossils for commercial purposes on public lands.

11. If any paleontological resources are discovered as a result of operations under this authorization, the applicant or any of his agents must stop work immediately at that site, immediately contact the BLM Paleontology Coordinator, and make every effort to protect the site from further impacts, including looting, erosion, or other human or natural damage. Work may not resume at that location until approved by the AO. The BLM or designated paleontologist will evaluate the discovery and take action to protect or remove

the resource within 10 working days. Within 10 days, the operator will be allowed to continue construction through the site, or will be given the choice of either (a) following the Paleontology Coordinator's instructions for stabilizing the fossil resource in place and avoiding further disturbance to the fossil resource, or (b) following the Paleontology Coordinator's instructions for mitigating impacts to the fossil resource prior to continuing construction through the project area.

3.2. No Action Alternative

The No Action Alternative constitutes denial of NSI's plant expansion. Under the No Action Alternative, none of the proposed project components described in the Proposed Action would take place. NSI's processing of sodium bicarbonate would continue at the current plant design capacity of 250,000 tpy and solution mining operations of the well field would continue in a similar manner as present.

Processing Facilities
Operations would continue in the current facilities and the long term disturbance of the existing facilities would be 32 acres (see Table 1). The additional waste water pond would not be constructed; however the construction of additional warehouse storage and parking area would occur.

Well Field Development and Disturbance
Continued annual production of 250,000 tpy would require the same number of wells annually as the proposed increase from 250,000 tpy to 500,000 tpy, except in years 2015 and 2016. Typical disturbance for production well pairs, exploration/monitoring wells, and access would remain the same as described above in the Proposed Action. Table 4 summarizes 20 years of estimated well field disturbance (62 acres) required for the continued operation at 250,000 tpy. Production development would occur in the same general well field areas (Appendix A: Figure 1).

Table 4. Estimated 20 Year Well Field Disturbances Required for the Current 250,000 tpy Facility

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2034 to 2026	Total
Annual New Production Well Pairs	1	2	1	1	1	1	1	1	1	1	1	9	21
Annual New Exploration/ Monitoring Wells[1]	1	1	1	1	1	1	1	1	1	1	1	9	20
Estimated Annual Disturbance (acres)[2]	3	5	3	3	3	3	3	3	3	3	3	27	62
Estimated Annual Long Term Disturbance[3]	1.75	3	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	(1.75 acres annually)	-
Cumulative Total Well Field Disturbance [4]	1.75	4.75	6.5	8.25	10	11.75	13.5	14	13.25	13.75	14.25	18.75[4]	18.75[5]

[1] Includes disturbances associated with access for all wells production and exploration/monitoring.
[2] Total disturbance for well construction, assumed well disturbance for each type of well.
[3] Remaining un-reclaimed disturbances after interim reclamation. Assumes all exploration/monitoring and access are retained as monitoring. Production well pads would be reclaimed at end of 7 year average well life. Long term disturbance refers to acreage that will not be reclaimed until the end of mining operations (greater than 20 years).
[4] Year 2022 and forward reflects plugged and reclaimed production well pads (7 year well life). Assumes monitoring wells remain until end of project or need for well (20 years plus).
[5] Un-reclaimed well field pad disturbance at year 2034.

Project Disturbance
Total surface disturbance of project since commencement of operation in 1990 through 2014 is approximately 130 acres. Approximately 64 acres of these 130 acres are considered long term disturbances (facilities, facility access, and monitoring wells). Table 5 contains the estimated disturbance from the project's start in 1990 through 2034. An estimated 70 surface acres (62 acres for well field development and 8 acres for warehouse construction) of the BLM lands over a 20 year time frame would be directly impacted.

Table 5. Estimated Acres of Disturbances Through 2034 for 250,000 tpy

Location	Disturbance[2] 1990-2014 (acres)	Long Term' Disturbance (acres)	Short Term Disturbance (Acres)	Un-Reclaimed Acres 2034
Facilities	32	35[6]	5	32
Access (RBC 31)	30	30	0	30
Current Well Field and Exploration/Monitoring Wells	73	7[3]	66	7
250,000 tpy Well Field	0	5[4]	62	18.75[5]
Total	135[1]	77	133	95.75

[1] Long term disturbance refers to acreage that would not be reclaimed until the end of mining operations (greater than 20 years).
[2] Disturbance is the sum of the short term and long term disturbance.
[3] Includes monitoring wells and access to monitoring wells.
[4] Monitoring wells and access to monitoring wells
[5] Reflects plugged and reclaimed production well pads (7 year well life). Assumes monitoring wells remain in interim reclamation.
[6] Includes additional warehouse area (8 acres)

Mining Methods
Mining methods would be the same as the proposed expansion and the existing Mine Plan.

Water
No additional waste water pond would be required and estimated average water usage would not be expected to exceed 210 gpm or 339 acre-feet per year.

Air Emissions
One new gas-fired steam boiler, instead of three, with associated equipment would be added to operations. The new boiler would have best available technology (BAT) emission controls. The loading area of the existing facility (Appendix A: Figures 2 and 3) could be paved to reduce dust.

Personnel
NSI's work force would be approximately70 employees instead of 100 and no temporary construction workforce would be required.

Traffic
Weekly product truck traffic would average 185 round trips from the plant facility. Pickup and car traffic would average approximately 280 roundtrips per week.

Reclamation
During the operational phase of the mine, NSI would conduct continuous reclamation activities in order to maintain a minimal impact to the ground surface. As of 2013, all well pads have undergone reclamation to some extent. Monitoring well locations are graded and seeded to the greatest extent possible while continuing to allow access for sampling and minor maintenance. Production well pads are also re-graded and reseeded to the maximum extent possible and still allow room for larger rigs to operate when needed. Reclamation activity would occur per NSI's Reclamation Plan.

3.3. Alternatives Considered but Eliminated from Detailed Analysis

No feasible alternative locations were identified for the proposed project that would result in less impacts than the proposed location.

4. ISSUES

The CEQ Regulations state that NEPA documents "must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail" (40 CFR 1500.1(b)). While many issues may arise during scoping, not all of the issues raised warrant analysis in an environmental assessment (EA). Issues will be analyzed if: 1) an analysis of the issue is necessary to make a reasoned choice between alternatives, or 2) if the issue is associated with a significant direct, indirect, or cumulative impact, or where analysis is necessary to determine the significance of the impacts. The following sections list the resources considered and the determination as to whether they require additional analysis.

4.1. Issues Analyzed

The following issues were identified during internal scoping as potential issues of concern for the Proposed Action. These issues will be addressed in this EA.

- **Air Quality**: Facility expansion, increased well field construction, and additional natural gas boilers could impact to air quality.

- **Geology and Minerals**: All or portions of the project area are encumbered by federal oil and gas, sodium, and oil shale research development and demonstration (RD&D) leases.

- **Soil Resources**: A total of 144 acres of soil resources could potentially be impacted by the Proposed Action.

- **Surface and Ground Water Quality**: The Proposed Action could potentially impact surface and ground water resources in Yellow Creek and Piceance Creek hydrologic basins (18,868 acres and 19,393 acres, respectively).

- **Floodplains, Hydrology, and Water Rights**: The Proposed Action could potentially impact surface and ground water resources in Yellow Creek and Piceance Creek hydrologic basins.

- **Vegetation**: Implementation of the Proposed Action would result in the removal of an estimated 144 acres of vegetation; 124 acres associated with well field expansion and 20 acres associated with facility expansion including the proposed pond. Under the No Action alternative approximately 70 acres of vegetation associated with the well field expansion and facility expansion (additional warehouse and parking lot only) would occur. Both alternatives would cause a loss of vegetative cover, and changes in plant community composition and structure in the affected area.

- **Invasive, Non-Native Species**: Disturbance figures would be as described above for Vegetation. Both alternatives would result in increased opportunity for the spread and establishment of noxious and invasive plant species though to the different extents described above.

- **Migratory Birds:** The Proposed Action would reduce the long-term availability of shrubland and woodland nesting habitat for migratory birds by about 144 acres over project life. At any given time through project life, the utility of another 30 acres of nest habitat adjacent to development activities would be temporarily rendered unsuited for nesting due to avoidance response. The No Action alternative would involve half the level of direct and indirect nest habitat loss projected for the Proposed Action (i.e., 62 acres of long-term habitat modification and 15 acres of indirect habitat loss at any given time through project life).

- **Terrestrial Wildlife**: Up to 144 acres of sagebrush shrublands and pinyon-juniper woodlands as a forage and cover base for big game (winter habitat) and raptors (nesting habitat) would be largely converted to an herbaceous state over project life. The interspersion and extent of mature and regenerating woodland cover among shrubland-dominated communities has a strong bearing on post-development utility of raptor nest habitat and big game winter habitat. Avoidance-induced disuse of habitat in close proximity to well development activity represents an effective reduction in the availability of forage and cover resources for seasonal big game use. The Proposed Action would increase the current influence of development activity on big game severe winter ranges by about 500 acres from its current footprint of about 550 acres (No Action Alternative). Reductions in the extent or continuity of mature woodland canopies can compromise the long term suitability of raptor nest habitat with no practical means of mitigating this effect.

- **Special Status Animal Species**: The Proposed Action would expand mining operations and increase water use (depletion) from the Upper Colorado River system as habitat for the four endangered Colorado River fishes (including bonytail, humpback chub, razorback sucker) and those BLM-sensitive fish that inhabit the lower White River, including roundtail chub, and bluehead, flannelmouth, and mountain suckers. It has been established that depletion of flow from the Upper Colorado River system is likely to jeopardize the continued existence of the four endangered fish of the Upper Colorado

River Basin and indirectly destroy or adversely modify designated critical habitat. Over the 20-year life of this project, average annual depletion from the Upper Colorado River Basin attributable to the No Action Alternative are not expected to exceed the 219 acre-feet rate established for the original mine plan. Expanded development associated with the Proposed Action would elevate mine-related water use an additional 475 acre-feet per year.

- **Cultural Resources**: No historic properties would be impacted by the proposed plant expansion; however, the well field development could adversely affect significant cultural resources. One eligible site (5RB 398) and one "needs data" site (5RB 396), which has to be treated as potentially eligible would need to be protected through avoidance during the development of the well field. The general area of avoidance spans 1S 98W: Section 26 Lots 13 and 14, Section 27 Lots 16, and Section 35 Lots 3 and 4. Any ground disturbing work within these defined areas would require specific monitoring requirements (as set forth in section 5.14.4) to be followed to ensure project activities would have "no effect" on eligible NRHP cultural resources. The BLM would determine if cultural monitors, or other potential mitigations, are needed when applications are submitted for individual wells.

- **Paleontological Resources**: Scientifically noteworthy fossil specimens and resources exist within the boundary of the Proposed Undertaking. The Proposed Action is located in an area generally mapped as the Uinta Formation (Tweto 1979) which the BLM has categorized as a Potential Fossil Yield Classification (PFYC) 5 formation indicating it is known to produce scientifically noteworthy and significant fossil resources (Armstrong and Wolny 1989).

- **Visual Resources**: The proposed expansion of the existing plant facility and well developments could result in changing the visual values of the landscape and would likely be noticeable by casual observers from nearby roads.

- **Livestock Grazing:** Implementation of the Proposed Action would result in as much as an additional 144 acres of disturbance with roughly a third of it including the proposed facility expansion and proposed pond being long term disturbance (20 years). Under the No Action Alternative approximately 70 acres of vegetation associated with the well field expansion and facility expansion (additional warehouse and parking lot only) would occur with about a half of it being long term (20 years). Both alternatives would affect forage availability for livestock in this area though to the varying extents. There would be an increase in localized traffic volume especially during construction of the facility expansion, which would increase traffic related hazards to livestock. Under the Proposed Action two rangeland improvement projects and one long term trend monitoring site would be affected. Under the No Action Alternative only the range improvement projects would be affected.

- **Forestry and Woodland Products:** The NSI plant expansion would require the removal of pinyon-juniper woodlands to construct the new buildings, tank farm, and ponds.

- **Access and Transportation**: The Proposed Action is likely to result in an increase in localized traffic volumes, may increase travel times to this area, and has the potential to add travel routes to the existing transportation system and change access to public lands.

- **Hazardous or Solid Wastes**: Wastes would be generated during construction and operations.

- **Social and Economic Conditions**: The proposed expansion construction, increased production, and increased employment would have an economic impact.

4.2. Issues Considered but not Analyzed

- **Native American Religious Concerns**: Section 106 of the National Historic Preservation Act (P.L. 89-665; 80 Stat. 915; 16 U.S.C. 470) and its implementing regulations found at 36 CFR 800 requires Federal agencies to take into account the effects their actions would have on cultural resources for any endeavor that involves Federal monies, Federal permitting or certification, or Federal lands. The White River Field Office area is located within a larger area identified by the Ute Tribes as part of their ancestral homeland. Contemporary Native American groups such as the Eastern Shoshone, Ute Tribes of the Uinta and Ouray Bands (Northern Ute), Southern Ute, and Ute Mountain Ute maintain cultural ties to the land and resources within the WRFO area.

  Cultural resources are locations of past or current human activity, occupation, or use and include prehistoric or historic archaeological sites, buildings, structures, objects, districts, or other places. Cultural resources can also be natural features including native plants localities that are considered important to a culture, subculture, or community. Traditional Cultural Properties (TCPs) located throughout the WRFO area, are places associated with the traditional lifeways, cultural practices or beliefs of a living community. These sites are rooted in the community's history and are important in maintaining cultural identity. Locations of TCPs, are often not known to the BLM, but may be present in or near the project area due its location in the Piceance Basin. Should recommended inventories or future consultations with Tribal authorities reveal the existence of such sensitive properties, appropriate mitigation and/or protection measures may be undertaken

- **Recreation:** The existing plant facility and well developments have been in existence for some time and most recreationalists visiting this area expect or know about these developments. For those recreationalists that are unaware of these developments, there is a vast amount of public lands that offer a diversity of settings and opportunities within a few miles of the Proposed Action. Therefore the expansion of the plant facility and additional well developments are not likely to have any new impacts or impacts that are not avoidable for recreationalists in this area.

- **Realty Authorizations:** There are portions of the proposed well field area that are off-lease. A right-of-way (ROW) application would be required for any facilities that are outside of the lease boundary. NSI has included this requirement in their 2014 Mine Plan

Modification. There are existing ROWs for pipelines, power lines, roads, and other facilities within the proposed well field area. Site specific NEPA review would occur when applications for surface disturbing activities are submitted and impacts to existing ROWs would be addressed at that time.

- **Lands with Wilderness Characteristics:** There are no lands identified as having wilderness characteristics within six miles of the Proposed Action.

- **Environmental Justice**: According to the most recent Census Bureau statistics (2010) and guidelines provided in WO-IM-2002-164, there are no minority or low income populations within the WRFO.

- **Prime and Unique Farmlands**: There are no prime and unique farmlands within the project area.

- **Wilderness**: There are no designated Wilderness areas or Wilderness Study Areas located near the Proposed Action.

- **Wild Horses:** The Proposed Action is not located within the Piceance-East Douglas Herd Management Area (PEDHMA) or the North Piceance and West Douglas Herd Areas. However, wild horses are known to be in the Yellow Creek Jeep Trail area because they have relocated outside of the PEDHMA boundaries, but impacts are not expected to wild horses as a result of the construction or proposed expansion.

- **Wild and Scenic Rivers**: There are no Wild and Scenic Rivers within the WRFO.

- **Fire Management**: The Proposed Action is located within the B6 Yellow Creek and the C6 Lower Piceance Basin fire management polygons. These polygons consist of Wyoming big sagebrush and pinyon juniper woodlands. A modified suppression strategy may be utilized where the potential to burn less than 200 acres of sagebrush exist. This area is abundant with oil and gas infrastructure and would receive a moderate to high suppression response in efforts to limit fire spread in the project area during periods of high fire danger.

- **Scenic Byways**: There are no Scenic Byways within the project area.

- **Special Status Plant Species**: Special Status Plant Surveys were completed by Rusty Roberts (Roberts, 2014) from April 8 to April 23, 2014. No occupied or suitable habitat for special status species was found during the surveys; therefore the proposed plant expansion would have not impacts to special status plant species. Individual wells would be analyzed during site specific analysis when applications are submitted.

- **Areas of Critical Environmental Concern:**
  There are no Areas of Critical Environmental Concern near the project area.

- **Wetlands and Riparian Zones**: The majority of the Proposed Action lies in the Yellow Creek watershed. The nearest downstream riparian community in this watershed (an isolated 1 mile perennial reach of Yellow Creek) is separated from potential surface

disturbance associated with the Proposed Action by about 4.7 miles of ephemeral channel. The easternmost well field extension lies in the Piceance Creek watershed and is separated from riparian vegetation in that channel by a minimum 2.7 miles of ephemeral channel in Horse Draw. The ephemeral channels support upland or facultative vegetation with no riparian affinity and are undifferentiated from adjacent valley terraces. Vegetation associated with intermittent and perennial reaches is composed primarily of facultative grasses and obligate sedges and rushes.

Groundwater depletion modeling (Clearwater Geosciences 2015) refined projected drawdown and depletion effects on Yellow and Piceance Creeks caused by pumping Natural Soda's three on-lease freshwater source wells. This model, based on historic well pumping rates and maximum projected pumping rates, indicates that flow depletion in Yellow Creek would rise sharply to short-term peak of 21 gallons per minute (gpm) (0.05 cfs) in 2090 and gradually decline over the next two centuries. Similarly, flow depletions in Piceance Creek would be expected to gradually develop a more protracted depletion peak of 15 gpm (0.03 cfs) in about 2190 and decline slowly thereafter. These depletion estimates represent about 2.7 percent of Yellow Creek's mean flows during typical low flow months of August and October and about 0.1 percent of Piceance Creek mean low flows in September. Although cumulative in nature, these depletions are not expected to prompt alterations in channel function or riparian vegetation in either of these drainages, with maximum projected reductions limited to about 1.5 percent in mean surface flows during the growing season (April through July) in the more prominently influenced Yellow Creek.

Considering the limited extent and dispersed nature of surface disturbance, relatively small incremental progression, applied reclamation (including fencing), required compliance with State and federal drilling and completion regulations, and lengthy separation of project work from perennial streams that support riparian vegetation, there is no foreseeable likelihood that either alternative would contribute sediments or contaminants capable of adversely influencing riparian resources or processes.

- **Aquatic Wildlife:** The discussion for Riparian/Wetland Zones above is pertinent to aquatic habitats as well. Higher order aquatic communities nearest proposed project work include Yellow Creek below Barcus Creek (minimum 16.6 channel miles downstream) and Piceance Creek (minimum 2.7 channel miles downstream). Both streams support BLM sensitive fish (primarily mountain sucker) and amphibians (northern leopard frog), but the likelihood of either of the alternatives contributing to depletion, sediment or contaminant levels capable of adversely influencing these species or their habitats would be remote.

5. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

5.1. General Setting & Access to the Project Area

The project area is located in Rio Blanco County, Colorado, approximately 41 miles west and south of Meeker, Colorado. It is situated on a northeast trending ridge between the Yellow Creek and Piceance Creek drainages with elevations ranging from about 6,480 to 6,740 feet. The project area is primarily pinyon/juniper and sagebrush parks. Access from the north is along Colorado Highway 64 to Rio Blanco County (RBC) Road 5 to RBC Road 24 to RBC Road 31 which terminates at NSI's process facilities. Access from the south is along Colorado Highway 13 to RBC Road 5 to RBC Road 24 to RBC Road 31 (Appendix A: Figure 1).

5.2. Assumptions for Analysis

The following are assumptions for well field development:

- An average of seven years for the life of production well pairs.
- Average of two production well pairs and two exploration/monitoring wells per year for the Proposed Action and one production well pair and one exploration/monitoring well per year for the No Action.
- Annual surface disturbance of six acres for the Proposed Action and three acres for the No Action.
- Interim reclamations would begin upon completion of drilling and completion activities final reclamation of production well pads would begin seven years after construction.

5.3. Cumulative Impacts Analysis

The geographic extent of cumulative impacts varies by the type of resource and impact. The timeframes, or temporal boundaries, for those impacts may also vary by resource. Different spatial and temporal cumulative impact analysis areas (CIAAs) have been developed and are listed with their total acreage in Table .

Table 6. Cumulative Impact Analysis Areas by Resource

Resource	CIAA	Total CIAA Acreage	Temporal Boundary
Air Quality	White River Field Office	2.65 million acres	From project inception through cessation of sodium mining operations.
Geology and Minerals	NSI's well field with a one half mile buffer	Approximately 2,780 acres	From project inception through cessation of sodium mining operations.
Visual Resources	From the intersection of RBC Road 83 and 31 to the existing plant facility	Approximately 800 acres	From when Proposed Action construction

	and one mile along RBC Road 83 either side of this intersection.		activities begin through complete or final reclamation of the project.
Transportation and Access	From RBC Road 5 along RBC Road 24 to RBC Road 31 and along RBC 31 and the area where the facility expansion and well developments are located.	Approximately 900 acres	From when Proposed Action construction activities begin through complete or final reclamation of the project.
Paleontological Resources	The facility expansion and well field development plus a 100-meter buffer.	Approximately 888 acres	Impacts to the regional paleontological database from this action would be irreversible and irretrievable and result in an ongoing cumulative loss of data.
Cultural Resources	The facility expansion and well field development plus a 100-meter buffer.	Approximately 888 acres	Impacts to the regional cultural resource database from this action would be irreversible and irretrievable and result in an ongoing cumulative loss of data
Soil Resources, Forestry and Woodland Products, Vegetation, Invasive-Non-native Species	The Proposed Action well field area and expansion area.	585 acres	From the Proposed Action construction activities begin through final reclamation of the project.
Livestock Grazing	Southern 1/3 of Upper Yellow Creek pasture of Square S grazing allotment.	Approximately 3,000 acres	From when Proposed Action construction activities begin through final reclamation of the project.
Surface and	Yellow Creek and	Yellow Creek – 18,868	Proposed Action

Groundwater Quality; Hydrology, Floodplain, and Water Rights	Piceance Creek watersheds.	acres and Piceance Creek – 19,393 acres.	construction activities begin through final reclamation of the project.
Colorado River fishes (two scales)	White River 100-year floodplain below Rio Blanco Lake (CO) and Upper Colorado River Basin	79.2 river miles (direct influence of critical habitat in CO) and 110,000 square miles (upper river basin)	Cumulative from initiation of original project through final reclamation of well field expansion area.
Riparian and aquatic habitats	Yellow Creek from Violett Springs to confluence with White River and Piceance Creek from mouth of Horse Draw to confluence with White River.	19 miles (Yellow Creek); 18 channel miles (Piceance Creek); 76.8 river miles (White River below mouth of Piceance Creek)	Initiation of Proposed Action through final reclamation of well field expansion area.
Terrestrial wildlife, migratory birds, BLM sensitive species (terrestrial)	Piceance Basin/Mesaverde Play Area	462,000 acres	Initiation of Proposed Action through final reclamation of well field expansion area.

5.3.1. ***Past, Present, and Reasonably Foreseeable Future Actions***

Cumulative effects are defined in the CEQ regulations (40 CFR 1508.7) as "...the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

Cumulative impacts from sodium development within the WRFO were disclosed in the 1996 White River Resource Area Proposed RMP and Final EIS. Impacts from sodium development were based on surface disturbance of 890 to 1,550 acres. The BLM estimated surface disturbance as a result of sodium development to date is 130 acres.

Cumulative impacts from oil and gas development within the WRFO were disclosed in the 1996 White River Resource Area Proposed RMP and Final EIS. A Reasonably Foreseeable Development (RFD) scenario compiled for the 1996 EIS estimated that oil and gas development would occur primarily south of Rangely, would consist of approximately 1,100 single well pads and would result in an estimated surface disturbance of 11,000 acres (10 acres per pad including associated infrastructure).

The BLM estimated actual development to date in 2011. From July 1, 1997 until August 19, 2011, there were 1,132 Federal wells drilled (including Federal wells drilled from fee pads). During that same time period, there were 261 plugged and abandoned wells and 375 abandoned

wells. The BLM estimated surface disturbance associated with oil and gas development to be 9,165 acres and reclamation to be 783 acres (assumed 3 acres per plugged and abandoned location).

In 2012 the BLM published the Oil and Gas Development Draft RMP Amendment/EIS which considered changes in the location, type, and level of oil and gas development within the resource area. Based on an updated 2007 RFD scenario, it is assumed that the majority (95 percent) of oil and gas development would occur within the Mesaverde Play Area (MPA; Piceance Basin) and consist of multi-well pads. The preferred alternative in the Draft RMPA/EIS considered drilling up to 15,042 wells from 1,800 well pads with an associated surface disturbance of 21,600 acres (see Table 2-1, Record 13 of the Draft RMPA/EIS). An estimated 12 acres per pad would be disturbed initially (including areas needed for associated infrastructure) however that would be reduced to 5 acres per pad following interim reclamation (see Table 4-2 of the Draft RMPA/EIS). Further, it was assumed there would be up to 1,295 miles of roads and 925 miles of utility lines (pipelines and power lines) developed to support this activity (see Table 4-3 of the Draft RMPA/EIS).

As of March 2014, the Colorado Oil and Gas Conservation Commission database indicated there were a total (i.e., including those drilled prior to the 1997 RMP) of 2,562 producing wells, 320 shut-in wells, and 84 wells where drilling has begun but are not yet in production.

This project is located within the MPA, where it was assumed that full-field development would require two to three pads per section.

Other past, present, and reasonably foreseeable actions in the project area include livestock grazing and associated range improvement projects, vegetation treatments, and both wildfires and prescribed burns. Other mineral development within the area includes two oil shale research development and demonstration leases where up to 120 acres of future disturbance could occur. Recreation use is characterized by dispersed camping, OHV use, and hunting.

Under the No Action Alternative solution mining operations would continue at the plant design capacity and a new warehouse would be constructed. Cumulative effects of No Action Alternative would be less and similar to the Proposed Action's direct and indirect effects. The number of surface acres disturbed, water usage and associated impacts for the No Action Alternative would essentially be halved.

5.4. Air Quality

5.4.1. *Affected Environment*

The U.S. Environmental Protection Agency (EPA), as directed by the Clean Air Act (CAA), has established national ambient air quality standards (NAAQS) for criteria pollutants. Criteria pollutants are air contaminants that are commonly emitted from the majority of emissions sources and include carbon monoxide (CO), lead (Pb), sulfur dioxide (SO_2), particulate matter smaller than 10 and 2.5 microns (PM_{10} and $PM_{2.5}$, respectively), ozone (O_3), and nitrogen dioxide (NO_2). Please note that ozone is generally not directly emitted from sources, but is chemically formed in the atmosphere via interactions of oxides of nitrogen (NO_X) and volatile organic compounds (VOCs) in the presence of sunlight and under certain meteorological

conditions (NO_X and VOCs are ozone precursors). Exposure to air pollutant concentrations greater than the NAAQS has been shown to have a detrimental impact on human health and the environment. The EPA regularly reviews the NAAQS (every five years) to ensure that the latest science on health effects, risk assessment, and observable data such as hospital admissions are evaluated, and can revise any NAAQS if the data supports a revision. The current NAAQS levels are shown in Table 7. Ambient air quality standards must not be exceeded in areas where the general public has access.

The CAA established two types of NAAQS:

- **Primary standards:** Primary standards set limits to protect public health, including the health of "sensitive" populations (such as asthmatics, children, and the elderly).
- **Secondary standards:** Secondary standards set limits to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

In addition to the criteria pollutants, regulations also exist to control the release of hazardous air pollutants (HAPs). HAPs are chemicals that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. EPA currently lists 188 identified compounds as hazardous air pollutants, some of which can be emitted from oil and gas development operations, such as benzene, toluene, and formaldehyde. Ambient air quality standards for HAPs do not exist; rather these emissions are regulated by the source type, or specific industrial sector responsible for the emissions.

The EPA has delegated regulation of air quality to the State of Colorado (for approved State Implementation Plan (SIP) elements). The Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division (APCD) administers Colorado's air quality control programs, and is responsible for enforcing the state's air pollution laws.

The CAA and the Federal Land Policy and Management Act of 1976 (FLPMA) require the BLM to ensure actions taken by the agency comply or provide for compliance with federal, state, tribal, and local air quality standards and regulations. FLPMA further directs the Secretary of the Interior to take any action necessary to prevent unnecessary or undue degradation of the lands [Section 302 (b)], and to manage the public lands "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values" [Section 102 (a)(8)].

Table 7. Ambient Air Quality Standards

Pollutant (final rule citation)	Standard Type	Averaging Period	Level	Form
Carbon Monoxide (76 FR 54294, Aug 31, 2011)	Primary	8-hour	9 ppm	Not to be exceeded more than once per year
		1-hour	35 ppm	
Lead (73 FR 66964, Nov 12, 2008)	Primary and secondary	Rolling 3- month average	0.15 µg/m3	Not to be exceeded
Nitrogen Dioxide	Primary	1-hour	100 ppb	98th percentile, averaged over 3 years

(75 FR 6474, Feb 9, 2010) (61 FR 52852, Oct 8, 1996)		Primary and secondary	Annual	53 ppb	Annual mean
Ozone (73 FR 16436, Mar 27, 2008)		Primary and secondary	8-hour	0.075 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Matter (73 FR 3086, Jan 15, 2013)	PM2.5	Primary	Annual	12 µg/m3	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m3	Annual mean, averaged over 3 years
		Primary and secondary	24-hour	35 µg/m3	98th percentile, averaged over 3 years
	PM10	Primary and secondary	24-hour	150 µg/m3	Not to be exceeded more than once per year on averaged over 3 years
Sulfur Dioxide (75 FR 35520, Jun 22, 2010)		Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
Colorado (State Only)		Primary and secondary	3-hour	267 ppb	Not to be exceeded in any 12 month period
(38 FR 25678, Sept 14,1973)		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: National- 40 CFR 50, Colorado-5CCR 1001-14.
µg/m3= micro grams per cubic meter, ppb = parts per billion, ppm = parts per million.

Climate and Existing Regional Air Quality

Air quality for any area is generally influenced by the amount of pollutants that are released within the vicinity and up wind of that area, and can be highly dependent upon the contaminants chemical and physical properties. Additionally, an area's topography or terrain (such as mountains and valleys) and weather (such as wind, temperature, air turbulence, air pressure, rainfall, and cloud cover) will have a direct bearing on how pollutants accumulate or disperse. The proposed mine expansion/modification project area is in the Piceance Basin of northwestern Colorado in the BLM White River Field Office (WRFO). The basin's climate is classified as semiarid continental. This type of climate is characterized by low relative humidity, sunny days and clear nights, low precipitation with high evaporation, and large diurnal temperature changes. Average maximum temperatures range from 45 degrees Fahrenheit (°F) to 85°F during summer months and from 5°F to 35°F in the winter months. Annual precipitation ranges from 8 to 24 inches, approximately half of the moisture coming from scattered spring and late summer thundershowers. Snowfall amounts, which vary from 25 to 150 inches, are commonly redistributed by wind. Although the regional wind flow is predominately from the southwest, the region's complex terrain induces strong localized wind flows or "drainage" winds in the late evening to mid-morning. The effect of these strong downslope drainage winds is to create air basins where local pollutant emissions may tend to accumulate. Air basins are areas with similar atmospheric flow, topographic influence, and general dispersion potential. Under stable atmospheric conditions, pollutants can collect and concentrate in an air basin until regional synoptic winds disperse the air in the basin. The rate at which emitted pollutants will be dispersed in the atmosphere is related to the parameters of atmospheric stability and mixing height. Unstable conditions produce the best vertical dispersion, typically on summer afternoons. Neutral conditions reflect a breezy, well-mixed atmosphere and moderately good dispersion potential. Stable conditions exhibit downslope drainage, producing the least amount of

dispersion. Temperature inversions may exist under stable conditions, trapping emitted pollutants within a layer of air close to the ground.

Ambient air quality in the affected environment (i.e. compliance with the NAAQS) is demonstrated by monitoring for ground level atmospheric air pollutant concentrations. The APCD monitors ambient air quality at a number of locations throughout the state. The data is summarized by monitoring regions and CDPHE prepares an annual report (Annual Air Quality Reports) to inform the public about air quality trends within these regions. Similarly, several Federal Land Managers (FLMs) like the BLM, FS, and NPS, also monitor air quality for NAAQS and Air Quality Related Values (AQRVs) to meet organic act requirements. Table 8 presents three years of monitoring data for criteria pollutants (with the exception of lead) for northwest Colorado counties. The maximum monitoring value is presented where multiple monitors exist within a single county that monitor for the same pollutant. Concentrations are in units of the standards form (see the "Level" column in Table 7 above), with the exception of the ozone data, which is shown as the 4th highest 8-hour average. To compute the ozone design value (3 year average of the 4th highest 8-hour max), sum all three years of data (if available) and divide by three.

Although the project area is currently designated as attaining the NAAQS, area monitors (Rio Blanco County - Rangley, Colorado) have recorded exceedances of the NAAQS for the following pollutants: ozone. Exceedances by themselves do not necessarily mean that the area will be designated as nonattainment (which would be determined by CDPHE and EPA). The form of the NAAQS must be considered along with the monitored value.

Table 8. Ambient Air Quality Monitoring Data

County	Pollutant	Standard	Monitored Values		
			2011	2012	2013
Garfield	O3	8-hour	0.076	0.068	0.062
Garfield	PM10	24-hour	73	46	34
Moffat	O3	8-hour	0.06	0.066	0.065
Rio Blanco	NO2	1-hour	23	19	24
Rio Blanco	O3	8-hour	0.073	0.069	0.091
Rio Blanco	PM2.5	24-hour	21.5	33.4	26.7
Rio Blanco	PM2.5	Annual	9.9	9.9	9.1
Routt	PM10	24-hour	79	93	77

AQRVs are metrics for atmospheric phenomenon like visibility and deposition impacts that may adversely affect specific scenic, cultural, biological, physical, ecological, or recreational resources. Visibility changes can occur when excessive pollutant contaminates (mostly fine particles) scatter light such that the background scenery becomes hazy. Deposition can cause excess nutrient loading in native soils and acidification of the landscape, which can lead to declining buffering capacity changes in sensitive stream and lake water chemistries (commonly referred to as acid neutralization change (ANC)). Air pollutants are deposited by wet deposition (precipitation) and dry deposition (gravitational settling). The chemical components of wet

deposition include sulfate (SO_4), nitrate (NO_3), and ammonium (NH_4); the chemical components of dry deposition include sulfate, sulfur dioxide (SO_2), nitrogen oxides (NO_X), nitrate, ammonium, and nitric acid (HNO_3). A recent 2014 NPS memo suggests that the critical nitrogen load value for high elevation surface water in all natural areas of Colorado is 2.3 kg/ha-yr. The NPS *Technical Guidance on Assessing Impacts on Air Quality in NEPA and Planning Documents* suggests that critical sulfur load values above 3 kg/ha-yr may result in moderate impacts. AQRVs are important to Federal Land Managers FLMs because they have a mandate to ensure their Class I and sensitive Class II areas meet scientific (landscape nutrient loading) and congressionally mandated goals (i.e. regional haze). Class I areas are generally pristine landscapes such as national parks, national forests, and wilderness areas that are specifically provided the highest levels of air quality protection under the CAA. Sensitive Class II areas are usually afforded additional protection under state specific rule making for one or more pollutants. This status elevates them above ordinary Class II areas which account for every other area of the country that is not explicitly designated as Class I or Sensitive Class II.

Class I/sensitive Class II areas are within or intersect the WRFO planning area (Appendix A: Figure 4): Dinosaur National Monument (sensitive Class II area - NPS) and Flat Tops Wilderness (Class I area – USFS).

Figures 5 and 6 in Appendix A provide current trend data for visibility and deposition at White River National Forest (Flat Tops WA) and Rocky Mountain National Park, respectively. In general, trends with a negative slope indicate better atmospheric conditions for each potentially affected area.

Greenhouse Gases and Climate Change

There is broad scientific consensus that humans are changing the chemical composition of Earth's atmosphere. Activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the accumulation of trace greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and several industrial gases in the Earth's atmosphere. An increase in GHG emissions is said to result in an increase in the earth's average surface temperature, primarily by trapping and thus decreasing the amount of heat energy radiated by the Earth back into space. The phenomenon is commonly referred to as global warming. Global warming is expected in turn, to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, and precipitation rates, which is collectively referred to as climate change. The Intergovernmental Panel on Climate Change (IPCC) has predicted that the average global temperature rise between 1990 and 2100 could be as great as 5.8°C (10.4°F), which could have massive deleterious impacts on the natural and human environments. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), industrialization and the burning of fossil carbon fuel sources have caused GHG concentrations to increase measurably, from approximately 280 ppm in 1750 to 400 ppm in 2014 (as of April). The rate of change has also been increasing as more industrialization and population growth is occurring around the globe. This fact is demonstrated by data from the Mauna Loa CO_2 monitor in Hawaii that documents atmospheric concentrations of CO_2 going back to 1960, at which point the average annual CO_2 concentration was recorded at approximately 317 ppm. The record shows that approximately 70 percent of the increases in atmospheric CO_2 concentration since pre-industrial times occurred within the last 54 years.

National Emissions Inventory (NEI) Data (2011)

As previously stated, air quality is generally a function of emissions loading within any particular region. With respect to WRFO counties (Moffat, Rio Blanco and Garfield in northwest Colorado), emissions inventories Table 9 is provided to describe the affected environment in terms of current cumulative emissions intensities.

Table 9. 2011 County NEI Data (tons)

Garfield	PM10	PM2.5	VOC	CO	NOX	SO2	CO2	CH4	N2O	NH3	HAPs
Agriculture	42.00	8.40	0	0	0	0	0	0	0	281.04	0
Biogenics	0	0	27,115.80	4,302.02	347. 7	0	0	0	0	0	2,685.23
Bulk Gasoline Terminals	0	0	95.38	0.00	0	0	0	0	0	0	13.94
Commercial Cooking	32.58	30.18	4.33	12.41	0	0	0	0	0	0	1.64
Dust	2,627.39	312.21	0	0	0	0	0	0	0	0	0
Fires	203.21	171.98	468.98	1,992.60	27.41	15.01	23,517.54	97.22	0	32.60	45.85
Fuel Comb	250.46	248.18	2,307.63	4,222.61	6,129.26	117.03	0	0	0	19.29	591.98
Gas Stations	0	0	329.45	0	0	0	0	0	0	0	5.85
Industrial Processes	3,387.02	659.34	68,118.84	4,958.81	11,072.14	936.91	0	0	0	0	2,056.00
Miscellaneous	0	0	26.53	0	0	0	0	0	0	0	1.96
Mobile	126.37	108.51	1,128.36	12,,425.51	2,700.96	14.57	517,623.73	51.18	17.56	32.29	287.63
Solvent	0.06	0.05	358.57	6.45	5.74	0.02	0	0	0	0	216.96
Waste Disposal	3.68	1.10	20.47	0.03	0.03	0.06	0	0	0	0	7.61
Sum Totals:	6,672.76	1,539.95	99,974.34	27,920.44	20,283.25	1,083.59	541,141.28	148.40	17.56	365.22	5,914.65
Moffat	**PM10**	**PM2.5**	**VOC**	**CO**	**NOX**	**SO2**	**CO2**	**CH4**	**N2O**	**NH3**	**HAPs**
Agriculture	295.32	59.06	0	0	0	0	0	0	0	620.41	0
Biogenics	0	0	29,532.40	6 ,013. 21	648.91	0	0	0	0	0	4,915 57
Bulk Gasoline Terminals	0	0	12.95		0	0	0	0	0	0	0.23
Commercial Cooking	4.58	4.24	0.61	1.78	0	0	0	0	0	0	0.22
Dust	2,359.91	365.51	0	0	0	0	0	0	0	0	0
Fires	136.65	112.80	255.29	1,183.21	24.78	10.63	16 ,113 .35	52.21	0	17.15	35.57
Fuel Comb	293.09	187.08	222.29	3,226.03	14.244.15	3,957.08	0	0	0	87.25	127.13
Gas Stations	0	0	32.70	0	0	0	0	0	0	0	0.61
Industrial Processes	2,140.80	594.88	4 ,063.42	695.08	418.38	18.89	0	0	0	0	343.93
Miscellaneous	0	0	5.23	0	0	0	0	0	0	0	0.39
Mobile	29.25	25.36	304.49	2.322.61	491.28	2.66	87 ,189.01	6.34	2.70	4.49	76.70
Solvent	0	0	93.11	0	0	0	0	0	0	0	53.75
Waste Disposal	3. 35	3.32	7.36	0.16	0.59	0.08	0	0	0	0.05	0.91
Sum Totals:	5,262.94	1,352.25	34,529.85	13,442.08	1 5,864.1	3,989.34	103,302.36	58.55	2.70	729.34	5,555.00

Rio Blanco	PM10	PM2.5	VOC	CO	NOX	SO2	CO2	CH4	N2O	NH3	HAPs
Agriculture	45.03	9.00	0	0	0	0	0	0	0	397.02	0
Biogenics	0	0	27,153.50	,122.03	418.28	0	0	0	0	0	3,589.10
Bulk Gasoline Terminals	0	0	55.47	0	0	0	0	0	0	0	4.53
Commercial Cooking	2.65	2.43	0.33	0.99	0	0	0	0	0	0	0.12
Dust	3,766.95	573.15	0	0	0	0	0	0	0	0	0
Fires	42.54	35.08	81.00	379.98	6.05	2.81	4,112.06	16.26	0	5.43	9.64
Fuel Comb	119.63	119.00	490.89	1,967.11	2,987.78	26.18	0	0	0	2.78	152.11
Gas Stations	0	0	21.48	0	0	0	0	0	0	0	0.59
Industrial Processes	1,377.62	387.99	23,394.12	1,294.50	1,938.32	414.12	0	0	0	0	676.05
Miscellaneous	0	0	5.36	0	0.02	0	0	0	0	0	0.40
Mobile	30.12	26.82	393.79	2,399.99	310.20	1.56	64,517.88	3.95	1.72	2.91	104.80
Solvent	0	0	46.10	11.28	18.05	0	0	0	0	0	25.90
Waste Disposal	8.27	8.25	5.54	0.78	0.07	0.01	0	0	0	0.02	0.10
Sum Totals:	5,392.80	1,161.74	51,647.58	11,176.66	5,678.77	444.69	68,629.93	20.21	1.72	408.18	4,563.35

5.4.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

Incremental impacts to air quality beyond current conditions (i.e., No-Action Alternative) would be minimal but likely occur from the Proposed Action mine expansion/modification considered in this environmental assessment (EA). These incremental impacts over baseline conditions would result from emissions of air pollutants as a result of construction activities (road and site preparation, drilling, gravel dumping and unpaved road traffic) and production phase activities (nahcolite mining, boilers and dryers operations) associated with the mine expansion/modification. The pollutants that would be emitted for construction phase activities for the proposed mine expansion are: particulate matter for all activities including unpaved road traffic, road and site construction and drilling and combustion related pollutants NO_x and CO for non-road engines, construction equipment and vehicle operations. The air pollutants that would be emitted for the production related activities are: particulate matter (PM_{10} and $PM_{2.5}$) for all activities including mining, boilers and dryers operations; combustion related pollutants NO_x and CO for the boilers and dryers operations and there would be small amounts of VOC and SO_2 emissions associated with the boiler operations. Greenhouse gas (GHG) emissions would be emitted from all combustion related sources but would be primarily associated with boiler operations. All proposed activities including, but not limited to, drilling activities would be subject to applicable local, State, and Federal air quality laws and regulations. The mine operations related emissions sources were permitted with the CDPHE in September 2014 and the following provides a list of emissions sources and controls that are described in the CDPHE issued permits:

- One Niro natural gas fired flash dryer – emissions of particulate matter are controlled by a FLOWaire dust collector bag-house and ~ 99.8 percent of material is re-captured and packaged.
- Two Raymond natural gas fired dryers; thirteen screens and nine curing bins (silos) – emissions of particulate matter are controlled by two fabric filter bag-houses and ~ 99.8 percent of the material is re-captured and packaged.
- One Sturtevant air classifier – emissions of particulate matter are controlled by one fabric filter bag-house and ~ 99.9 percent of material is re-captured and packaged.
- Nahcolite mining and supporting activities – emissions of particulate matter are controlled by two dust collectors at nahcolite material transfer point to dome bin; and enclosure and covered conveyors for material load-out to trucks.

In addition to the standard operating emission control equipment listed in the CDPHE permits (control equipment information shown above), the following provides details for the particulate matter emissions control plan shown in the CDPHE issued mining permit that lists the control measures that should be used for compliance purposes on the activities covered by the new mining permit:

- Mining and processing activities – visible emissions not to exceed 20 percent and no off-property transport of visible emissions.
- Haul Roads – no off-property transport of visible emissions shall apply to on-site haul roads and the nuisance guidelines shall apply to off-site haul roads.

- Haul Trucks – there shall be no off-property transport of visible emissions from haul trucks when operating on the property of the owner (mine site) and there shall be no off-vehicle transport of visible emissions from the material in the haul trucks when the trucks are operating off the property of the owner or operator (mine site).
- Control measures shown in the mine plan include:
    - Adequate soil moisture must be maintained in topsoil and overburden to control emissions during removal. Watering shall be implemented if necessary.
    - Topsoil and overburden stockpiles shall be controlled by maintaining a material moisture content sufficient to meet the above guidelines until such time that stockpile has been re-vegetated.
    - Emissions from drilling operation shall be controlled by water injection.
    - Raw material removal shall be accomplished by wet solution mining.
    - Conveyors shall be partially enclosed. All transfer points shall be fully enclosed and vented to dust collectors.
    - Final product load-out building shall be partially enclosed. Transport trucks shall be totally enclosed, and an extending chute shall be used to load trucks in order to minimize fall distance.
    - Road accessing the facility shall be paved, and shall be kept clean to minimize emissions.
    - Total disturbed areas shall be limited to acreage approved by the CO-DRMS and US BLM (excluding buildings, paved access roads and parking lots). Areas shall be re-vegetated within 12 months as per Colorado Division of Reclamation and Mining and Safety Guidelines.

Table 10 shows the annual air pollutant emissions rates for construction related activities. As shown the table, particulate matter emissions are generated for all construction related activities and combustion related pollutants (NO_x, CO, SO_2 and VOC) are generated for non-road engines and equipment/vehicle operations. Annual total emissions for all pollutants are well below the CDPHE air quality impacts modeling thresholds (thresholds CDPHE uses to determine if air quality modeling is needed for permitting).

Table 10. NSI TOTAL ANNUAL EMISSIONS (tons/year) Construction Expansion Emissions

Activity	PM	PM10	PM2.5	NOx	VOC	CO	SO2
Unpaved Road Emissions	0.532	0.107	0.011				
Gravel Dump Emissions	0.002	0.001	1.3E-04				
Non-Road Engine Emissions	0.008	0.008	0.008	0.159	0.075	1.389	0.003
Drilling Emissions	0.003	0.001	7.8E-05				
Wind Erosion Emissions	1.429	0.714	1.072				
Road Construction and Site Preparation Emissions							
Bulldozing and Compacting	0.197	0.038	0.021				
Grading	0.954	0.274	0.030				
Scraping	0.006	0.003	1.8E-04				
Truck Loading of Excavated Material	6.3E-05	3.0E-05	4.5E-06				
Vehicle Operating Emissions	7.7E-05	7.7E-05	2.9E-05	1.0E-03	3.4E-05	1.0E-03	5.8E-06
Reclamation Emissions	1.156	0.315	0.050				
TOTAL	**4.286**	**1.462**	**1.191**	**0.160**	**0.075**	**1.390**	**0.00**
CDPHE Modeling Thresholds (ton/yr)		**15**	**5**	**4**		**100**	**4**
Modeling Threshold Exceeded		**No**	**No**	**No**		**No**	**No**

Table 11 below shows the annual operations emission rates for the No Action and Proposed Action Alternative and the change in emissions for the proposed mine expansion/modification (increase in emissions for the Proposed Action is the difference between No-Action and Proposed Action Alternatives emissions). The increase in particulate emissions for the proposed mine expansion is primarily related to the increase in nahcolite mining and associated activities. The increase in combustion related pollutants (NO_x, CO, SO_2 and VOC) for the proposed mine expansion is primarily related to the increase in boiler operations emissions. As shown in the table below, annual total emissions increases ("Modification Increase") for the Proposed Action for all pollutants are well below the CDPHE air quality impacts modeling thresholds.

Based on the annual emission rates shown in Tables 10 and 11 as compared to the CDPHE modeling thresholds (CDPHE modeling thresholds are being applied for this EA to evaluate if air quality impacts modeling may be needed for the emissions increases associated with the Proposed Action) and emissions control requirements and information shown in the CDPHE issued permits (including the particulate matter emissions control plan for the new mining permit), it is reasonable to conclude that most actions that could be taken to mitigate air quality impacts will be implemented while operating under the CDPHE permits and therefore, any emissions increases associated with the mine expansion (Proposed Action) would not result in significant air quality impact changes.

Table 11 Air Emission Calculations Summary (tons/year)

EMISSIONS SUMMARY -Permitted (No-Action)									
Source	**PM**	**PM10**	**PM2.5**	**SOX**	**NOX**	**VOC**	**CO**	**CO2e**	**HAPs**
Nahcolite Mining	9.7	6.1	0.6						
Main Boiler	3.1	3.1	3.1	0.7	14.2	2.3	14.7	45,274	6.8E-01
Backup Boiler No. 1	5.9E-02	5.9E-02	5.9E-02	4.7E-03	0.8	4.3E-02	0.7	988	1.5E-02
Backup Boiler No. 2	5.9E-02	5.9E-02	5.9E-02	4.7E-03	0.8	4.3E-02	0.7	988	1.5E-02
Niro Flash Dryer	9.8	9.8	9.8	1.6E-02	2.7	0.1	2.2	3,351	5.0E-02
Raymond Flash Dryers	8.8	8.8	8.8	2.9E-02	4.8	0.3	4	6,089	9.1E-02
SD-20 Air Classifier	11.7	11.7	11						
Total	**43.2**	**39.6**	**34.1**	**0.7**	**23.3**	**2.8**	**22.3**	**56,691**	**0.8**
EMISSIONS SUMMARY - MODIFICATION (No-Action plus Increase for Mine Expansion)									
Source	**PM**	**PM10**	**PM2.5**	**SOX**	**NOX**	**VOC**	**CO**	**CO2e**	**HAPs**
Nahcolite Mining	15.4	7.7	4.9						
Main Boiler	3.1	3.1	3.1	0.7	14.2	2.3	14.7	45,274	6.8E-01
Backup Boiler No. 1	1	1	1	8.1E-02	13.6	0.7	11.4	17,169	2.6E-01
Backup Boiler No. 2	1	1	1	8.1E-02	13.6	0.7	11.4	17,169	2.6E-01
Niro Flash Dryer	14.8	14.8	14.8	2.4E-02	4.1	0.2	3.4	5,129	7.7E-02
Raymond Flash Dryers	9.8	9.8	9.8	3.4E-02	5.7	0.3	4.8	7,180	1.1E-01
SD-20 Air Classifier	2.3	2.3	2.3						
Total	**47.4**	**39.7**	**36.8**	**0.9**	**51.1**	**4.3**	**45.7**	**91,922**	**1.4**
Major Source Threshold	100	100	100	100	100	100	100	See note	25
	Minor	Minor	Minor	Minor	Minor	Minor	Minor	N/A	Minor
Modification Increase	4.2	0.1	2.7	0.2	27.9	1.5	23.4	35,232	0.5
Modeling Threshold		15	5	40	40		100		
Modeling Threshold Exceeded		**No**	**No**	**No**	**No**		**No**		

Note: The 100,000 ton-per-year threshold for PSD and Title V applicability was adopted per EPA's Tailoring Rule: "The revisions were proposed by the Air Pollution Control Division based on EPA's GHG Tailoring Rule. On June 3, 2010, EPA promulgated the 'Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule.' See 75 Fed. Reg. 31514 (June 3, 2010)." AQCC Reg. 3, Part G, I.TT. This portion of the Tailoring Rule was vacated by the U.S. Supreme Court decision on June 23, 2014: "Specifically, the Agency may not treat greenhouse gases as a pollutant for purposes of defining a "major emitting facility" (or a "modification" thereof) in the PSD context or a "major source" in the Title V context. To the extent its regulations purport to do so, they are invalid."

Greenhouse Gases and Climate Change

The implementation of the proposed mine expansion/modification is estimated to contribute 83,647 metric tons of carbon dioxide equivalent (CO_2(e)) in the maximum operations year

(includes annual construction related non-road engine operations). The CDPHE used the EPA's State Inventory Tool to estimate future years GHG emissions inventories for Colorado. In year 2020, it is estimated that Colorado's annual GHG emissions will be approximately 128,060,000 metric tons CO_2(e). The Proposed Action annual operating GHG emissions would represent about 0.07 percent of the state of Colorado's year 2020 annual GHG emissions. Given the relative magnitude of greenhouse gas emissions associated with the proposed mine expansion/modification as compared to the state's GHG emission levels, the GHG contribution associated with the Proposed Action is extremely small.

To provide additional context, the EPA has recently modeled global climate change impacts from a model source emitting 20 percent more GHGs than a 1,500MW coal-fired steam electric generating plant (approx. 14,132,586 metric tons per year of CO_2, 273.6 metric tons per year of nitrous oxide, and 136.8 metric tons per year of methane). It estimated a hypothetical maximum mean global temperature value increase resulting from such a project. The results ranged from 0.00022 and 0.00035 degrees Celsius occurring approximately 50 years after the facility begins operation. The modeled changes are extremely small, and any downsizing of these results from the global scale would produce greater uncertainty in the predictions. The EPA concluded that even assuming such an increase in temperature could be downscaled to a particular location, it "would be too small to physically measure or detect", see Letter from Robert J. Meyers, Principal Deputy Assistant Administrator, Office of Air and Radiation re: "Endangered Species Act and GHG Emitting Activities (Oct. 3, 2008). The project emissions are a fraction of the EPAs modeled source and are shorter in duration, and therefore reasonable to conclude that the project would have no measurable impact on the climate.

Cumulative Impacts

In consideration of disclosing cumulative and regional air quality impacts, the BLM has completed the Colorado Air Resources Management Modeling Study (CARMMS) using the WestJumpAQMS year 2008 modeling platform (meteorology, baseline conditions, etc.). The study includes assessing projected year 2021 air quality impacts for three future year emissions scenarios (low, medium and high) that were developed for each BLM Colorado Field Office/Planning Area. Air pollutant emissions for each Field Office/Planning Area (including WRFO) was modeled with the source apportionment option, meaning that incremental impacts to regional ozone and AQRVs from WRFO based air pollutant emissions were tracked to better understand the significance of such emissions levels on impacted resources and populations. The three CARMMS future year 2021 emissions for WRFO (the mine facility is located in the Piceance Basin of WRFO) were developed using oil and gas projections for the Piceance Basin. Although the proposed mine expansion/modification is not directly associated with future oil and gas development in the Piceance Basin, the CARMMS modeling system modeled emissions rates from particular locations in the Piceance Basin that can be applied for assessing regional air quality impact contributions for any Piceance Basin based emissions sources (oil and gas or mining, etc.). The CARMMS source apportionment tracking allows for determining the level of air quality impact contributions (contributions to total regional air quality) at all locations in Colorado (including Class I areas) from a particular level of emissions originating from the BLM Field Offices/Planning Areas. This type of analysis provides a look at the sensitivity of the atmosphere with respect to a particular set of air pollutant emissions.

CARMMS WRFO Emissions Table
Table 12 provides the projected WRFO emissions rates modeled for the CARMMS Low emissions scenario.

Table 12. CARMMS Annual Emissions (TPY) – WRFO Low Emissions Scenario

Field Office	PM_{10}	$PM_{2.5}$	NO_X	VOC	SO_2
WRFO – Low Scenario	226	99	1,861	4,502	149

CARMMS Modeling Results for Low Scenario
The CARMMS source apportionment contributions modeling results for each source group (i.e. WRFO Planning Area) are applicable for the amount of additional air pollutant emissions that were modeled in the study for the Field Office/Planning Area. The CARMMS low scenario modeled source apportionment contributions for WRFO are associated with the emissions rates as shown in the Table 12 above. Note that the majority of WRFO emissions for the CARMMS low scenario originated (were released) from the Piceance Basin area. The following table provides a quasi-cumulative summary of ozone, visibility and nitrogen deposition impacts for the projected WRFO emissions changes associated with the CARMMS Low modeling scenario. These impacts show the relative contribution to full cumulative (all world-wide emissions sources) impacts for the projected year 2021 WRFO emissions changes (see Table 12 above) associated with the Low modeling scenario.

Table 13. CARMMS Low Emissions Scenario - WRFO Impact Contributions to Total Modeled Impacts

Source Group - Modeling Scenario	Number of Annual Days Above 0.5 dv Change	Maximum Modeled Annual Nitrogen Deposition (kg/ha-yr)	Overall Maximum 4th High Daily 8-hour Ozone Contribution (ppb)	Maximum 4th High Daily 8-hour Ozone Contribution to Modeled Exceedance (ppb)	Overall Maximum 8th High 24-hour $PM_{2.5}$ Contribution (ug/m^3)
WRFO – Low Scenario - Year 2021	0	0.0228	1.2	0.4321	0.6

* maximum modeled concentrations/values for any Class I/sensitive Class II area (AQRV) or grid cell (ozone).

As shown in Table 13, there are no days that the projected WRFO year 2021 Low scenario emissions changes have a significant (~ 0.5 dv) visibility change impact at any Class I or sensitive Class II area and the maximum modeled nitrogen deposition contribution is minimal with respect to the cumulative critical nitrogen deposition load of 2.3 kg/ha-yr value. The maximum contributions to 4th high daily maximum 8-hour ozone concentrations are minimal with respect to the 75 ppb 8-hour ozone standard and the maximum contribution to the 8th high

maximum 24-hour $PM_{2.5}$ concentration is minimal with respect to the 35 ug/m^3 24-hour $PM_{2.5}$ standard.

The information above shows that the predicted air quality impact contributions associated with the WRFO low scenario emissions changes are minimal. Considering that the air pollutant emission releases associated with the WRFO source apportionment impacts originated in the Piceance Basin (mine is located in the Piceance Basin) and at much higher levels in the CARMMS model than annual emissions levels estimated for the proposed mine expansion/modification, it is reasonable to conclude that any air quality impacts associated with a Piceance Basin based project such as the proposed mine expansion/modification would have much lower contributions to the overall cumulative air quality.

In addition to modeling source apportionment contributions to total air quality impacts for each BLM Colorado Field Office/Planning Area, total cumulative changes (total changes for all emissions sources modeled from year 2008 to year 2021) in air quality were also modeled in CARMMS. Modeling full cumulative air quality impact changes from years 2008 to 2021 shows predicted regional air quality trends and atmospheric sensitivity for all cumulative emissions changes accounting for new emissions control regulations for oil and gas, mobile sources and power generating facilities that are established from years 2008 to 2021. Table 14 provides a full cumulative summary of ozone, visibility and nitrogen deposition impact changes (changes from years 2008 to 2021) for all (i.e. world-wide) emissions sources associated with the CARMMS Low modeling scenario.

Table 14. CARMMS Modeled AQRV Impact Changes – Low 2021 Scenario - Full Cumulative Emissions Inventory

Class I Area	Best 20% Days Visibility Metric (dv) - 2021 Low Improvement from 2008	Worst 20% Days Visibility Metric (dv) - 2021 Low Improvement from 2008	Maximum Modeled Annual Nitrogen Deposition (kg/ha-yr) – 2021 Low Improvement from 2008
Mount Zirkel Wilderness	0.16	0.87	1.03
Flat Tops Wilderness	0.20	0.68	0.96

* positive visibility related values mean overall visibility improvement and deposition values are average for all grid cells making up the Class I area.

For full cumulative ozone design value projections at regional ozone monitoring sites, the maximum current year 8-hour ozone design concentration (DVC; based on 2006-2010 observations) is 82.0 ppb at the Rocky Flats North (CO_Jefferson_006) monitor that is projected to be reduced to 78.1 ppb for the CARMMS 2021 Low emissions scenario.

For the ozone design value projection unmonitored area analysis (analysis for areas with no monitors), the geographical extent (i.e. size) of the overall area of ozone design value exceedances is reduced (from 2008 to 2021) and Appendix A: Figure 7 CARMMS plot shows

predicted ozone reductions in the Denver and Salt Lake City areas for the CARMMS Low emissions scenario.

CARMMS plot (Appendix A: Figure 8) shows changes in 8th highest daily average $PM_{2.5}$ concentrations (2021 Low Scenario minus Base Year 2008 concentrations). As shown in the figure, concentrations are expected to increase in major Colorado Front Range cities and near mining (coal) operations in Colorado.

With the exception of $PM_{2.5}$ concentrations near large cities and future coal mining operations, the CARMMS Low Scenario full cumulative modeling results show an overall improvement to air quality in the region from year 2008 to year 2021.

5.4.3. ***Environmental Consequences – No Action Alternative***

Direct and Indirect Impacts

Operations would occur at the design rate of the existing facility and construction of the warehouse and parking area would occur. Direct and indirect impacts from these activities would be similar, but reduced, to the Proposed Action (See Table 11).

Cumulative Impacts

Cumulative impacts would be similar to the Proposed Action.

5.5. Geology and Minerals

5.5.1. ***Affected Environment***

The Proposed Action is near the depositional center of the northern portion of the Piceance Basin. Surficial geology of the area is the upper portion of the Uinta Formation (Duncan).

Stratigraphic geologic units which would be affected by the project consist of the Uinta and Green River Formations. The Green River Formation contains both sodium and oil shale resources. Estimated total oil shale resource in the area of the Proposed Action is approximately 3.2 million barrels/acre (Johnson *et al* 2010) and the total estimated sodium bicarbonate is over 0.8 million tons per acres (USGS 2009).

The plant expansion and well field are located in an area identified as available for oil and gas, oil shale; and multi-mineral leasing and development in the White River ROD/RMP. The southern portion of the well field development area is congruent with NSHI's Oil Shale Research Development and Demonstration (RD&D) Lease COC74299 and overlaps into ExxonMobil's oil shale RD&D lease COC74300 (Appendix A: Figures 1 and 2). The next nearest oil shale RD&D lease to the Proposed Action and is approximately 1.8 miles southwest of the southwestern corner of the modification and the remaining RD&D leases are located four to seven miles from the modification

Mineral resources within foreseeable development located in the vicinity of the Proposed Action include oil and gas, sodium, and oil shale. Oil and gas resource development occurs below the Green River Formation in the Wasatch, Mesaverde and lower formations. The majority of the

natural gas development occurs within the Mesaverde Formation which is approximately 4,500 feet below the bottom of the Green River Formation.

Vertical solution mining of sodium minerals was conducted by American Soda, LLP, a division of Solvay America, Inc. (AMSO), from 2000 to 2004 on federal sodium leases at a facility located three miles northeast of the Proposed Action. The process dissolved nahcolite from bedded nahcolite and nahcolitic oil shale at depths of 1,500 to 2,000 feet. Operations at the processing plant were discontinued following a failure to economically produce soda ash from the nahcolite. No subsequent sodium production has occurred from AMSO's federal sodium leases.

Natural gas has been produced in the area since 1940 from the Tertiary Wasatch Formation, from the Douglas Creek Member of the Green River Formation, and from the Cretaceous Mesaverde Formation. The Mesaverde gas is the principal objective of most of the current drilling in the area. Each natural gas well is expected to drain an area of 10 to 20 acres with the production zone ranging from 9,000 feet to over 12,000 feet below ground surface. All federal oil and gas mineral estate in the area is currently leased. NSI's well field area overlays federal oil and gas lease COC60731, COC60732, COC60733, and COC60735 which are committed to WPX's Ryan Gulch Oil and Gas Exploratory Unit COC68239X. The Colorado Oil and Gas Conservation Commission (COGCC) database identifies 32 existing and 34 planned bottom hole locations (66 total) within one half mile of NSI's well field (2,870 acres).

5.5.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

Implementation of the Proposed Action could interfere with the development of oil and gas resources. The current oil and gas operator in the area avoids impacts to the existing sodium mining operations and oil shale extraction by cooperatively working with NSI in locating well pads and restricting the directional deviation outside of NSI's well field through the Green River Formation. Oil and gas development in the area occurs in the Mesaverde Formation and is located at depths of greater than 5,500 feet below the current targeted sodium zone. Implementation of directional drilling techniques, already commonly practiced in the area, would allow oil and gas development while avoiding oil shale and sodium surface facilities. The proposed well field and facility expansion encompasses 585 acres and could affect the surface location of oil and gas well pads. Prevention of conflict between sodium and natural gas recovery would require placement of natural gas well pads outside of NSI's well field. This could increase the directional distance of the bottom hole in future gas wells to achieve the full development of the natural gas resources.

Drilling operations for sodium development in the modification could be affected by geologic characteristics of portions of the Green River Formations which contain zones prone to lost circulation, particularly the Dissolution Surface and A and B Groove zones within the Green River Formation of the Parachute Creek Member. Circulation problems in these zones can also affect the integrity of casing cement jobs. These potential problems are manageable using careful drilling techniques; appropriate mud, cement, and casing design; and performing proper post-cementing integrity evaluations according to BLM requirements. The expansion would allow for the NSI to recover, process, and sell the sodium bicarbonate recovered during the first stage of

NSHI's RD&D two stage process. NSI's recovery of sodium bicarbonate within the proposed lease modification in the current Boies Bed mining horizon should have limited impacts on NSHI's oil shale RD&D.

Code of Federal Regulation 43§ 3594.5 (c) limits solution mining to within 500 feet of the lease boundary without written permission from the authorized officer. NSI has been authorized to mine to within 100 feet of their lease boundaries which could place well pads off of their sodium leases. Off lease sodium injection and recovery well pads could be authorized through a BLM ROW to achieve maximum resource recovery. Portion of NSI's proposed well field is located on 20 acres in the northeastern part ExxonMobil's oil shale RD&D lease COC74300 (Appendix A: Figures 1 and 2). Placement of surface facilities for sodium extraction on this portion could affect ExxonMobil's development of their RD&D lease.

Rate of sodium recovery would increase from 250,000 to 500,000 tons per year. Sodium resources mined would be removed and remaining sodium resources would be potentially forgone as subsidence control. Mined out cavities and potential subsidence could complicate future oil and gas drilling within the sodium well field. However, it is likely these areas would be avoided through the continued use of direction drilling techniques for the recovery of the underlying oil and gas resources. NSI's subsidence monitoring plan includes both surface and subsurface monitoring of the potential vertical ground movement resulting from solution mining. The Wolf Ridge EIS disclosed subsurface subsidence, which would occur if the solution mined cavity roofs collapsed and/or pillars between cavities failed, would result in a downward surface expression of less than one foot. A current estimate of surface subsidence is less than 0.6 feet. Surface subsidence would be uniform in aerial extent over the mined area. No appreciable changes in surface topography would occur and post-mining land use as range/wildlife habitat and would not be affected. The surface expression of subsidence would be undetectable except by survey methods. Subsidence monitoring results from the commencement of operation has not detected and surface or significant subsurface subsidence.

Cumulative Impacts

The CIAA for geology and minerals is NSI's well field with a one half mile buffer (2,780 acres). The Proposed Action (565 acres of well field and 20 acres facility expansion) combined with 140 acres of oil shale RD&D lease COC74300 outside NSI's well field could make 725 acres of surface area, or approximately 26 percent of the CIAA, unavailable for siting of oil and gas well pads. This could require additional lengths of the directional drilling for the recovery of the oil and gas resources underlying the 725 acres. A 10 acre spacing for oil and gas development could require 212 additional oil and gas wells on an associated 9 to 10 well pads within the CIAA.

5.5.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

Recovery of the sodium resources would be limited to the current facility capacity of 250,000 tons years and the time frame associated with the recovery of sodium resources in NSI's identified well field would approximately double. Impacts to other geologic and mineral resources would remain as described in the Direct and Indirect Impacts of Section 5.5.2 above.

Cumulative Impacts

Cumulative impacts would be similar to the Proposed Action Alternative. Time frame for the full development of sodium resources in the well field would double.

5.5.4. *Mitigation Measures and Residual Impacts*

1. To minimize or prevent potential conflicts between sodium recovery and oil shale RD&D operations, an agreement between NSI and the oil shale RD&D lessees should be in place prior to the approval of any ROW for the placement of off lease well pads or facilities.

5.6. Soil Resources

5.6.1. *Affected Environment*

Soils within the project area were identified using the Natural Resources Conservation Service (NRCS) soil survey of Rio Blanco County Area, Colorado (Soil Conservation Service - SCS, 1982) and web-based data (NRCS 2012).

A total of 585 acres were analyzed (well field plus facility expansion area), of which 144 acres would be disturbed. The actual total acreage directly impacted is summarized in Section 3.1 Proposed Action for a detailed breakdown of impacted acres. Within the analyzed area, there are 208 acres of Yamac loam, 88 acres of Piceance fine sandy loam, 143 acres of Redcreek-Rentsac complex, and 143 acres Rentsac channery loam.

Yamac loam, 2 to 15 percent slopes: This deep, well-drained soil is found on rolling uplands, terraces, and fans. It is formed in eolian and alluvial material, and the surface and subsurface textures are loam. The Yamac soil is non-saline and non-sodic, permeability is moderate, effective rooting depth is 60 inches, runoff is medium, and the hazard of overland sheet erosion is slight to moderate during runoff events typical during summer convective rain events.

Piceance fine sandy loam, 5 to 15 percent slopes: This moderately deep, well-drained soil is on uplands and broad ridgetops. It formed in eolian material and colluvium derived dominantly from sandstone. The Piceance soil is non-saline and non-sodic, permeability is moderate, effective rooting depth is 20 to 40 inches, runoff is slow to medium, and the hazard of overland sheet erosion is moderate to high.

Redcreek-Rentsac complex, 5 to 30 percent slopes: This unit is 60 percent Redcreek sandy loam and 30 percent Rentsac channery loam and typically located on mountainsides and ridges. The Redcreek soil is shallow and well-drained. It formed in residual and eolian material derived dominantly from sandstone. The Redcreek-Rentsac is non-saline and non-sodic, permeability is moderate, effective rooting depth is 10 to 20 inches, runoff is medium, and the hazard from overland sheet erosion is moderate to high.

Rentsac channery loam, 5 to 50 percent slopes: This shallow, well-drained soil is found on ridges, foothills, and side slopes. It is formed in residuum derived dominantly from calcareous sandstone. The Rentsac soil is non-saline and non-sodic, permeability is moderately rapid, available water capacity low, effective rooting depth 10 to 20 inches, runoff is medium and overland sheet erosion is moderate to very high.

No controlled surface use (CSU-1) soils (including fragile [slope greater than 35 percent]/saline soils) or no surface occupancy (NSO-1) landslide soils are located within the proposed footprint of the plant or well field expansion (refer to Appendix A: Figure 9). NSO-1 soils are considered unstable and subject to slumping and mass movement. Surface occupancy would not be allowed in such areas. CSU-1 code encompasses fragile soils on slopes greater than 35 percent and saline soils typically derived from Mancos shale. Surface disturbing activities would be allowed only after engineered construction-reclamation plan is submitted by operator and approved by the Area Manager.

5.6.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

Impacts to soils from the plant and well field expansion include removal of vegetation, mixing of soil horizons, loss of subsurface soil structure, soil compaction, increased susceptibility to wind and water erosion, and loss of organic matter and subsequent soil productivity. The impacted sensitive/nonsensitive soils are illustrated in Appendix A: Figure 9.

These impacts could potentially accelerate wind and surface erosion processes resulting in discharges of sediment into surrounding ephemeral drainages and stormwater control features. All of the soils located within the Proposed Action are rated as having a severe erosion hazard. The soil rutting hazard is slight for the Rentsac channery loam, moderate for the Redcreek-Rentsac, and severe for the Yamac and Piceance loams. Due to the severe erosion rating of the soils contained within the Proposed Action, any rutting resulting from construction activities could result in severe rill erosion which would contribute to the transport and deposition of sediment. Disturbed areas including access roads, well field, and plant expansion site are to be reclaimed as soon as practical following construction. Appropriate best management practices (BMPs) including contour furrowing and water bars should minimize surface erosion from disturbed areas until such time that vegetative cover is restored.

Cumulative Impacts

Past, present, and reasonably foreseeable future impacts on upland soil resources in the project area include livestock grazing, range improvement projects, vegetation treatments, and both wildfires and prescribed burns. Other mineral development within the area includes oil shale research tracts. Recreation use is characterized by dispersed camping, OHV use, and hunting.

5.6.3. ***Environmental Consequences – No Action Alternative***

Direct and Indirect Impacts

Under the No Action Alternative, the construction of additional warehouse storage and parking area would occur and the associated impacts discussed in the Proposed Action would be applicable.

Cumulative Impacts

Under the No Action Alternative, the construction of additional warehouse storage and parking area would occur and the cumulative impacts discussed in the Proposed Action would be applicable.

5.6.4. *Mitigation Measures and Residual Impacts*

1. When preparing the site, all suitable topsoil should be stripped from the surface of the location and stockpiled for reclamation once the location is abandoned. When topsoil is stockpiled on slopes exceeding five percent, construct a berm or trench below the stockpile.
2. Sedimentation shall be diverted and/or run through catchment basins in order to protect surface waters.
3. All sediment control structures or disposal pits will be designed to contain a 100-year, 6-hour storm event. Storage volumes within these structures will have a design life of 25 years.

5.7. Surface and Ground Water Quality

5.7.1. *Affected Environment*

A total of 585 acres were analyzed, see Section 5.6.1. The actual acreage directly impacted is summarized in Section 3.1 Proposed Action (Table 1 and 2).

Surface Water: The plant facilities and well field are located in the Piceance Creek and Yellow Creek watersheds within Rio Blanco County. The climate of the area is semi-arid, with annual precipitation ranging from 12 to 16 inches. Precipitation generally occurs as snow during winter months and high intensity rainfall during the summer.

Piceance and Yellow Creeks are perennial streams draining into the White River to the north. Surface runoff from these basins is from snowmelt in the spring and high-intensity thunderstorms in the summer. The Piceance Creek and Yellow Creek hydrologic basins drain 18,868 acres and 19,393 acres, respectively characterized by a network of poorly developed ephemeral channels typical of an arid region. Piceance Creek is a perennial stream and Yellow Creek is intermittent in the upper drainage becoming perennial in the lower drainage with baseflow (minimum sustained flow) being sustained by groundwater discharge.

Section 303(d) of the federal Clean Water Act requires states to identify water bodies or stream segments that are water quality limited. Those water quality limited segments currently identified in Colorado are identified in the 2014 303(d) List. Water quality limited segments are those water bodies or stream segments which, for one or more assigned use classifications or standards, the classification or standard are not fully achieved. Once listed, the State is required to quantify the amount of a specific pollutant that a listed water body can assimilate without violating applicable water quality standards and to apportion that allowable quantity among the different pollutant sources.

Table 15 list the segments impacted by the Proposed Action, there use designation, if any, and the classifications.

Table 15. CDPHE Stream Classification

Stream Segment	Stream Segment Description	Designation	Classifications
13a.	All tributaries to the White River, including all wetlands, from a point immediately below the confluence with Piceance Creek to a point immediately above the confluence with Douglas Creek,	UP - use protected	Aquatic Life Warm - 2 Recreation - N Agriculture
13b.	Mainstem of Yellow Creek including all wetlands from the source to immediately below the confluence with Barcus Creek. All tributaries to Yellow Creek from the source to the White River, including wetlands.	N/A	Aquatic Life Warm - 2 Recreation - N Water Supply Agriculture
13c.	Mainstem of Yellow Creek, including all wetlands from immediately below the confluence with Barcus Creek to the confluence with the White River.	N/A	Aquatic Life Warm - 2 Recreation - N Agriculture

Stream segments 13a qualify for a use-protected designation while segments 13b and c have an undesignated antidegradation designation because the existing water quality meets the 12 parameter test of Section 31.8 of the CDPHE Regulation No. 31.

Segments 13a, b, and c are classified as Aquatic Class 2 streams which are waters not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.

Segments 13a, b, and c are class N for recreation which is surface waters not suitable or intended to become suitable for primary contact recreation use classified Agriculture for surface waters are suitable or intended to become suitable for irrigation of crops. Segment 13b is classified as suitable or intended to become suitable for potable water supplies after receiving standard treatment.

Groundwater: The Parachute Creek Member of the Green River Formation is the principal source for both oil shale and saline minerals. The Green River Formation is more than 2,500 feet thick and is overlain by the Uinta Formation and underlain by the Wasatch and Fort Union Formations. The Parachute Creek Member averages about 1,700 feet thick in this area and consists primarily of oil shale, marlstone, leached oil shale, and saline oil shale.

Groundwater of varying quality is encountered in the water bearing zones, which include, from top downward, the Perched in the Uinta Formation, A-Groove, B-Groove, and Dissolution Surface Aquifers. Typically, the water quality of the aquifers decrease and the age of water increase with depth. The aquifers in this area are separated by layers of sediments with very low permeability contributing to the aquifer layers having minimal hydraulic or chemical communication with overlying or underlying aquifers. The exception is where vertical communication occurs through vertical faults and fractures cross-cut the confining units. Recharge to the aquifer system occurs principally from snowmelt during the spring.

During the summer months, the high intensity monsoonal rainfall is lost as overland flow or infiltrates into the soil profile and is subsequently lost as soil deficit recharge, atmospheric evaporation, and/or evapotranspiration by vegetation. During spring snowmelt, water is released slowly, especially on the north facing slopes, allowing ample opportunity for the melt to infiltrate the soil, increase soil moisture content to field capacity, and percolate into the saturated zone.

In the recharge areas, water from the A-groove Aquifer moves downward through the Mahogany Zone to recharge the B-groove Aquifer. A minor amount of water moves downward through the R-6 zone to recharge the Dissolution Surface Aquifer. Generally groundwater in the A-groove and B-groove Aquifers flows from the recharge areas at the basin margins toward the north-central part of the basin. In discharge areas, north of Natural Soda, water moves upward from the B-groove and Dissolution Surface Aquifers through the R-6 and Mahogany Zones to the A-groove Aquifer. Water is discharged from the A-groove Aquifer to the alluvium through valley floors and by springs along the valley walls providing baseflow for Piceance Creek and Yellow Creek.

5.7.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

Generally, concentrations of pollutants in surface waters are indirectly related to flow since higher the stream flow, the lower the concentration and the lower the stream flow, the greater the concentration. Therefore, the instream low flow condition becomes the critical condition for the analysis and for the survival of aquatic life and surface water quality.

A groundwater depletion analysis was completed by Clearwater Geosciences, LLP and Daub & Associates Incorporated for the purpose of analysis for the Proposed Action. The results from this analysis indicated a maximum depletion of Yellow and Piceance creeks would be 4.9 percent and 3.5 percent of the pumping rate, respectively. Estimated average water usage is not expected to exceed 430 gpm per year which equates to 21gpm (0.05 cfs) and 15 gpm (0.03 cfs) flow reductions for Yellow and Piceance creeks, respectively. The modeled depletions could potentially impact Yellow Creek during periods of low baseflow. For water years 1973 to 2013, the annual mean flow for Yellow Creek (based on USGS gage 09306255 – Yellow Creek near White River) was 2.58 cfs (annual high – 8.93cfs and annual low – 0.92 cfs). The highest recorded daily mean was 500 cfs on September 7, 1978 and the lowest 0 cfs measured December 15, 1978. The annual seven-day minimum was 0.38 cfs calculated August 14, 2013 (USGS Water-Data Report 2013). Groundwater pumping could result in increased communication between the Perched, A-Groove, B-Groove, and Dissolution Surface Aquifers resulting in temporary increases in deeper aquifer water quality, decreased water quality in upper aquifers, or both.

As discussed in Section 3.1 of the Proposed Action, the NSI's mine has been designed as a zero discharge facility in regard to wastewater. Water produced during drilling would be conveyed to an existing and proposed additional, waste water pond via truck. As such, no point or non-point source pollutant releases are expected. NSI is required to file annual stormwater reports pursuant

to Permit No. COR 34-0751. In addition, disturbed areas including access roads, well field, and plant expansion site are to be reclaimed as soon as practical following construction. Appropriate BMPs including contour furrowing and water bars are to be utilized to minimize surface erosion from disturbed areas until such time that vegetative cover is restored. Impermeable production areas would be sloped to prevent stormwater runoff to the surrounding terrain since precipitation falling on these surfaces could become enriched with sodium bicarbonate. All captured, possibly enriched, stormwater are directed to containment structures and ultimately, to onsite containment ponds pursuant to NSI's Storm Water Discharge Permit.

Cumulative Impacts

Past, present, and reasonably foreseeable future impacts on surface and ground water resources in the project area include livestock grazing and associated range improvement projects, vegetation treatments, and both wildfires and prescribed burns. Other mineral development within the area includes oil shale research tracts. Recreation use is characterized by dispersed camping, OHV use, and hunting.

5.7.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

Under the No Action Alternative, the construction of additional warehouse storage and parking area would occur and the associated impacts discussed in the Proposed Action would be applicable.

Cumulative Impacts

Under the No Action Alternative, the construction of additional warehouse storage and parking area would occur and the cumulative impacts discussed in the Proposed Action would be applicable.

5.7.4. *Mitigation Measures and Residual Impacts*

1. All fluid storage tanks shall have a dike constructed around the tank of sufficient capacity to adequately contain at least 110 percent of the largest tank.
2. Pits designed to contain fluids shall be constructed so that leaking or breaching problems are minimized and reclamation potential is maximized. At least 50 percent of the pit capacity shall be in cut material. When fractured rock or porous materials are encountered, pits shall be lined with bentonite or an impermeable membrane to prevent leakage.

5.8. Floodplains, Hydrology, and Water Rights

5.8.1. *Affected Environment*

The plant facilities and well field are located in the Piceance Creek and Yellow Creek watersheds within Rio Blanco County. The climate of the area is semi-arid, with annual precipitation ranging from 12 to 16 inches. Precipitation generally occurs as snow during winter months and high intensity rainfall during the summer.

Piceance and Yellow Creeks are perennial streams draining into the White River to the north. Surface runoff from these basins is from snowmelt in the spring and high-intensity thunderstorms in the summer. The Piceance Creek and Yellow Creek hydrologic basins drain 18,868 acres and 19,393 acres, respectively characterized by a network of poorly developed ephemeral channels typical of an arid region. Piceance Creek and Yellow Creek are perennial streams with baseflow (minimum sustained flow) being sustained by groundwater discharge.

There are no streams located within the Proposed Action that are classified as floodplains. The Bureau of Land Management (BLM) has formally updated its instream flow recommendations for Yellow Creek. No Federal water rights should be impacted by the Proposed Action. The recommendation covers two reaches of Yellow Creek. The first reach is 3.7 miles in length and begins at the confluence with Barcus Creek and extends downstream to the confluence with Lambert Springs. The second reach is 2.3 miles in length and begins at the confluence with Lambert Spring and extends to the confluence with the White River

5.8.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

The BLM is not aware of any decreed water rights in these reaches. However, there are numerous decreed diversions, reservoirs, springs, and wells located upstream on Yellow Creek and its tributaries. A large percentage of these water rights are in conditional status. Yellow Creek is an intermittent upstream from the reaches recommended for instream flow, so the modeled depletions (refer to Section 5.7.2 of this document) should not directly impact flow rates in downstream locations. Specifically, the BLM is aware of the following absolute water rights in upstream locations:

- Lathan Ditch – 2.0 cfs for irrigation use
- WH Violett Ditch – 5.0 cfs for irrigation use
- Wilson Ditch – 2.4 cfs for irrigation use

The BLM recommends using U.S. Geological Survey (USGS) Gage 09306255 (Yellow Creek near White River) as an indicator of water availability and indicator for possible need for augmentation by the Proposed Action based on modeled depletions.

Cumulative Impacts

Past, present, and reasonably foreseeable future impacts on surface hydrology resources in the project area include livestock grazing and associated range improvement projects, vegetation treatments, and both wildfires and prescribed burns. Other mineral development within the area includes oil shale research tracts. Recreation use is characterized by dispersed camping, OHV use, and hunting.

5.8.3. ***Environmental Consequences – No Action Alternative***

Direct and Indirect Impacts

Under the No Action Alternative, the construction of additional warehouse storage and parking area would occur and the associated impacts discussed in the Proposed Action would be applicable.

Cumulative Impacts

Under the No Action Alternative, the construction of additional warehouse storage and parking area would occur and the cumulative impacts discussed in the Proposed Action would be applicable.

5.9. Vegetation

5.9.1. *Affected Environment*

The proposed facility expansion area and well field expansion area are located in an area of Pinyon Juniper Woodland and Rolling Loam range sites. The majority of the facility expansion would occur in a dense stand of mid-aged and young Pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) with a sparse herbaceous understory of native perennial grasses. If the proposed pond is constructed as part of this expansion and soils are stockpiled on its northern side a minor extent of the new disturbance would be in a Rolling Loam range site.

The well field expansion area would occur in a mix of the pinyon/juniper dominated sites and Rolling Loam sites dominated by Wyoming sagebrush (*Artemisia tridentata spp. wyomingensis*) parks. Throughout the expansion area there is a moderate level of pinyon/juniper encroachment into the sagebrush parks. Cheatgrass (*Bromus tectorum*) is present in associated and nearby areas of earthen disturbance and it could readily spread into newly disturbed areas. A summary of observed vegetation classes is shown in Table 16.

Table 16. Ecological Sites/Vegetation Classes Present on Proposed Drilling Sites

Range Site/Woodland Type	Plant Community Appearance	Predominant Plant Species in the Plant Community
Rolling Loam	Sagebrush/Grass Shrubland	Wyoming big sagebrush, winterfat, low rabbitbrush, horsebrush, bitterbrush, western wheat grass, Indian rice grass, squirreltail, June grass, Nevada and Sandberg bluegrass
Pinyon/Juniper	Pinyon/Juniper Woodland	Pinyon pine, Utah juniper, mountain mahogany, bitterbrush, serviceberry, Wyoming big sagebrush, beardless bluebunch wheatgrass, western wheatgrass, June grass, Indian rice grass, mutton grass

5.9.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

Construction and development would directly affect vegetation by removing a total of approximately 144 acres; comprised of around 40 acres of pinyon/juniper woodland, about 68 acres of pinyon/juniper encroached shrubland and about 35 acres of sagebrush dominated shrubland, over the 20 year life of the plan. Similarly, where disturbance occurs, soils could be lost or damaged during the life of the project due to erosion, mixing of soil horizons, compaction, contamination, and reduced viability in stored top-soils. Successful reclamation of portions of each disturbance area would establish early-seral herbaceous plant communities with

desirable species composition within two to three growing seasons. NSI's reclamation seed mix currently includes pubescent wheatgrass and Russian wildrye, which are both introduced grass species that establish well and are useful on very harsh sites. These grasses compete with native grasses and have been shown to spread into the adjacent native plant communities over time. NSI's reclamation seed mix also includes Palmer's penstemon. Due to its documented tendency to cross-pollinate with local native penstemon species including the Graham beardtongue (*Penstemon grahamii*) a BLM listed sensitive plant species, the use of Palmer's penstemon in seed mixes is being discouraged throughout the Field Office. Continued operational activities and livestock grazing, except where fenced as described, could negatively affect the success of ongoing reclamation and re-vegetation. Vegetation near roads or pads may be affected by deposited from passing vehicles reducing its health, vigor, and palatability.

Noxious/invasive plant species could become an increased component of affected plant communities due to ground disturbance and seed dispersal in the area and could spread into surrounding plant communities. Cheatgrass may be particularly problematic, as this species is capable of invading a variety of habitats, often becoming a dominant species. Cheatgrass is only palatable as a forage source for wildlife and livestock for a short portion of the growing season and its annual production is variable and unreliable.

On-going reclamation activities of each well pair and monitoring hole throughout the development period would help off-set the continued planned development. Successful reclamation of a third of the disturbance associated with each well pair site would reduce short term affects to plant communities where disturbance occurs. Continuous reclamation activities as described in the Proposed Action would reduce impacts to vegetation. Successful final reclamation would re-vegetate all previously disturbed areas allowing these sites to progress toward desirable native plant communities.

Cumulative Impacts

The disturbance associated with the proposed facility expansion, when added to other projects and developments, in and near the project area, as well as within the Yellow Creek and Piceance Creek watershed as a whole, would result in an increase in short-term removal of existing vegetation on public land. Long-term changes in plant community composition and structure would also occur in the project sites and on a broader scale from activities such as livestock grazing. Of the total potential vegetation removal near the project area and the Piceance Basin, the proposed project would not result in a noteworthy increase in vegetation disturbance or long-term changes in affected or nearby plant communities.

5.9.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

Under the No Action alternative disturbance associated with well field development and facility expansion (additional warehouse and parking lot only) would directly affect vegetation by removing approximately 70 acres of vegetation. The acreages of each plant community affected would be roughly half that of the Proposed Action and would result in the same general affects.

Cumulative Impacts

Under the No Action alternative cumulative impacts would be similar to those described for the Proposed Action.

5.9.4. *Mitigation Measures and Residual Impacts*

1. For reclamation actions described in Section 8 (Reclamation) of NSI's approved Mine Plan seed mixture tables for both interim and final reclamation; replace pubescent wheatgrass with Bluebunch wheatgrass (Whitmar), replace Russian wildrye with Needle and Thread grass (*Hesperostipa comata* spp. *comata*), and replace Palmer's penstemon with Rocky Mountain Penstemon as listed below in Tables 17 and 18.

Table 17. Reclamation Seed Species List[1]

Species	Variety	Pounds Pure Live Seed/Acre
Grasses		
Thickspike wheatgrass	Critana	0.5
Streambank wheatgrass	Sodar	0.5
Western wheatgrass	Arriba	1.0
Bluebunch wheatgrass	Whitmar (*Pseudoroegneria spicata* spp. *inermis*)	1.0
Basin wildrye	Magnar	0.5
Needle and thread grass	(*Hesperostipa comata* spp. *comata*)	1.0
Green needlegrass	Common or Lodorm	2.0
Forbs		
Lewis flax	Appar	0.2
Cicer milkvetch	Monarch*	0.5
Alfalfa	50% Ladak*	0.75
	50% Nomad*	0.75
Scarlet globemallow	VNS or common	0.2
Rocky Mountain Penstemon	Bandera	0.2
Shrubs		
Fourwing saltbush	Rincon (dewinged)	1.5
Winterfat	VNS or common	0.5
Antelope bitterbrush	VNS or common	1.0
* preinoculated	**Total**	**12.1**

[1]See Terrestrial Wildlife Mitigation measure Number 4. at 5.12.4 regarding the requirement to incorporate efforts to expedite establishment of big sagebrush on final reclamation sites.

Table 18 Interim Reclamation Seed Species List

Species	Variety	Pounds Pure Live Seed/Acre
Grasses		
Bluebunch wheatgrass	Whitmar (*Pseudoroegneria spicata* spp. *inermis*)	4.0
Thickspike wheatgrass	Critana	2.0
Forbs		
Alfalfa	Ladak*	2.0
* preinoculated	**Total**	**8.0**

2. Successful reclamation must reflect a plant community of at least five desirable plant species where no one species may exceed 70 percent relative cover and desired foliar cover, bare ground, and shrub and/or forb density must have 80 percent similarity in relation to the identified desired plant community (DPC).

Finding on the Public Land Health Standard #3 for Plant and Animal Communities: Due to the historic, current, and future development of mineral resources and continued grazing in this area, the overall vegetative cover and productivity is diminished from the potential for this area. With implementation of mitigation measures and successful re-vegetation, the Proposed Action would likely increase vegetative cover and productivity to at least equal or possibly better than the surrounding landscape due to the application of reclamation measures and monitoring. Overall with successful reclamation of disturbances there would be no negative effect on the status of Land Health Standard 3 in the project area or at a landscape scale.

5.10. Invasive, Non-Native Species

5.10.1. *Affected Environment*

The Colorado Noxious Weed Act (Title 35 Article 5.5, enacted 1996) defines noxious weeds as plant species that are not indigenous to the State of Colorado and which aggressively invade or are detrimental to economic crops or native plants; are poisonous to livestock; are carriers of detrimental insects, diseases, or parasites; or the presence of the plant is detrimental to the environmentally sound management of natural or agricultural ecosystems. Recognized noxious weeds are grouped into three categories: Lists A, B, and C (Colorado Weed Management Association 2009). List B includes species for which a state noxious weed management plan is required to stop their spread. List C includes species that are common in Colorado. Optional programs provide resources to governing bodies that choose to require management of List C species, however, prevention of these weed species is not state-mandated (CWMA 2009).

According to “Natural Soda’s Botanical Survey for Special Status Species of Plants For Natural Soda’s Proposed 2014 Exploration Drilling Program” (Roberts), conducted in the spring of 2014,

there were no State “A” or “B” list species encountered within that larger expansion project area. Only common mullein and cheatgrass, both State “C” list species were encountered within the overall project area. There are several List “B” and List “C” noxious (weed) species known to occur in the general area surrounding the proposed facility expansion, including bull thistle, halogeton, diffuse knapweed, common mullein, Russian thistle, yellow sweetclover, curleycup gumweed, and cheatgrass. Diffuse knapweed, a list “B” status species, occurs along CR 83. Halogeton, a list “C” species, occurs in association with several existing well pads in the area. Most of the other weeds listed occur in association with disturbance including access roads, county roads, and pipelines.

5.10.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

The potential 144 acres of surface-disturbance associated facility expansion and well field expansion could create or exacerbate noxious weed problems by importing weed seed or plant parts (rhizomes) on vehicles and construction equipment and by creating suitable conditions in the form of non-vegetated disturbed areas. Cheatgrass establishment is very likely if disturbed surfaces are not re-seeded at the first appropriate seeding window following each disturbance. As addressed in Section 8.4.2 of Natural Soda’s Reclamation Plan, noxious weeds would be treated to achieve control and prevent spread. Additionally as addressed at Section 8.6 of this plan, reclamation monitoring would track establishment of desirable vegetation to ensure that it is self-sustaining and that it is sufficient to prevent non-native weed encroachment.

Cumulative Impacts

Noxious and invasive weeds present in the general area surrounding the proposed facility and well field expansion are primarily associated with existing areas of development/disturbance. Disturbance associated with the proposed expansion projects would create additional opportunity for noxious/invasive weed establishment. Existing roads and development related disturbances throughout the general area are common sources of weeds so elimination of these species from the general area is unlikely. The extent of infestation and persistence of weeds would be dependent on monitoring and treatment as part of future projects and activities in the general Yellow Creek/Ryan Gulch/Piceance Creek area. Section 8 of NSI’s Mine Plan (Reclamation) including long term weed control, along with the mitigation measures listed below, would ensure compliance, improve effectiveness, and reduce risk of long term negative impacts associated with the Proposed Action.

5.10.3. ***Environmental Consequences – No Action Alternative***

Direct and Indirect Impacts

Under the No Action alternative approximately 70 acres of vegetation associated with the well field expansion and facility expansion (additional warehouse and parking lot only) would occur. The disturbance acreages in each plant community would be roughly half that of the Proposed Action. The general risk factors in terms of potential for spread and establishment weed species into the disturbed areas would be the same as described for the Proposed Action.

Cumulative Impacts

Cumulative effects would be similar to those of the Proposed Action.

5.10.4. *Mitigation Measures and Residual Impacts*

1. Application of herbicides must comply with the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Environments Impact Statement* (EIS), and the WRFO Integrated Weed Management Plan (DOI-BLM-CO-110-2010-0005-EA).
2. All seed, straw, mulch, or other vegetative material to be used on BLM and split-estate lands will comply with United States Department of Agriculture (USDA) state noxious weed seed requirements and must be certified by a qualified Federal, State, or county office as free of noxious weeds. Any seed lot with test results showing presence of State of Colorado A or B list species will be rejected in its entirety and a new tested lot will be used instead. All areas identified to be disturbed under this proposal will be monitored and treated for noxious weeds on an annual basis for the life of the project until Final Abandonment has been approved by the Authorized Officer.
3. Pesticide Use Proposals (PUPs) must be submitted to and approved by the BLM before applying herbicides on BLM lands. The PUP will include target weed species, the herbicides to be used, application rates and timeframes, estimated acres to be treated, as well as maps depicting the areas to be treated and known locations of weeds. The WRFO recommends that all PUPs be submitted no later than March 1st of the year anticipating herbicide application.
4. Pesticide Application Reports (PAR) will be provided to the BLM annually, usually in the fall at the end of annual weed treatment. The PAR will include operator name, PUP number, applicator name(s), application date, timeframe of application, location of application, type of equipment used, pesticide used including manufacturer and trade name, formulation, application rate in terms of active ingredient per acre, acres treated, primary species treated, stage of plant development, and weather conditions during treatment.

5.11. Migratory Birds

5.11.1. *Affected Environment*

Breeding birds associated with the project area's woodlands and sagebrush shrublands nest principally from mid-May through mid-July (May 15 to July 15) with an estimated overall nest density of 0.5 to 1 nest per acre. Birds that have been identified for heightened management attention include Brewer's sparrow (BLM-sensitive) in sagebrush habitats, and juniper titmouse and pinyon jay (FWS Birds of Conservation Concern) in pinyon-juniper woodlands. These birds are widely distributed at appropriate densities throughout the Piceance Basin and northwest Colorado.

Although these birds are distributed throughout the lease tract, the abundance and richness of both woodland and shrubland associated birds vary with habitat conditions. Open-canopied woodlands, even when mature, tend to support fewer of the same species occurring in woodlands with better developed understories and denser canopies. The composition and abundance of

woodland bird communities tends to peak in stands composed of more mature, well-structured canopies. Mature open and closed canopy woodlands are evenly represented and comprise about 104 acres or 24 percent of the lease expansion areas.

Sagebrush-dominated shrublands currently comprise about 119 acres (27 percent) of the lease expansion areas. Avian abundance and composition decline substantially as the density of young pinyon-juniper regeneration increases in these former fire-disclimax sagebrush stands (137 acres or 32 percent of expansion acreage). Conifer-encroached shrublands, representing over half the former sagebrush shrubland extent in the lease expansion areas, provide suboptimal habitat for either woodland- or shrubland-associated avian communities and are typically composed of fewer and more generalized species (e.g., chipping and lark sparrows, green-tailed towhee).

5.11.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

Direct Effects

Development-related effects on migratory birds would include: reduced availability of shrubland or woodland nesting habitat, reduced utility of habitat adjacent to development caused by bird avoidance of human activities, and mortality of eggs or dependent young from nest destruction or disruptive incidents that prompt excessive absence of incubating, brooding, or tending adults.

The Proposed Action would involve the clearing and/or occupation of an estimated 124 acres in the well field expansion areas and up to 20 additional acres for processing facilities (about 33 percent of the entire expansion acreage and comparable to current mine footprint).

Based on habitat distribution and assuming efforts to site well field disturbances in less productive wildlife habitats are reasonably effective (see discussion below), it is estimated that total vegetation clearing over the 20-year plan life would involve about 35 acres of sagebrush shrubland, 68 acres of conifer-encroached shrubland, and 40 acres of pinyon-juniper woodland habitat. Seven years after proposed development, about 104 acres would be reclaimed and represent early seral herbaceous communities with no substantive recovery of former shrubland or woodland character as nesting habitat for several decades or centuries after final reclamation. Considering the collective extent and distribution of habitat modifications within the well field (about 33 percent), it would be expected that overall declines in the capacity of those shrublands and woodlands to support migratory bird nesting activity would generally be proportionate to reduction in overall habitat availability (e.g., 30-35 percent).

Direct loss of woody nesting substrate attributable to production and monitoring well development would progress at an annual rate of about 6 acres per year (e.g., 2.1 acres of sagebrush, 2.4 acres of conifer-encroached sagebrush, 1.4 acres of woodland; about 1.4 percent of mine expansion area). Well-pair acreage (e.g., 84 acres), decades after final reclamation would likely become recolonized by sagebrush with the potential to offer habitat better suited to the support of sagebrush obligates (i.e., absent encroaching conifers).

Except for reclaimed ground cover that may suffice for ground-nesting birds (e.g., western meadowlark, vesper and lark sparrow), there would be little redevelopment of nesting substrate

for woodland or shrubland associates over the course of proposed development. The character of vegetation communities available on the active and proposed expansion of the well-field, however, affords opportunities to emphasize facility and feature siting in suboptimal habitats supporting lesser nest densities (e.g., about 50 percent of optimal in conifer-encroached sagebrush, near existing permanent sources of disturbance, and early seral, open-canopied, or smaller patches of woodland). Siting objectives developed for big game (see Terrestrial Wildlife section) are also appropriate for stratifying the quality of nesting habitat for migratory birds.

Avoiding facility occupation and vegetation clearing in those habitats that are suboptimal nesting habitat or require more prolonged recovery timeframes (i.e., homogenous sagebrush and closed canopy woodland) would be effective in reducing shorter-term avoidance-related effects and longer-term habitat-related effects and help maintain the composition and distribution of breeding migratory birds in remaining intact habitats.

Prompt and effective interim reclamation and employing efforts to enhance the utility of conifer-encroached shrubland (see Terrestrial Wildlife mitigation) would help offset declines in the availability and provide a strong foundation for regaining utility of sagebrush shrublands as nesting habitat for sagebrush associates, including Brewer's sparrow. Furthermore, assuming that wildlife-oriented habitat mitigation measures are implemented, broader utility of conifer-encroached sagebrush shrublands (much exceeding 50 conifers per acre) as nesting habitat for sagebrush obligate birds (e.g., Brewer's sparrow) would be regained and nesting density of such species would be expected to increase by a factor of 2 or more on up to 135 treated acres. Relative to the current capacity of the well field expansion area to support nesting functions of migratory birds, it is roughly estimated that treatment of conifer-encroached sagebrush shrublands would reduce net long term losses in nest activity attributable to the Proposed Action to one-third that of unmitigated effects (e.g., declines of 30 percent reduced to 10 percent). Beyond concerted efforts to avoid the involvement of mature woodland in the well field, the loss of mature woodland habitat, estimated to involve 35 to 40 percent of that available on the lease expansion areas, is not considered capable of being mitigated.

Indirect Effects

Migratory birds respond to disturbance by avoiding habitat closely associated with human activity. Migratory bird nest densities within 100 meters of travelled roads in sagebrush habitats have been found to support about half the density of nests in habitat more distant from roads (Ingelfinger and Anderson, 2004). Nesting birds likely react in a similar manner to proposed drilling and completion activity and, to a lesser extent, through the productive life of the location. Disuse of habitat adjacent to mine development activity represents an effective reduction in the availability of habitat for nesting and recruitment of young into the population. Contrary to the more persistent effects of adverse habitat modification or loss, however, there is no strong evidence to suggest that habitats vacated by birds intolerant of disturbance would not regain much of their former utility once intense activity subsides and affected acreage is contiguous with large tracts of intact and largely unaffected source habitat (Riffell et al. 1996). This mining technique does not require concentrated attendance once the pad is constructed and the wells are producing and it likely that much of the former utility of intact nesting habitat in close proximity to these locations would be regained prior to final abandonment.

In the event pad/access construction and well development activities (production and monitoring wells) were to coincide with the core nesting season, effective habitat loss, or the avoidance and disuse of otherwise suitable nest habitat, could be expected to extend to as many as 60 additional acres of nesting habitat in any given year. These indirect effects would not occur on locations that are developed outside the nesting season (between May 15 to July 15) and those depleted well pair locations that are abandoned and fully reclaimed.

In contrast to longer-term habitat-related effects, indirect avoidance effects would be transient and expected to subside to relatively low levels after initial pad construction and well development. Post-development activities would involve routine well monitoring (several daily vehicle visits) and periodic equipment/well maintenance (up to several times per year) through the 7-year production life of each well pair. Less frequent, shorter duration, and lower intensity activities during the production phase are expected to substantially moderate avoidance and alarm response in nesting birds. After the first 7 years of well field activity, as production cavities become sequentially exhausted and reclaimed, overall field-related disturbances would stabilize (i.e., steady state) through plan life to those associated with 12 producing well pair locations and 2 locations being newly developed. It is estimated that residual habitat avoidance effects attributable to well monitoring and periodic equipment maintenance (from year 7 to year 20) would be equivalent to a 30-acre loss of breeding habitat. Impacts would be effectively eliminated at well-pair sites that are depleted and subject to final reclamation.

Monitoring wells would presumably remain active throughout mine life and accumulate at the rate of 2 per year. However, once installed, well monitoring activities and vehicle access to these locations would occur infrequently through the breeding season (up to 1 per month) and would not be expected to have a cumulative consequence on reproductive activities or outcomes.

Direct Mortality

Because migratory birds are relatively abundant and well-distributed across the WRFO during the nesting season, it is considered impractical for vegetation clearing or dirt work to avoid ongoing nest attempts from May 15 through July 15 (e.g., using siting adjustments to avoid nests). Although development activities that occur during the core nesting season would not affect adult birds, destruction of nests or disturbances that lead to inopportune absences of brooding or incubating adults that result in mortality of eggs or nestlings contradict ‘take’ provisions of the Migratory Bird Treaty Act.

Fluid storage, whether in earthen pits or open tanks, presents a potential hazard for birds. Birds exposed to fluids that are toxic, compromise the insulative properties of a bird’s plumage, or poses a drowning hazard are at risk of mortality in violation of the Migratory Bird Treaty Act. Since its inception, the mine’s existing, highly saline waste-water pond has had a history of causing bird mortality in spite of efforts to deter bird access, including netting. At present, the mine nets the waste water pond and bird contacts are believed to be limited to a small number of migrant grebes (primarily eared grebe). The mine operators have a long-established working relationship with local U.S. Fish and Wildlife Service law enforcement staff, who have directed the course of bird deterrent devices used at the mine. WRFO routinely recommends the use of netting as the most effective means to limit access to fluid storage facilities associated with the

oil and gas industry and considers it appropriate in the event an additional waste water pit is required for plant expansion.

Cumulative Impacts

Although adverse effects on nest habitat attributable to the Proposed Action would be relatively localized and progress in small annual increments, the Proposed Action would contribute incrementally to long-term habitat modification and disturbance-induced disuse of nesting habitat associated with mineral development in the Piceance Basin. Based on projections in the Draft Oil and Gas Development RMP Amendment/EIS, migratory bird effects attributable to the Proposed Action would be integral with effective habitat losses on the order of 5 or 6 percent in the Piceance Basin.

5.11.3. ***Environmental Consequences – No Action Alternative***

Direct and Indirect Impacts

This alternative would exert the same influence on migratory birds and their habitat as would the Proposed Action, but because the scale of development would be reduced, the No Action alternative would result in approximately half those direct and indirect impacts attributable to the Proposed Action. The No Action alternative would involve the clearing and/or occupation of an estimated 62 acres in the well field expansion areas with no additional acreage needed for processing facilities (about 14 percent of the entire expansion acreage and comparable to current mine footprint). Considering the collective extent and distribution of habitat modifications within the well field, overall declines in the capacity of those shrublands and woodlands to support migratory bird nesting activity would generally be proportionate to reduction in overall habitat availability (e.g., 15 percent). Direct loss of woody nesting substrate attributable to production and monitoring well development would progress at an annual rate of about 3 acres per year.

In the event pad/access construction and well development activities (production and monitoring wells) were to coincide with the core nesting season, effective habitat loss could be expected to extend to as many as 30 additional acres of nesting habitat in any given year. It is estimated that residual habitat avoidance effects attributable to well monitoring and periodic equipment maintenance (from year 7 to year 20) would be equivalent to a 15-acre loss of breeding habitat.

Vectors of direct mortality would be the same as those discussed in the Proposed Action.

Cumulative Impacts

Although adverse effects on nest habitat attributable to the No Action alternative would be relatively localized and progress in small annual increments (half the rate of the Proposed Action), those influences stemming from mining at currently authorized production rates would contribute incrementally to long-term habitat modification and disturbance-induced disuse of nesting habitat associated with mineral development in the Piceance Basin. Based on projections in the Draft Oil and Gas Development RMP Amendment/EIS, migratory bird effects attributable to the Proposed Action would be integral with effective habitat losses on the order of 5 or 6 percent in the Piceance Basin.

5.11.4. *Mitigation Measures and Residual Impacts*

1. Scheduled development of pads and access, and well drilling/completion operations would not be authorized during the core migratory bird nesting season (from May 15 to July 15).
2. The operator shall prevent migratory bird access to facilities that store or are expected to store fluids which may pose a risk to migratory birds (e.g., toxicity, compromised insulation, drowning). Features that prevent access to such fluids must be in place and functional prior to the discharge or storage of fluids and shall remain in place and effective until such features are removed or incapable of storing fluids. Deterrence methods used by the operator are to remain consistent with the operator's current agreements with the FWS law enforcement branch or that otherwise meet BLM WRFO approval. In the absence of a valid reporting protocol, all lethal and non-lethal events that involve migratory birds will be reported to the AO immediately.

Residual effects after mitigation would be limited to low levels of behavioral avoidance attributable to production and maintenance activity on active well pair pads. This effect is estimated to be equivalent to a steady-state reduction of about 30 acres of shrubland and woodland nesting habitat over 20 years. Additionally, the Proposed Action would result in the direct loss and/or long-term modification of about 144 acres of nesting habitat, including an estimated 35 acres of sagebrush shrubland, 68 acres of conifer-encroached shrubland, and 40 acres of mature pinyon-juniper woodlands.

Relative to the current capacity of the well field expansion area to support nesting functions of migratory birds, it is roughly estimated that removal of conifer regeneration from 135 acres of conifer-encroached sagebrush shrublands would reduce net long-term losses in nest activity attributable to the Proposed Action to one-third that of unmitigated effects (e.g., estimated decline from 30 percent to 10 percent). Beyond concerted efforts to avoid the involvement of mature woodland in the well field, the loss of mature woodland habitat, estimated to involve 35 to 40 percent of that available on the lease expansion areas, is not considered capable of being mitigated.

5.12. Terrestrial Wildlife

5.12.1. *Affected Environment*

The entire lease tract is encompassed by CPW-designated deer severe winter range and winter concentration area. These important winter ranges, by definition, support concentrated use by most of the deer wintering in a unit under the most severe winter conditions. The lands between the existing Natural Soda nahcolite mine and Yellow Creek support concentrated winter deer use most importantly from December 1 to April 30.

Overall route density in the general project area is about 3.7 miles per square mile and exceeds route density objectives established for severe winter range in the White River RMP (i.e., 1.5 miles per square mile). The well field is framed by a paved county road to the east and all-weather access for ongoing natural gas development on its eastern and southern margins. Natural gas well access also extends through the processing facilities on the northern point of the well

field. The southern margin of the well field expansion area also coincides with the operator's existing RD&D oil shale lease tract and abuts an adjacent RD&D oil shale lease on its west edge, where operations are expected to commence soon.

The woodland stands associated with the lease tract have a history of nesting use by woodland raptors, especially Cooper's hawk, red-tailed hawk, and great-horned owl (8 nest sites within 0.25 mile of the tract boundary). Since 2008, monitoring data suggests that the lease tract may be integral with the support of two pair of Cooper's hawks. Raptor nest surveys were conducted by a consultant in 2014 consistent with WRFO survey protocols. Several nest clusters were mapped that correspond well to the largest available tracts of mature, more densely canopied woodlands in or near the mine field. The only exception is the woodland tract that has been the center of mining activity over the last 20 years, where no evidence of nest activity remain. These nest clusters are likely associated with three nest territories of Cooper's hawk. Cooper's hawk nests are often periodically occupied by long-eared owl, common raven, or sharp-shinned hawk.

Table 19. Vegetation Associations Pertinent to Wildlife Resources

Vegetation Type	Approximate Acreage	Percent of Non-Disrupted
Denser canopied mature pinyon-juniper woodland	53	12%
Open-canopy mature pinyon-juniper woodland	52	12%
Big sagebrush (Wyoming and basin subspecies)	119	27%
Pinyon-juniper encroached sagebrush (variable density)	137	32%
Vintage woodland chainings (circa 1960's)	25	6%
Barren	2	trace
Disturbed and reclaimed land	46	11%
Total	434	100%

Of the 585 acres of the Proposed Action well field and facility expansion, approximately 434 acres are non-disrupted vegetation associations pertinent to wildlife resources. These vegetation associations are summarized in Table 19. These vegetation communities are distributed and arranged in a manner similar to surrounding habitats. About half of the total sagebrush shrublands are in advanced seral states where young pinyon-juniper regeneration is expressing itself as light to moderate density encroachment (but where much is at or exceeding 50 trees per acre).

5.12.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

The Proposed Action would involve the clearing and/or occupation of an estimated 124 acres in the well field expansion areas and up to 20 additional acres for processing facilities (about 33 percent of the expansion acreage and comparable to current well field disturbance). Based on habitat distribution and assuming efforts to locate well field disturbances in less productive wildlife habitats are reasonably effective (see discussion below), it is estimated that total vegetation clearing over the 20-year plan life would involve about 35 acres of sagebrush shrubland, 68 acres of conifer-encroached shrubland, and 40 acres of mature pinyon-juniper

woodland habitat. Direct loss of shrubland and woodland habitat attributable to production and monitoring well development would progress at an annual rate of about 6 acres per year.

Disturbed acreage in the well field would be in various stages of reclamation through plan life, increasing incrementally from an initial minimum of 40 percent reclaimed to 84 percent reclaimed by end of plan life. Once final reclamation practices begin to be applied, reclaimed acreage would slowly begin to regain shrubland character from successional advance of seeded species and natural dispersal, however, these sites are likely to represent early seral herbaceous communities with no substantive recovery of former shrubland canopies as a winter forage base for deer for one to several decades after final reclamation. Although this woody forage is widely distributed in the general region, its availability in the well field and active portions of the lease tract has been sharply diminished. Over the last 24 years, ongoing well field and processing plant developments have resulted in the clearing or occupation of about 62 acres of sagebrush habitat. Together with sagebrush choppings implemented by BLM for wildfire structure (mine facility) protection, only 23 acres of sagebrush remain in the initial 260-acre mine footprint. With additional projected disturbance of about 103 acres of sagebrush shrubland over the next 20 years, total long term involvement of sagebrush-dominated and conifer-encroached shrublands attributable to the mine operation would be about 165 acres or about 60 percent of sagebrush stands remaining in the 700-acre mine area. Herbaceous forage loss would be short-term and reclaimed acreage would likely wholly offset losses in the quality and quantity of herbaceous forage for big game spring and fall use within 2 to 3 years.

Special stipulations attached to this mine's lease commits the lessee to compensate for and/or offset the loss, displacement, or adverse modification of wildlife populations and/or associated habitats, on or off lease, which occur as the result of lease development and operation. This provision explicitly targeted raptors and mule deer. Consistent with this stipulation's intent, WRFO has developed several Conditions of Approval that are intended to help reduce short and longer term declines in the utility of well field acreage as mule deer winter range. Although inter-related with behavioral influences, those measures that address direct habitat loss are detailed in the Mitigation section below and include efforts to: redevelop shrubland character in areas of conifer encroachment, avoid prolonged adverse modification to more important shrubland and woodland stands, and encourage rapid colonization of reclaimed lands with local forms of big sagebrush.

Big Game Indirect Habitat Loss

A serious consequence of mineral development activity on these important winter ranges is the tendency for big game to avoid and displace from human activity (Sawyer et al. 2009). Avoidance of human activity, regardless of form, has important ramifications on big game energetics (e.g., avoidance movements, heightened state of alert) and nutrition (e.g., reduced time foraging and access to available forage, displacement from preferred foraging sites) that, in turn, have consequences on fitness and performance (e.g., survival, reproduction) at the individual and population level. As effective forage availability becomes increasingly constrained by removal or avoidance-induced disuse, it is inevitable that the capacity of the range to support former numbers of animals deteriorates and eventually increases the probability of density-dependent adjustments in animal abundance. Bartmann et al. (1992) demonstrated

strong nutritionally-driven density-dependent winter mortality in mule deer in the Piceance Basin.

Sawyer et al. (2009) demonstrated that deer avoidance of activity associated with producing gas wells in winter decreased in response to declines in vehicle passes. Reducing the frequency of vehicle use is analogous to the imposition of timing limitations that reduce the extent and intensity of human activity during periods of animal occupation. There is also recent work suggesting that deer and elk are behaviorally capable of becoming conditioned to long established patterns of activity within mature oil and gas fields (road density ~3.9 miles per square mile) and making efficient use of forage resources by making advantageous use of topographic and vegetation cover (Webb et al. 2011).

At present, the existing mine influences about 550 acres of big game severe winter habitat (about 0.4 percent of severe winter range habitat in the Piceance Basin). The influence estimate is based on a two hundred meter buffer of the existing well field, facility, and access. Much of the proposed well field and processing expansions are integral with or lie in close proximity to existing well field extent and infrastructure and would not add substantially to winter ranges influenced by development. The most notable exceptions are well field involvement of the relatively undeveloped western and eastern extensions. Overall, well field expansion would be expected to nearly double the extent of potential influence imposed on wintering big game (an additional 500 acres or an additional 0.4 percent of the severe winter range in Piceance Basin).

The Proposed Action would be expected to require about 5 miles of access construction over the life of the project. Access associated with reclaimed production wells may eventually retract, but the basic access system would be expected to persist through the 20-year project life. The current well field hosts a dense, but clustered network of routes presently split between mine infrastructure (~5 miles) and that access associated with other land uses in the area (~2 miles). Access to monitoring well sites (~1.8 miles) is generally lightly used and probably does not figure prominently toward big game avoidance effects. The remaining routes receive more frequent mine use and/or are used for public access (5.3 miles total; equivalent to route density of 4.8 miles per square mile). Access associated with the Proposed Action would be expected to be about evenly split between monitoring access (light use) and more frequently used well field access. It is estimated that route density in the active well field would increase from its current 4.8 miles per square mile to about 6.7 miles per square mile. The practical influence of this road density increase on big game habitat utility or animal distribution within the general project area depends on how routes are distributed and how traffic is managed through time, but its influence has potential to be pronounced.

Although the mine's development activity would be expected to prompt deer avoidance and disuse of available habitat, based on current mine operations, development would tend to be spatially limited, clustered, and progressive, such that activity-related effecs would be confined to relatively small portions of the well field at any given time and the disruptive influence of advancing development would be partially offset by concomitant declines of activity on well pads with depleted cavities. Intensive development activity (e.g., pad construction, drilling, completions, and schedulable workovers), consistent with mitigation imposed on the original lease, would be subject to winter big game timing limitations. Although impossible to detail at this stage, potential declines in winter forage availability and winter range utility may be

moderated to some degree by siting developments and well access in positions more advantageous for big game in the long and short term (e.g., locating pads in less productive sites, both in terms of forage production and permanent disturbance sources, and in positions that are less likely to compromise the effectiveness of concealing cover). Planning-level and project-specific considerations to keep more continuous and cohesive woodland and sagebrush stands intact and avoid more productive habitats as much as practicable would, from the cumulative perspective, be warranted. Surface siting objectives that would ostensibly aid in maintaining the desirable interspersion of forage and cover resources and the longer term utility of winter range habitat include locating disturbances:

- on stand edges (i.e., avoiding bisect of or centralized disturbance in larger habitat patches);
- more closely to existing long-term sources of disturbance or concentrated in narrow, widely-spaced corridors;
- in smaller or disconnected patches rather than larger and more cohesive stands;
- among more heavily encroached shrubland;
- in less mature/more open canopy woodland types;
- in stands with more poorly developed understories; and
- in stands more strongly influenced by invasive annuals or introduced grazing-tolerant grasses.

These objectives would apply equally to sagebrush shrublands or mature pinyon-juniper woodlands.

As applied to mature woodland stands, these siting provisions would also help reduce the prolonged loss and modification of mature woodland stands that are best suited for woodland raptor nesting and foraging activity in the short and long term. Beyond concerted efforts to avoid adverse alteration of mature woodland in the well field, woodland clearing that reduces the extent or continuity of mature stands (projected involvement of 35 to 40 percent of that available on the lease expansion areas) is not considered capable of being mitigated. Because woodland stands in this area tend to be smaller in size and isolated from one another, impinging on any mature woodland stand runs the risk of rendering the stand unsuited for subsequent nesting use for a century or more.

It is standard operating procedure to perform woodland raptor nest surveys, either by the operator or BLM, prior to authorization of surface disturbances. The results of these surveys provide the basis to move well pads or well access a minimum of 200 meters and/or defer operations through the nesting season to provide sufficient separation/isolation between nest sites and development activity to: 1) maintain the integrity of the nest stand for current and subsequent nesting functions, and 2) prevent disruption of ongoing nesting attempts that may lead to disturbance-induced absences of the adult birds sufficient to jeopardize the survival of eggs or nestlings (e.g., chilling, malnourishment, predation). Conditions of Approval (e.g., no surface occupancy and timing limitations) that provide raptor nest protections are generally sufficient to prevent inadvertent disruption of ongoing nest efforts and, particularly in the case of stands that have a history of nesting use, serve to identify and maintain the integrity those stands that are important with respect to sustaining local or regional raptor populations.

Cumulative Impacts

Relative to fluid mineral development in the Piceance Basin, this mining operation involves clearing and occupying a higher percentage of an affected lease base (i.e., 33 percent rather than 2 to 5 percent). Conversely, it is thought that the character of these mine operations are lower intensity and more predictable through time, which tends to moderate the severity of big game reactions (e.g., avoidance). Although inescapable that increasing the rate of development and well-field extent would contribute to cumulative direct and indirect effects on wintering big game, these effects would take place largely within the confines of existing mine operations and the surrounding influences of fluid mineral developments and would tend to moderate its cumulative contributions. The lease tract itself is bounded on all sides by ongoing nahcolite and natural gas development and production activity and prospective oil shale RD&D development. These activities, as well as the use of county and unrestricted BLM routes by industry and the public, are likely to persist through the term of this lease. It is anticipated that, as conditioned, the cumulative influence of ongoing mine operations on big game populations in the Piceance Basin would remain integral with projected total effective big game habitat losses on the order of 14 percent in the Piceance Basin (RMPA).

Without appropriate consideration, there would be a strong likelihood that expanded development would impinge on the long term availability of suitable woodland raptor nest habitat. Although most preferred mature closed canopy woodlands comprise a relatively small portion of the expanded mine field (about 12 percent), technical limitations on the siting of mine infrastructure mine operations may not always allow for avoidance. With conscientious attention to siting considerations, woodland clearing required for well field development may be reduced to the point that the longer term utility of woodlands encompassed by the well field may be largely maintained to accommodate subsequent raptor nesting activity and would not contribute substantially to cumulative declines in the regional availability of suitable nest habitat. Projected mineral development in the Piceance Basin (RMPA) was expected to result in effective declines in the availability and utility of woodland nest habitat of 5 to 6 percent over the next 20 years.

5.12.3. ***Environmental Consequences – No Action Alternative***

Direct and Indirect Impacts

This alternative would exert the same influence and pose the same risks on terrestrial wildlife and their habitat as would the Proposed Action, but because the scale and rate of development would be reduced (i.e., 1 production well pair and 1 monitoring well per year rather than 2), the No Action alternative may be expected to result in approximately half those direct and indirect impacts attributable to the Proposed Action at any given time. However, considering that production well pairs are drilled in close proximity and adjacent to one another, it is less certain whether the No Action would serve in any practical sense to reduce avoidance-related effects on wintering big game. The No Action alternative would involve the clearing and/or occupation of an estimated 62 acres in the well field expansion areas over the next 20 years with no additional acreage needed for processing facilities (i.e., 20 acres immediately adjacent to existing disturbance). Direct loss of shrubland and woodland habitats attributable to production and monitoring well development would progress at an annual rate of about 3 acres per year. The No Action alternative would be subject to the same Conditions of Approval established for the Proposed Action.

Cumulative Impacts

The cumulative effects of the Proposed Action would be the same as those discussed in the Proposed Action, though its contributions through time may be reduced by up to 50 percent. See discussion above concerning uncertainty in ascribing reduced indirect impacts to the No Action alternative.

5.12.4. ***Mitigation Measures and Residual Impacts***

1. Surface disturbing activities involving pad, pipeline, or access preparation or construction, the drilling and completion of wells, and routine activity-intensive maintenance and production activities would not be allowed on this lease between December 1 and April 30 to reduce cumulative impacts on wintering big game. This timing restriction would be subject to exception and modification provisions developed in the 1997 White River RMP.

2. Lease developments would be subject to siting considerations that are intended to reduce long term and residual impacts on the utility and continued availability of suitable shrubland and woodland wildlife habitat in the lease tract. It is recommended that the operator consider these objectives to the extent practicable when planning lease development operations. These objectives would be used, where appropriate, by WRFO staff during project-specific on-sites and NEPA analysis to develop siting adjustment recommendations to meet those objectives. Siting considerations would apply equally to shrubland or woodland habitats and may include, but are not limited to, locating pads, access and pipeline corridors in the following manners:
    a. on stand edges (i.e., avoiding the bisect of, or a centralized disturbance source in larger habitat patches);
    b. more closely to existing long-term sources of disturbance or concentrated in narrow, widely-spaced corridors;
    c. in smaller or disconnected patches rather than larger and more cohesive stands;
    d. among more heavily pinyon-juniper encroached shrubland;
    e. in less mature/more open canopied woodland types;
    f. in stands with more poorly developed understories; and
    g. in stands more strongly represented by invasive annuals or introduced grazing-tolerant grasses.

3. Special stipulations attached to this mine's lease commits the lessee to compensate for and/or offset the loss, displacement, or adverse modification of wildlife populations and/or associated habitats, on or off lease, which occur as the result of lease development and operation. This provision explicitly targeted raptors and mule deer. Consistent with this stipulation's intent, the WRFO recommends that the lessee be responsible for the removal of conifer regeneration from 135 acres of fire-disclimax shrublands identified by WRFO wildlife staff within the boundaries of the current well field and the mine field expansion areas evaluated in this document. Authorization and implementation of this project would be subject to separate environmental analysis and conditions of approval. The lessee would be responsible for all costs associated with necessary resource surveys and clearances, and equipment operation and maintenance. The BLM would remain

responsible for NEPA preparation and project delineation. Barring unforeseen circumstances, the project would be required to be finalized within 3 years of the signing of the Decision Record. Treatment areas would not necessarily preclude subsequent siting of proposed processing or well-field features or infrastructure.

4. Final reclamation practices would be required to include efforts to accelerate the reestablishment of big sagebrush on reclamation sites from collections of local sagebrush stock. The goal of reestablishment would be to develop internal seed sources at mature canopy densities of 5 to 10 percent.

5. Surface occupancy would not be allowed within 200 meters of functional nest sites of raptors. No development activities are allowed within 0.25 mile of identified raptor nest sites from April 1 through August 15 or until fledging and dispersal of young. These conditions of approval would be subject to the same NSO and TL exception and modification provisions as established in the 1997 White River RMP.

5.13. Special Status Animal Species

5.13.1. *Affected Environment*

The White River and its 100-year floodplain are designated critical habitat for the Colorado pikeminnow from Rio Blanco Lake (upstream of Yellow Creek mouth) downstream to the Green River, though occupied habitat is confined to the river below Taylor Draw dam, about 28 river miles downstream of Yellow Creek (see Riparian/Wetland and Aquatic Wildlife discussions in Section 4.2). The White River is also inhabited by a number of BLM-sensitive fish, including roundtail chub and the flannelmouth, bluehead, and mountain sucker. Major tributaries in the Piceance Basin draining to the White River, including Yellow Creek and Piceance Creek, are also widely inhabited by BLM-sensitive mountain sucker and northern leopard; flannelmouth suckers are generally confined to these systems' lower reaches.

BLM-sensitive northern goshawk are known to nest in modest numbers in the Piceance Basin's mature pinyon-juniper woodlands above 6,500 feet elevation. Woodlands associated with the proposed project are on the lower margin of this elevation range (maximum elevation 6,750 feet with half of project area below 6,500 feet). No goshawk nesting activity was indicated during raptor nest surveys conducted in the spring of 2014 nor in any previous surveys conducted by NSI staff over the past 24 years.

Midget faded rattlesnakes (BLM-sensitive) are generally confined to the Green River geologic formation in southeast Wyoming, eastern Utah, and western Colorado. Narrowly adapted to denning habitat composed of bedded sandstone outcrops with fallen mid-slope slabs on south to southeast exposures below 7,000 feet in elevation, this snake was documented in scattered locations across the WRFO during the summer of 2012 and may be the only species of rattlesnake in the Piceance Basin. There are no rock outcrops with appropriate aspect closely associated with the Proposed Action.

The nearest mapped sage-grouse habitat is 6 miles from project-related influence. The BLM-sensitive Brewer's sparrow is addressed in the Migratory Bird section.

There are no water features with sufficient persistence (minimum 5 weeks) known to be capable of supporting a breeding population of Great Basin spadefoot within a half mile of areas potentially disturbed by proposed development.

5.13.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

The Proposed Action would have no direct influence on Colorado pikeminnow and other downstream endangered Colorado River fish or habitat designated as critical for their support and recovery. Separated from the nearest designated critical habitat by 11 miles of ephemeral channel and 9 miles of intermittent and perennial tributary channels in the Yellow Creek watershed and 3 miles of ephemeral channel and 21 miles of perennial channel in the Piceance Creek watershed, the WRFO believes there is no reasonable potential for proposed activities to contribute measurably to sediment or other contaminant loads in the unoccupied reach of the White River (above Taylor Draw dam) capable of directly affecting downstream populations of Colorado pikeminnow. The current mine is designed as a zero-discharge facility and all processing wastewater and facility run-off is directed to containment features for disposal. Vegetation clearing and well-field construction is relatively minor at any given point in time (average 6 acres per year well field disturbance), of which, about 40 percent would be subject to interim reclamation as soon as possible after ground disturbance. Production pads would begin to be permanently reclaimed at the seventh year such that bare ground in the well field would accumulate at the rate of one acre per year to a maximum 37.5 acres after 20 years. Eighty-four percent of well field disturbance would be reclaimed by the time development of the expansion area is finalized. Projected lease development and monitoring activities are expected to have no direct effect on the condition or function of the White River's 100-year floodplain.

Although the Proposed Action would have no reasonable potential to directly influence the condition or character of critical habitat, the Proposed Action would expand mining operations and water use (depletion) from the Upper Colorado River system as habitat for the four endangered Colorado River fishes (including bonytail, humpback chub, razorback sucker) and those BLM-sensitive fish that inhabit the lower White River, including roundtail chub, and bluehead, flannelmouth, and mountain suckers.

It has been established that depletion of flow from the Upper Colorado River system is likely to jeopardize the continued existence of the four endangered fish of the Upper Colorado River Basin (including bonytail, humpback chub, razorback sucker) and indirectly destroy or adversely modify designated critical habitat. Water depletions attributable to this mining operation were addressed in the original Section 7 consultation (Biological Opinion SE/SLC: 6-5-86-F-019, August 28, 1986). The Service determined that project depletion impacts could be satisfactorily offset with a monetary contribution to help fund conservation measures implementing the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program). Receipt of Wolf Ridge Corporation's balance of payment for implementing conservation measures and avoiding jeopardy for the endangered Colorado River fishes was verified in that Biological Opinion.

Average annual water depletion attributable to solution mining and nahcolite processing evaluated in the original BA/BO was 219 acre-feet per year. Since operations began in 1990

annual water use has averaged about 101 acre-feet per year. In 2010 NSI submitted and BLM approved an updated/revised mine plan that reflected current and future mining processes including an expansion of the facilities that increased the original production of 125,000 tons per year (TPY) to 250,000 TPY of sodium bicarbonate. Increasing rates of sodium production was expected to elevate water use requirements, but based on projected water use figures (i.e., 160 to 200 gallons per minute) it would have taken nearly 3 decades before an average annual depletion of 219 acre-feet was approached or exceeded. Similarly, current water use projections for the 250,000 TPY No Action alternative (339 acre-feet per year or 210 gallons per minute) could be sustained for the next 27 years before average annual depletions exceeded the average annual 219 acre-feet previously consulted on.

WRFO and FWS recently evaluated an average water depletion rate of 3,230 acre-feet per year attributable to projected oil and gas development in the Piceance Basin. Water use associated with this development (equivalent to 4.46 cubic feet per second) was generally expected to result in modest flow reductions in the White River (i.e., 3 percent of baseflow, 0.3 percent of spring flow). These reductions were not expected to have measurable effect on pikeminnow populations in the White River except during exceptionally dry years when fish passage through shallow riffle areas may be temporarily interrupted.

Increased water use attributable to the Proposed Action (i.e., 0.66 cfs or 475 acre-feet/year) represents an increase in White River base flow reductions of about 0.4 percent (above that volume of water previously consulted on). Total flow depletions attributable to the entire mining operation would be 694 acre-feet per year and represents about 0.6 percent of the White River's base flow. Though additive, it is unlikely that incremental flow reduction associated with increased mine production would alter flow volumes sufficiently to exert influences on pikeminnow habitat measurably different than those established for projected oil and gas development.

However, the proposal to increase water use represents an action that may contribute to jeopardizing the continued existence of the 4 endangered Colorado River fish and must be independently evaluated for conformance with the Endangered Species Act and Colorado pikeminnow recovery plans (i.e., Section 7 consultation with the FWS). Conservation measures that may arise from this consultation (e.g., monetary contributions to fund recovery action for the endangered Colorado River fishes) would be appended to the Record of Decision.

Cumulative Impacts

Incremental flow depletions from the Upper Colorado River system contribute to cumulative reductions in flow volume that affect seasonal fluctuations in flow, water quality, and channel/floodplain structure as important determinants of endangered fish habitat. The consequences of 219 acre-feet average annual depletion have been considered and conservation measures applied in the context of basin-wide water use in previous Section 7 consultations with the FWS. The ramifications of withdrawing another 475 acre-feet per year from the Upper Colorado River system must be evaluated in supplemental Section 7 consultation with the FWS.

5.13.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

Average annual water depletion attributable to solution mining and nahcolite processing evaluated in the original BA/BO was 219 acre-feet per year. Since operations began in 1990 annual water use has averaged about 101 acre-feet per year. In 2010 NSI submitted and the BLM approved an updated/revised mine plan that reflected current and future mining processes including an expansion of the facilities that increased the original production of 125,000 tons per year (TPY) to 250,000 TPY of sodium bicarbonate. Increasing rates of sodium production was expected to elevate water use requirements, but based on projected water use figures (i.e., 160 to 200 gallons per minute) it would have taken nearly 3 decades before an average annual depletion of 219 acre-feet was approached or exceeded. Similarly, current water use projections for the 250,000 TPY No Action alternative (339 acre-feet per year or 210 gallons per minute) could be sustained for the next 27 years before average annual depletions exceeded the average annual 219 acre-feet previously consulted on.

Cumulative Impacts

Incremental flow depletions from the Upper Colorado River system contribute to cumulative reductions in flow volume that affect seasonal fluctuations in flow, water quality, and channel/floodplain structure as important determinants of endangered fish habitat. The consequences of 219 acre-feet average annual depletion have been considered and conservation measures applied in the context of basin-wide water use in previous Section 7 consultations with the FWS.

5.13.4. *Mitigation Measures and Residual Impacts*

Conservation measures that are formulated during the Section 7 consultation process with regard to withdrawing an additional 475 acre-feet of water from the Upper Colorado River system would be appended to this action's Decision Record.

5.14. Cultural Resources

5.14.1. *Affected Environment*

The BLM manages cultural resources on public lands in accordance with the Antiquities Act of 1906, National Historic Preservation Act (NHPA) of 1966, Native American Graves Protection and Repatriation Act of 1990, the Archaeological Resources Protection Act of 1979, and various other laws and Executive Orders. The management process is also governed by the Colorado BLM's 2014 Protocol with the State Historic Preservation Officer (SHPO), implementing the BLM's National Programmatic Agreement with the Advisory Council on Historic Preservation.

The project area has been inventoried at the Class III (100 percent pedestrian) level, with most portions having been redundantly inventoried (Weber 1977; Conner et al. 1980; Jones 1984; Reed et al. 2008; Schwendler et al. 2008; Conner et al 2014). As a result of the inventories, 7 archaeological sites and 12 isolated occurrences (IOs) are known to exist within the project area which could be affected by the Proposed Action and alternatives. Of these, two sites are eligible or potentially eligible for listing in the National Register of Historic Places. One eligible site

(5RB 398) and one "needs data" site (5RB 396), which has to be treated as potentially eligible, would need to be protected through avoidance during the development of the well field. The general area of avoidance spans the following legal description:

Township 1 South, Range 98 West, 6th P.M
Section 26, Lots 13 and 14,
Section 27 Lots 16,
Section 35 Lots 3 and 4.

Any ground disturbing work within this defined area would require specific monitoring requirements (as set forth in Section 5.14.4) to be followed to ensure project activities would have "no effect" on eligible NRHP cultural resources. The BLM would determine if cultural monitors, or other potential mitigations, are needed when applications are submitted for individual wells.

5.14.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

Impacts from the Proposed Action have the potential to irreparably damage or destroy archaeological sites that are present within the project area. These effects include alterations to the physical integrity of a cultural resource. If a cultural resource is significant for other than its scientific information, effects may also include the introduction of audible, atmospheric, or visual elements that are out of character for the cultural site. Impacts that affect the physical setting could result in a loss of characteristics that make an area significant for listing in the National Register of Historic Places. Potential effects include plant operations, routine maintenance, unauthorized land and road modifications, and a greater presence of human activity or access to areas, not previously accessible, increasing the potential of unauthorized removal or other alteration to cultural resources in the area. Furthermore, effects could result from landscape alterations and modifications that accelerate erosion and other natural forces that foster the degradation of cultural resources.

Cumulative Impacts

Long-term cumulative damage from this project when combined with other development projects in the area could include accidental damage, vandalism, illegal collection and unauthorized excavation. In addition, impacts to auditory and visual environments are important when considering values placed on some sites by Native American tribes and the combined development in the region could impact such values. Lastly, there is potential for landscape fragmentation due to increased roads which could cumulatively impact the area over time and result in general cultural site degradation. These losses are additive over the region and could result in a loss of data from the regional archaeological database that cannot be recovered.

5.14.3. ***Environmental Consequences – No Action Alternative***

Direct and Indirect Impacts

Under this alternative, there would similar impacts to cultural resources as the Proposed Action because the plant operations would continue to function at the design capacity, the warehouse, and parking lot would be constructed, and would require well field development.

Cumulative Impacts

Cumulative Impacts would be the same as those in the Proposed Action.

5.14.4. ***Mitigation Measures and Residual Impacts***

1. One eligible site (5RB 398) and one "needs data" site (5RB 396), which has to be treated as potentially eligible will need to be protected through avoidance during the development of the well field. The general area of avoidance spans the following:

   Township 1 South, Range 98 West, 6th P.M.
   Section 26, Lots 13 and 14,
   Section 27 Lots 16,
   Section 35 Lots 3 and 4.

   Any ground disturbing work within these defined areas will require the following monitoring requirements to be followed to ensure project activities will have "no effect" on eligible NRHP cultural resources. The BLM will determine if cultural monitors, or other potential mitigations, are needed when applications are submitted for individual wells.

   a) A qualified archaeologist who holds a valid Cultural Resource Use Permit from the Colorado BLM will monitor all construction activities in and near the areas of the NRHP eligible properties. The monitor archaeologist will be present during construction activities in and near the locations of the eligible NRHP cultural resource sites, to ensure construction activities do not encroach within the identified site boundaries. No construction activities will be allowed within the identified cultural site boundaries.
   b) The monitor archaeologist will have the authority to temporarily halt construction to examine cultural resources, or newly discovered archaeological objects within the project corridor. After an examination of the materials, the monitor archaeologist will either authorize the resumption of project activities or require that all work should be halted in that location until appropriate evaluations and consultations between BLM, the Colorado SHPO, and other affected parties have been conducted.
   c) Prior to construction activities, the two NRHP eligible site boundaries adjacent to any planned production well will be identified in the field with surveyors flagging by the monitor archaeologist in a manner which makes the site boundary easily visible and definable.
   d) The monitor archaeologist will attend all pre-construction and project meetings when construction activities are scheduled to be in the area of the NRHP eligible properties. The monitor archaeologist will coordinate with the project construction supervisor to identify and schedule monitoring requirements. A pre-construction field meeting with the construction supervisors and crews will include a discussion of the legal context of cultural resource property protection, the types of archaeological resources in the project corridor, the importance of avoiding adverse effects to cultural properties that could result from project

development activities, the procedures for monitoring, and the protocols that will be followed in the event of new discoveries.

e) The monitor archaeologist will notify the WRFO BLM archaeologist when construction activities are scheduled in the areas of the NRHP eligible cultural resource properties.

5.15. Paleontological Resources

5.15.1. *Affected Environment*

The Proposed Action occurs within the Uinta Formation (Tweto 1979) which the BLM has categorized as a Potential Fossil Yield Classification (PFYC) 5 formation indicating it is known to produce scientifically noteworthy and significant fossil resources (Armstrong and Wolny 1989).

5.15.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

If it becomes necessary to excavate into the underlying sedimentary rock formation at any time during the plant expansion or during the development of the well field there is a high potential to impact scientifically noteworthy fossil specimens and resources. Direct impacts include crushing of fossils with construction equipment, dislocation of fossils from their context in the formation, breaking of larger fossils and loss of contextual information regarding the depositional and paleo-environment associated with the fossil resources.

Indirect impacts could include increased erosion of disturbed areas that could expose fossils to accelerated weathering or unauthorized collection. Smaller fossils, being more fragile, could be seriously damaged by erosion where the fossils are carried by water erosion which would tumble them, removing diagnostic features and eventually destroying the fossils. Larger fossils would be exposed, gradually weathered, and slowly destroyed as the fossils deteriorate and are washed away by erosion. Unauthorized collection could increase as access into the area is improved and there is an increase in human activity in the area.

The total disturbance footprint for the Proposed Action would affect 144 acres (20 acres for plant expansion and 124 acres for well field development) which represents .0002 percent of the Uinta Formation. Impacts to the regional paleontological database from this action would be irreversible and irretrievable and will contribute to an ongoing cumulative loss of data.

Cumulative Impacts

There is a potential for the Proposed Action to affect 144 additional acres of the Uinta Formation. This would be in addition to the already impacted acreage in the Uinta formation. It could also result in the loss of an unknown number of fossil resources because of direct and indirect impacts. These would represent a net permanent, long term, irreversible and irretrievable loss of data from the regional paleontological database.

5.15.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

Under this alternative, there would similar impacts to paleontological resources as the Proposed Action because the plant operations would continue to function at the design capacity, the warehouse, and parking lot would be constructed, and would require well field development.

Cumulative Impacts

Cumulative impacts would be the same as those in the Proposed Action.

5.15.4. *Mitigation Measures and Residual Impacts*

Adequate paleontological mitigation measures are contained in the BLM required mitigation and Appendix B Lease Stipulations of the Design Features.

Residual impacts constitute the loss of any paleo-environmental data and smaller fossils that are lost either through weathering, erosion, unlawful collection or any data not recovered during the construction process. Erosional losses are likely to occur whether the project is approved or not.

5.16. Visual Resources

5.16.1. *Affected Environment*

Visual resources are the visible physical features of a landscape that convey scenic value. The visual resource inventory (VRI) process described in BLM Manual H-8410-1 establishes VRI class's I-IV from highest (I) to lowest (IV) value. These VRI classes are used to assess visual values for areas of the landscape. The Proposed Action is located in Visual Resource Inventory Class IV, which means this area is a lesser valued scenic landscape. The area of the landscape was placed into VRI Class IV as a result of being rated as having a low Scenic Quality scoring of C (A, B, and C type rating), the Sensitivity Level rating as moderate value to the public, and in a Distance Zone of Background. Scenic values in the BLM WRFO have been classified according to the Visual Resource Management (VRM) system into four VRM Classes (I-IV), and corresponding VRM objectives were established in the 1997 White River ROD/RMP. The Proposed Action is located within a VRM Class III area. The objective of the VRM III classification is to partially retain the existing character of the landscape. The level of change to the characteristic landscape in VRM Class III areas should be moderate. Management activities may attract attention but should not dominate the view of the casual observer.

The Proposed Action is located along a relatively flat and broad ridge that separates the Piceance Creek drainage from Yellow Creek drainage. This area consists of scattered stands of pinyon-juniper with areas of sage brush and grasses. The proposed plant expansion facilities are proposed to be located directly adjacent to the northwest side of the existing Natural Soda plant and facilities. Existing facilities consist of: the plant facility that includes a cluster of two to eight story high rectangle buildings with various silos, conveyer belts, pipes, and valves that occupies approximately 7 acres, approximately 10 acres of holding ponds, and 10 acres of top soil piles, storage yards, and various access roads. Most of the existing buildings, pipelines, and other

structures are painted Juniper Green or a similar shade of dark green. The areas of potential well development are located in areas one to two miles south of the existing plant facility. The Proposed Action would most likely be viewed by those traveling on the paved Rio Blanco County (RBC) Road 31 (Natec Road) from the south and from select viewpoints along the graveled RBC 83 from the south. These two routes primarily receive daily year round traffic from Natural Soda employees, oil and gas employees, and local ranch operators with additional use September through November by big game hunters. Currently weekly product truck traffic averages 185 rounds trip and pickup and car traffic averages 280 round trips from the plant facility. After implementing the Proposed Action it is estimated that this traffic would increase to 371 product truck and 420 car and pickup truck round trips to the plant facility.

5.16.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

The construction of the new plant facilities includes a total of up to approximately 27 acres of ground disturbance for the plant expansion, new warehouse, holding ponds, and associated infrastructure. The proposed well field development includes drilling two new set of production well pairs and two new exploration/monitoring well each year through 2034. This would result in approximately 124 acres of short term ground disturbance and 37.5 acres of long term ground disturbance after interim reclamation activities have been completed. However, because wells are planned to be drilled each year and reclamation activities would take place each year, the amount of actual ground disturbance would incrementally increase from 2015 through 2034 (Table 2). The exposed soils created by these construction activities and associated linear access roads and pipeline disturbances would create noticeable contrast to the landscape color and line characteristics from the construction start until interim reclamation activities have been completed. Upon completing interim reclamation, areas of exposed soils would be reduced in size and other formerly disturbed acres would then have some vegetation growing. This would reduce the amount of noticeable contrast and newly established vegetation would begin to blend with the surrounding landscape. In areas where sparse and scattered pinyon-juniper woodlands may be removed during well pad construction, the visual impact of contrasting vegetation of grass and soils with adjacent woodlands may be somewhat noticeable for several decades but would likely slowly blend with the landscape over time. The unnatural shape and color contrast of all above ground structures could cause moderate long term impacts to casual observers, if not mitigated. To reduce this impact, it is recommended that all permanent above ground structures (on-site for six months or longer) including buildings, tanks, associated production equipment, and any piping and valves be painted, Juniper Green according to the BLM Standard Environmental Chart CC-001: June 2008 where feasible. This color should best serve to blend these structures with the scattered pinyon-juniper trees that surround the Proposed Action. While the height of the existing plant facility structures is several stories high, this large facility is not readily noticeable to the casual observer until within one mile or less of the plant to those traveling on RBC Road 31. Also the proposed plant expansion facilities are planned to be located on the northwest side of the existing plant. Because the existing plant is most readily viewed by those traveling north on RBC Road 31, the new proposed facilities would likely not be noticeable traveling north on RBC Road 31 because these facilities would be located behind the existing plant. Overall, the implementation of the Proposed Action would not change the VRI Class IV

rating and would meet the VRM Class III objective of partially retaining the existing character of the landscape in this area.

Cumulative Impacts

Combined with other existing, ongoing, and foreseeable Natural Soda plant developments and oil and gas developments, the Proposed Action may begin to contribute to an increasingly impacted visual landscape.

5.16.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

Under this alternative, NSI would produce sodium bicarbonate at the current plant design capacity of 250,000 tpy and not expand the existing plant facility. This alternative would result in additional warehouse space being constructed within the existing plant facility footprint area. Continued annual production of 250,000 tpy would require the same number of wells annually as the proposed increase from 250,000 tpy to 500,000 tpy, except in years 2015 and 2016 (Table 4). This would result in impacts that are similar to those described above from with the same mitigation recommended. Overall, this alternative results in less ground disturbance and would have slightly less impact on visual resource values and casual observers in this area as compared to the Proposed Action alternative.

Cumulative Impacts

Combined with other existing, ongoing, and foreseeable Natural Soda plant developments and oil and gas developments, this alternative may begin to slowly and incrementally contribute to an increasingly impacted visual landscape.

5.16.4. *Mitigation Measures and Residual Impacts*

1. Where feasible and not impeding safety requirements, paint and maintain the paint on all permanent above ground structures (on-site for six months or longer) including buildings, tanks, associated production equipment, and any piping and valves. Paint color is to be Juniper Green according to the BLM Standard Environmental Chart CC-001: June 2008 or the same dark green shade that is on the existing plant facility.

5.17. Livestock Grazing

5.17.1. *Affected Environment*

The proposed facility expansion and well field expansion occurs in the Upper Yellow Creek pasture of the Square S Allotment (#06027). This 9,000+ acre pasture is grazed early in the summer (May/June) by cattle belonging to the LOV Ranch and Mantle Ranch. The total allotment consists of nearly 76,000 acres, including 64,000+ federal acres, about 9,400 State of Colorado acres, and around 2,250 private acres. The Square S allotment is permitted to both the LOV Ranch (Authorization #504241) and the Mantle Ranch (Authorization #501432) for livestock grazing. Currently the Square S allotment public lands have 3,522 AUMs of grazing use permitted at a stocking rate averaging 18.2 acres per AUM. The general area surrounding the Natural Soda facility has experienced a high level of oil and gas development over the past ten years and associated traffic/vehicle trips has increased accordingly during this timeframe.

Rangeland carrying capacity is typically estimated on the basis of the Animal Unit Month (AUM). The AUM is defined as the amount of forage needed by an "animal unit" grazing for one month. The animal unit in turn is defined as one mature 1,000-pound cow and her suckling calf (43 CFR 4130.8-1 (c)). Assuming that such a cow nursing her calf would consume about 26 pounds of dry matter per day as forage, combined with a factor for tramping and waste of about 25 percent, results in an estimate of about 1,000 pounds of dry matter from forage to supply one AUM.

Under the Proposed Action disturbance would proceed at an average of six acres per year and ongoing reclamation would occur on something over half of every disturbance. Reclamation would be expected to re-vegetate and restore associated forage production in less than five years from the time of each disturbance. Assuming 18 acres per AUM and 144 acres of total disturbance there would be a total of eight AUMs of forage affected by this project though ongoing reclamation would reduce that number by at least half. Under the No Action Alternative disturbance would proceed at an average of three acres per year and as under the Proposed Action, reclamation would occur on just over half of each disturbed area. Assuming 70 acres of total disturbance there would be roughly four AUMs of forage affected by this alternative. On-going reclamation would reduce that number by at least half. Short-term forage losses associated with both alternatives are likely to be less than the annual climate related forage fluctuations and are not expected to result in any need for changes in livestock numbers or grazing periods in the Upper Yellow Creek pasture.

Range Improvements: Range improvement project #204420, the Yellow Creek pipeline lateral, crosses through Section 26 and the proposed facility expansion and well field expansion areas. This water pipeline was constructed in 1973 to provide dependable upland water sources for cattle through an approximately 30 square mile area in four different pastures and was implemented to improve livestock distribution through these areas. This large expansive project is aging, has been compromised in several locations, and the pipe material is beginning to fail randomly throughout the project's extent. The portion of the waterline that goes through the proposed well field expansion area is only functional to a tire tank about one half mile south of the existing Natural Soda facility at approximately (NAD 83 Zone 13 UTM 212576.9E, 4425112.2N). The waterline is non-functional where it continues north of the existing facility. This range improvement project would likely be affected by either alternative.

There is a pasture division fence that traverses the southeast corner of the proposed well field expansion area that could be affected by either alternative. Additionally there is a long-term trend monitoring plot (B-2) that would be eliminated if the proposed waste water pond and its associated topsoil storage pile were implemented. Data from this plot is used to determine the trend of vegetation, especially forage species, in relation to scheduled livestock grazing use. This plot was most recently read in 2005 and has been used to collect trend data since 1970.

5.17.2. ***Environmental Consequences – Proposed Action***

Direct and Indirect Impacts

Implementation of the Proposed Action would result in as much as an additional 144 acres of disturbance with roughly a third of it including the proposed facility expansion and proposed pond being long term disturbance (20 years). There would be an increase in localized traffic

volume especially during construction of the facility expansion, which would increase traffic related hazards to livestock.

Livestock grazing would continue during authorized use periods throughout the duration of the facility expansion project and the well field expansion. The expected increase in traffic associated with construction and to a lesser extent associated with increased future production would continue to be a hazard to livestock. The primary impact to the grazing resource would be an on-going minor short-term loss of available forage as a result of construction related disturbance for plant expansion, additional well pairs, and monitoring wells.

In addition to direct forage loss, livestock would be likely to avoid grazing the area surrounding construction due to increased noise, activity, and traffic. If reclaimed areas are not fenced, livestock grazing on those sites would likely reduce the success of re-vegetation efforts. To date there have not been any documented incidents of livestock being injured by traffic associated with the Natural Soda plant. However, the potential for this occurrence remains and would rise with the increased number of vehicle trips associated with the proposed increased production. Driver awareness of the presence of livestock and adherence to the posted speed limits should keep the potential for incident reasonably low.

For the proposed facility expansion involving a long term disturbance of approximately 17 acres, actual forage loss would be negligible because the majority of the disturbance associated with construction of the proposed warehouse, parking lot, and access roads would be in a dense pinyon juniper dominated site where the herbaceous component is sparse. Where well field expansion occurs in pinyon/juniper encroachment sites forage resources are marginal. Most forage losses would be associated with well field expansion in sagebrush dominated rolling loam sites (estimated at 68 acres for the Proposed Action and roughly half that for the No Action alternative). If the proposed pond is constructed its northeast corner and the topsoil storage pile would remove approximately one AUM of forage in the grass dominated rolling loam site. This forage loss would be through the duration of the project and final site reclamation (20+ years).

Planned on-going reclamation, averaging around 60 percent of each well pair disturbance, would reestablish forage species throughout the duration of the project and would help off-set forages losses in these areas. Successfully reclaimed portions of other projects in the area have been shown to out-produce later-seral undisturbed vegetative cover, especially in mature Pinyon/Juniper, encroachment areas dominated by trees, and dense decadent sagebrush dominated sites—both in total available biomass and forage quality. Increased forage production on reclaimed sites has been observed along RBC Road 83, south of the proposed facility expansion where pinyon/juniper has been cleared for pipelines. Final reclamation of each site would result in an increase in forage production until woody species reestablish on those sites.

For both alternatives the proposed facility expansion project would likely destroy portions of the Yellow Creek Lateral water pipeline that pass through the plant area. However, this section of the pipeline has been non-functional for several years. The BLM would continue to work with the livestock grazing permittees, and facility operators in the area of this project to assess its functionality, impacts, maintenance, and repairs associated with it and to identify alternative means of providing livestock water in the surrounding area.

Damage to fences or gates left open interfere with the control of cattle and ultimately with proper utilization of the rangeland resource. Well field expansion for either alternative may damage the pasture fence in the southeast part of the project area. This fence is necessary for control of livestock and to keep cattle from straying into the wrong grazing use area.

If the waste water pond is constructed as part of the Proposed Action the long term trend monitoring site would be lost. However, a new plot could be established in another near-by rolling loam site to continue providing information on vegetative trend in relation to livestock grazing use in this area. BLM range staff would prioritize to re-visit this plot in the summer of 2015 prior to any construction activities.

Cumulative Impacts

Agriculture, road development, and oil and gas development, which all have the potential to impact rangeland management, would continue to occur. There would be a minor increase in the overall amount of traffic in the area associated with the Natural Soda facility. The proposed facility expansion would remove a minor amount of forage temporarily in the Upper Yellow Creek pasture. After final reclamation has been completed and grass/forb communities have returned to the previously disturbed sites there would be a slight increase in forage for livestock in the area.

5.17.3. ***Environmental Consequences – No Action Alternative***

Direct and Indirect Impacts

Under the No Action alternative the facility expansion would not include the proposed waste water pond and well field expansion would occur to a lesser extent and slower rate. Approximately 70 acres associated with the well field expansion and facility expansion (62 acres for well field development and 8 acres for warehouse and parking lot) of disturbance would occur with about a half of it being long term (20 years). The long term trend monitoring site would be retained. Potential effects to the range improvement projects and general effects to livestock grazing would be essentially the same as under the Proposed Action.

Cumulative Impacts

Cumulative effects would be similar to those of the Proposed Action though approximately half the acreage would be affected.

5.17.4. ***Mitigation Measures and Residual Impacts***

1. Lease stipulation Rangeland Management numbers 29 and 30 listed in Appendix B would apply only to that portion of the water line from where it enters NSI's lease to the tire tank one half mile south of the facility at approximately NAD 83 Zone 13 UTM 212576.9E, 4425112.2.

5.18. Forestry and Woodland Products

5.18.1. *Affected Environment*

The proposed plant expansion and ponds are located in pinyon-juniper woodlands and rolling loam ecological sites. The expansion area is dominated by pinyon-juniper woodlands with a little open shrubland on the northeast part of the expansion area.

5.18.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

The Proposed Action would result in the direct removal of approximately 40 acres (14 acres for facility expansion and 26 acres for the well field) of pinyon-juniper within the NSI project area. It is uncertain of the exact location of the 124 acres of well pad disturbance within the well field, however siting of the pads as described in Sections 5.11 and 5.12 minimize the impacts to mature woodlands. Removal of the trees would be considered long-term based on the proposed life of the facility and the amount of time that would be required for pinyon-juniper to recolonize the site.

Cumulative Impacts

Past disturbance for NSI has resulted in 130 total acres being disturbed with approximately 25 acres of that being direct removal of pinyon-juniper stands. Future cumulative disturbance for natural soda is estimated at 118.5 acres with approximately 50 to 60 acres of that occurring in pinyon-juniper woodlands. Cumulative impacts from 50 to 60 acres of disturbance in pinyon-juniper woodlands for NSI to conduct business is expected to be minimal based on the large overall acreage (approximately 265) of Pinyon-Juniper woodlands in the analysis area.

5.18.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

In the No Action Alternative development would essentially be half of the Proposed Action's disturbance (8 acre warehouse and 62 acres well field) and could result in 21 acres of disturbance (8 acre warehouse and 13 acres well field) to pinyon-juniper woodlands around the Natural Soda facility for the plant expansion.

Cumulative Impacts

Past disturbance for Natural soda has resulted in 130 total acres being disturbed with approximately 25 acres of that being direct removal of pinyon-juniper stands. With additional disturbance of 21acres to pinyon-juniper woodlands, cumulative impacts to forest and woodland products are expected to be nominal based on only 46 acres of disturbance out of approximately 265 acres of pinyon-juniper woodlands in the analysis area.

5.18.4. *Mitigation Measures and Residual Impacts*

Mitigations measures for well pad siting identified in Terrestrial Wildlife Section 5.12.4 would minimize impacts to the mature woodlands. Residual impacts would be the loss of 21 to 26 acres of mature woodland.

5.19. Access and Transportation

5.19.1. *Affected Environment*

The access to the Proposed Action from Meeker, CO includes traveling approximately 20 miles west on State Highway 64 then 14 miles on Rio Blanco County (RBC) Road 5, then 2 miles RBC Road 24, then 3 miles on RBC Road 31. The access to the Proposed Action from Rifle, CO includes traveling approximately 20 miles north on State Highway 13 then 25 miles on RBC Road 5, then 2 miles RBC Road 24, then 3 miles on RBC Road 31. The roads closer to the Proposed Action are traveled primarily by Natural Soda employees, oil and gas employees, local ranch operators, big game hunters, and other recreationalists. According to the White River ROD/RMP, motorized vehicle travel is restricted to the existing roads and trails from October 1 through April 30 of each year.

5.19.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

Currently weekly product truck traffic averages 185 rounds trip and pickup and car traffic averages 280 round trips form the plant facility. After implementing the Proposed Action it is estimated that this traffic would increase to 371 product truck and 420 car and pickup truck round trips to the plant facility. This increase in traffic volume may cause a slight increase in travel times for those traveling the above routes to reach this area. The traffic volume would likely substantially increase during plant expansion construction activities and the closer one travels towards the plant facility on RBC Roads 24 and 31. The construction traffic would be a short term impact of approximately one year. Because the proposed access roads to the well developments are to be used only by those accessing the well pads and the access to the plant expansion is on existing state and county roads, the Proposed Action is not expected to increase access to public lands in this area. Some access roads may be gated or have signs posted as needed to prevent unauthorized use of these roads. It is unlikely that any route used to access the plant expansion construction activities would be damaged when soils are saturated because these roads are paved all the way to the existing plant facility. There is potential for existing unsurfaced BLM roads and routes in this area to be damaged if used during construction activities associated with the well drilling occurs when these roads and routes are saturated. Lease stipulations in the Design Features require that all construction activity and use of unsurfaced roads shall cease when soils or road surfaces become saturated to a depth of three inches unless there are safety concerns or activities are otherwise approved by the Authorized Officer. This stipulation would help prevent road and route damage as a result of use of these roads and routes when they are saturated.

Cumulative Impacts

Combined with the existing traffic on the above described routes, it is likely that the Proposed Action would result in a long term increase of traffic volume and may increase travel times for

those using these routes in this area. This is even more likely during the construction of the plant expansion facilities, but this is expected to be a short term impact of a year or less.

5.19.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

By not expanding the plant facility or but continuing to drill new wells each year, the traffic volume, travel times, condition of existing routes, and access to public lands are likely to remain somewhat similar as a result of this alternative. This would mean that weekly product truck traffic would continue to average 185 rounds trip and pickup and car traffic would continue to average 280 round trips from the plant facility.

Cumulative Impacts

Combined with the existing traffic on the above described routes, it is likely that this alternative would result in no noticeable increase in traffic volume and no change travel times for those using these routes in this area.

5.20. Hazardous or Solid Wastes

5.20.1. *Affected Environment*

Common domestic solid wastes are collected in containers and periodically transported to the Rio Blanco County land fill. Sewage from the process facilities is directed into a permitted sewage disposal system with a leach drain field. Process waster, including plant wash down and storm water runoff is directed to the process pond. A pump in the process pond allows NSI to recycle process pond water in o the barren system. The wastewater pond stores water from the cooling tower blow, water softener brine, and blow down form boilers. Small amounts of hazardous wastes are generated on site and consist of used crankcase oil (which is recycled), chemical wastes from product testing, and light bulbs. These wastes are collected safely contained, stored separately and disposed of by a certified hazardous waste company. Above ground bulk gas and diesel tanks located on site have secondary containment.

5.20.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

Increase production would increase the amount of wastes generated. The potential for harm to human health or the environment is presented by the risks associated with spills of fuel, oil and/or hazardous substances used at the processing facilities and during sodium drilling operations. Other accidents and mechanical breakdowns of machinery are also possible. These activities may pose direct and indirect impacts to soil, water, air, and biological resources that occur in close proximity to individual disturbance features. Impacts to these resources may also occur at farther distances from individual disturbance features, though it is assumed that these impacts would be reduced because of proximity to the point source. Accidents and mechanical breakdown may also have direct and indirect effects to resources depending on the type of accidents or mechanical breakdown and when and where they occur. Lease Stipulations in the Design Features contain hazardous or solids waste stipulations that would minimize the effects

of these impacts. The sewage disposal system would be upgraded to handle the increased number of employees.

Cumulative Impacts

Effects to soil, water, air, and biological resources as a result of cumulative release of hazardous materials into the environment are unknown. Because some hazardous substances persist in the environment, it is reasonable to assume that multiple activities that may occur throughout the project area that result in the release of individual hazardous material spills or discharge events, may cumulatively result in impacts to soil, water, air, and biological resources. However, freshwater-bearing formations and other resources suitable for human use or consumption are isolated from man-made materials used in the sodium recovery process and oil and gas operations through the use and cementing of surface casing, see 43 CFR 3162.5-2(d).

5.20.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

The level of generated wastes would continue at the current rate.

Cumulative Impacts

Cumulative effects are similar but at a reduced rate as those analyzed in the Proposed Action.

5.21. Social and Economic Conditions

5.21.1. *Affected Environment*

The socioeconomic study area includes Rio Blanco County. In 2013, Rio Blanco County had a population of 6,807 and per capita income is $27,586. Between 2000 and 2013 the population of Rio Blanco County increased 13.7 percent from 5,986 to 6,807 while the number of full and part-time jobs increased 16.2 percent from 4,109 to 4,776 (BEA). The unemployment rate in Rio Blanco County was 7.9 percent in 2010 and has trended downward dropping below 5 percent in August of 2013 (BLS).

The mineral and mining sector is a large component of the regional economy with 860 full and part-time jobs in Rio Blanco County (Census Bureau 2013). NSI's processing facility and associated infrastructure has the capacity to produce 250,000 tons per year (tpy) of sodium bicarbonate. Sodium bicarbonate is used in a number of household and commercial products including tooth paste, baking soda, antacids, clean supplies, fire extinguishers, and acid spill clean-up. In 2014, 11,600,000 tons of sodium bicarbonate was produced in the United States in California, Colorado, and Wyoming for a total value of approximately $1.7 billion (USGS 2015).

5.21.2. *Environmental Consequences – Proposed Action*

Direct and Indirect Impacts

NSI is proposing a $50 million investment for the expansion of its processing facilities to double sodium bicarbonate production from 250,000 tpy to 500,000 tpy. NSI has informed the BLM that the construction phase of the project would require up to 150 temporary full-time contract employees. Additionally, NSI anticipates the plant expansion would resultin an increase of 30

full-time employees to reach a total of 100 full-time employees at the NSI sodium bicarbonate processing facility.

The regional economic impacts of both the construction phase and increased production capacity of NSI's plant expansion were assessed with IMPLAN an input-output modeling tool. The inputs for the regional economic impact model are based on NSI's statement that the construction phase would be a one-time direct investment of $50 million and require 150 full-time contract employees to complete the construction. Likewise the inputs for the expanded production capacity are the additional 30 full-time plant employees, 10 contractor transportation works, and increased sodium bicarbonate production from 250,000 tpy to 500,000 tpy.

The construction phase has an estimated total economic impact of approximately $59 million and 242 combined full and part-time jobs throughout processing facility construction time period (IMPLAN, 2012). Table 20 displays the impact types of direct, indirect, and induced effects composed of employment, labor income, value added (the cost of intermediate inputs), and output that sum to the total economic impact.

Table 20. Economic Impacts of the Construction Phase

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	150	$28,661,591	$28,876,276	$50,000,000
Indirect Effect	28	$1,010,500	$1,539,847	$2,840,253
Induced Effect	64	$1,502,722	$3,889,180	$6,176,408
Total Economic Impact	242	$31,174,812	$34,305,304	$59,016,660

Upon completion of the construction, NSI plans to expand production by 250,000 tpy and add 30 full-time employees at the processing facility and 10 to15 transportation contractors. The Department of Interior's Office of Natural Resource Revenue provides an average estimate of sodium bicarbonate at $167.68/ton in 2014 (ONRR). Accordingly, the annual economic impact of the expanded capacity increases the current capacity by an estimated $73 million with 195 combined full and part-time jobs at the 500,000 tpy production levels (IMPLAN, 2012). Table 21 displays the impact types of direct, indirect, and induced effects composed of employment, labor income, value added (the cost of intermediate inputs), and output that sum to the annual economic impact. NSI's operating expenses would increase along with the increased production and are implicitly captured in the direct and indirect effects. The expanded capacity impacts in Table 21 assume the increase of 30 full-time employees and 10 of the 10 to15 transportation contractors would be required for production at 500,000 tpy this is represented as the 40 jobs listed under Employment as a Direct Effect.

Table 21. Economic Impacts of NSI's Expanded Capacity

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	40	$4,558,461	$8,633,064	$43,390,394
Indirect Effect	83	$7,536,028	$12,147,130	$19,934,344
Induced Effect	72	$3,512,387	$6,011,565	$9,735,768
Total Economic Impact	195	$15,606,875	$26,791,759	$73,060,507

NSI estimates that permit and impact fees paid to Rio Blanco County would be between $0.6 million and $1 million. These fees include mitigation fees to be paid to Rio Blanco County for

construction related impacts and permitting. In addition to permit and impact fees, fiscal impacts would include revenue from sales and income taxes.

In accordance with E.O. 12898 and Council on Environmental Quality guidance Rio Blanco County does not meet the criteria for having environmental justice populations that need to be further analyzed.

Cumulative Impacts

The 150 temporary employees and the 30 permanent employees would continue the trend of declining unemployment in Rio Blanco County. If specialized skills are required for these positions, the limited labor supply within Rio Blanco County may necessitate non-local hiring. This would increase the population of Rio Blanco County and could impact infrastructure, housing, and social services. Water and land-use could impact alternative socioeconomic activities and reduce opportunities for livestock grazing, recreation, and other mineral development.

5.21.3. *Environmental Consequences – No Action Alternative*

Direct and Indirect Impacts

Natural Soda Incorporated would continue to produce a maximum of 250,000 tpy of sodium bicarbonate due to constraints of existing plant infrastructure.

Cumulative Impacts

There would be no net increase in the number of employees or the economic income to Rio Blanco and the surrounding area. The declining unemployment trend could change.

5.21.4. *Mitigation Measures and Residual Impacts*

No mitigation measures were identified. The economic impact increase associated with operations of NSI's expanded production would remain through the economic life of the solution mining operations.

5.22. Colorado Standards for Public Land Health

In January 1997, the Colorado BLM approved the Standards for Public Land Health. These standards cover upland soils, riparian systems, plant and animal communities, special status species, and water quality. Standards describe conditions needed to sustain public land health and relate to all uses of the public lands. If there is the potential to impact these resources, the BLM will note whether or not the project area currently meets the standards and whether or not implementation of the Proposed Action would impair the standards.

5.22.1. *Standard 1 – Upland Soils*

All disturbed areas would be reclaimed as soon as practical following the completion of construction activities and with time, the preconstruction soil infiltration and permeability characteristics should recover. Interim storm water BMPs would be utilized to control overland stormwater runoff and consequent rill/gully erosion of upland soils in and around the Proposed Action.

5.22.2. *Standard 2 – Riparian Systems*

The two alternatives would have no reasonable likelihood of influencing riparian or aquatic systems and would not affect related land health standards.

5.22.3. *Standard 3 – Plant and Animal Communities*

The project area is generally influenced by ongoing mining activity and surrounding oil and gas developments, but retains utility as big game, raptor, and migratory bird nesting habitat. Although the availability and character of shrubland habitats encompassed by the lease may be modified substantially through plan life, it is believed that, as conditioned, the net effects on forage and cover resources can be offset in the short term and regained in the longer term. More disruptive forms of mine-related activity would generally be curtailed during important wildlife use periods use (e.g., severe winter range, migratory bird and raptor nesting nesting timeframes); these behavioral effects are considered reversible and are expected to diminish as mining activity subsides. Under either alternative, habitat within the well field would continue to function as part of a landscape-level matrix consistent with continued meeting of the land health standard, though temporarily at reduced levels.

5.22.4. *Standard 4 – Special Status Species*

The project area does not contribute substantively to the direct support of special status animals, and with the exception of the endangered fish of the Upper Colorado River system, neither alternative would contribute measurably to influences on off-site populations or habitat of special status species. Incremental flow depletions from the Upper Colorado River system contribute to cumulative reductions in flow volume that affect seasonal fluctuations in flow, water quality, and channel/floodplain structure as important determinants of endangered fish habitat, including most prominently, Colorado pike-minnow in the lower White River. The consequences of depletion attributable to the Proposed Action are being considered and conservation measures are expected to be applied in the context of basin-wide water use in ongoing Section 7 consultation with the FWS. Neither alternative would be expected to have notable influence on factors that would contradict continued meeting of the land health standard for special status animals.

5.22.5. *Standard 5 – Water Quality*

With the timely reclamation of disturbed areas, implementation of stormwater BMPs, and proper implementation of the zero discharge methodology the Proposed Action should not result in short-term or long-term impacts on surface and groundwater quality.

6. SUPPORTING INFORMATION

6.1. Interdisciplinary Review

Table 22. List of Preparers

Name	Title	Area of Responsibility	Date Signed
Forrest Cook	Air Specialist	Air Quality	2/27/2015
Keith Sauter	Hydrologist	Soil Resources, Surface and Ground Water Quality, Floodplains, Hydrology,	1/26/2015

Name	Title	Area of Responsibility	Date Signed
		and Water Rights.	
Ed Hollowed	Wildlife Biologist	Special Status Animal Species, Migratory Birds, and Aquatic and Terrestrial Wildlife, Wetlands and Riparian Zones	2/9/2015
Mary Taylor	Rangeland Management Specialist	Vegetation, Invasive, Non-Native Species, and Livestock Grazing	2/2/2015
Matthew Dupire	Ecologist	Special Status Plant Species, Forestry and Woodland Products, Areas of Critical Environmental Concern	1/29/2015
Brian Yaquinto	Archaeologist	Cultural Resources, Paleontological Resources, Native American Religious Concerns	1/22/2015
Aaron Grimes	Outdoor Recreation Planner	Visual Resources, Lands with Wilderness Characteristics, Recreation, Access and Transportation, Wilderness, Scenic Byways	1/21/2015
Paul Daggett	Mining Engineer	Air Quality; Geology and Minerals, Hazardous or Solid Wastes,	3/4/2015
Kyle Frary	Fire Management Specialist	Fire Management	1/26/2015
Martin Hensley	Economist	Social and Economic Conditions	2/19/2015
Melissa J. Kindall	Wild Horse Management	Wild Horses	1/28/2015
Stacey Burke	Realty Specialist	Realty Authorizations	2/3/2015
Heather Sauls	Planning & Environmental Coordinator	NEPA Compliance	3/9/2015

6.2. Tribes, Individuals, Organizations, or Agencies Consulted

The BLM is in the process of Section 7 consultation with the U.S. Fish and Wildlife Service to update the previous consultation (Biological Opinion SE/SLC: 6-5-86-F-019, August 28, 1986) for the existing operation.

An email for scoping was sent to interested party INFORM Colorado on 12/10/2014.

6.3. References

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APPENDIX A. FIGURES

Figure 1 Topographic and General Location Map

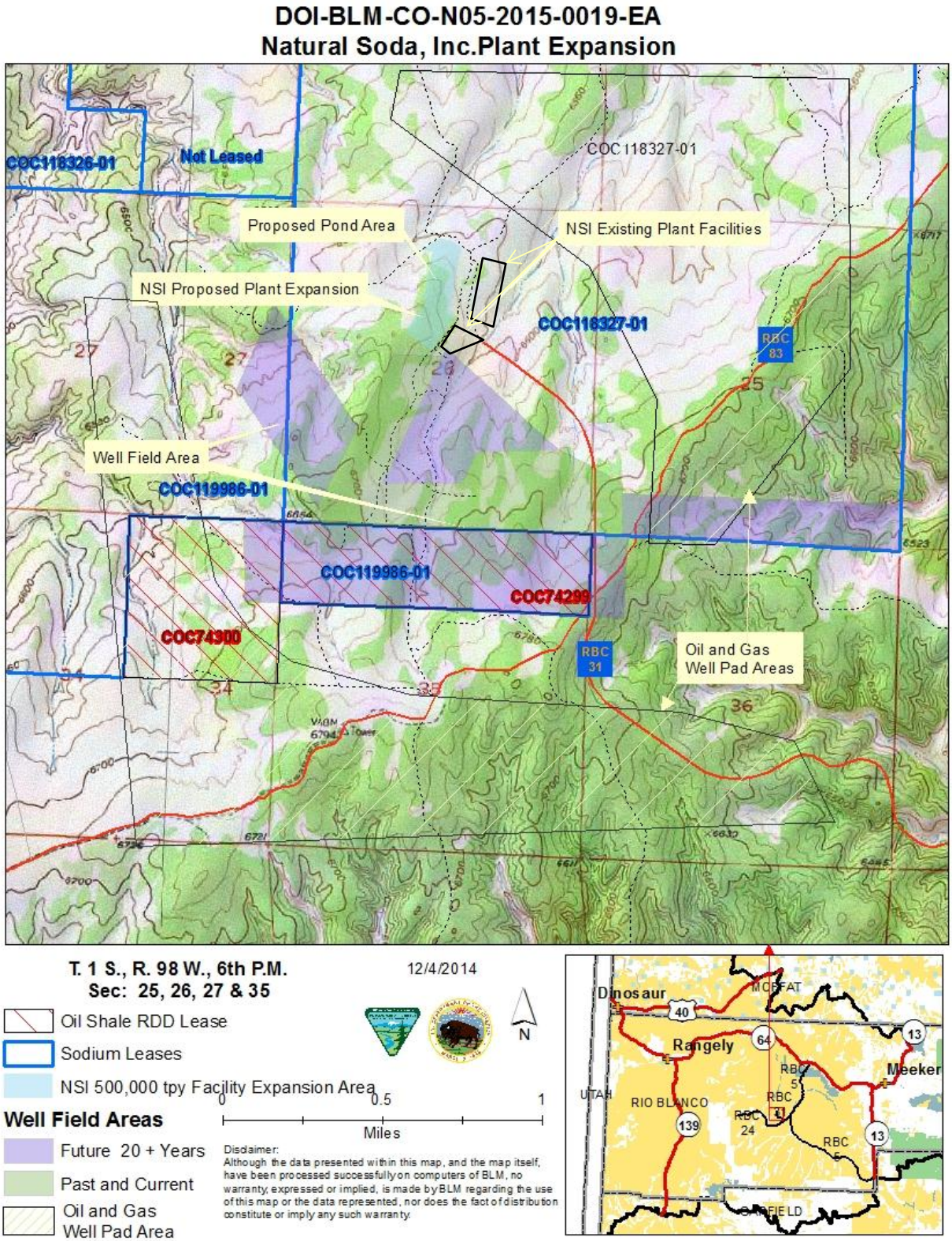

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Figure 2 Aerial Map of Project

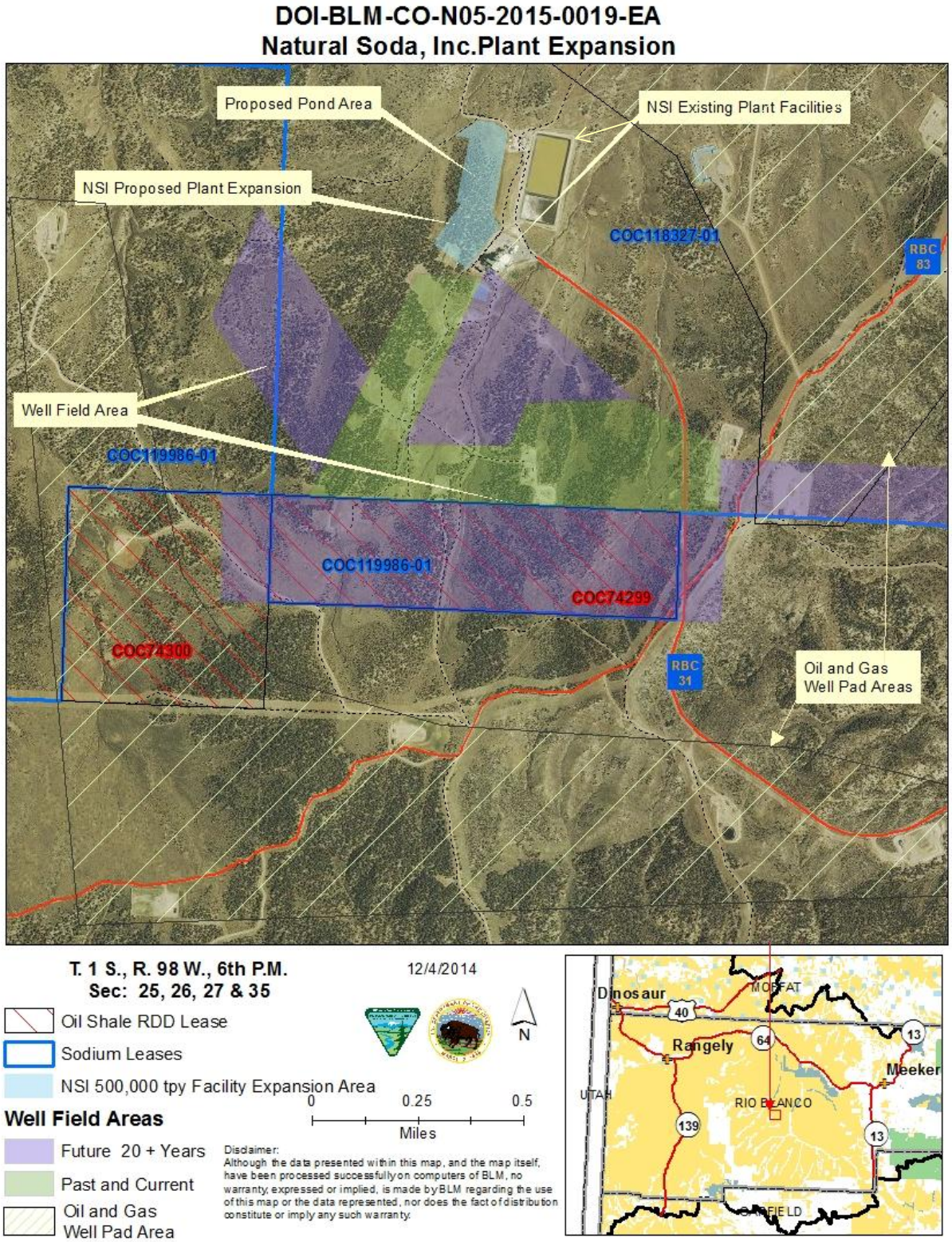


Figure 3 Plant Expansion Area

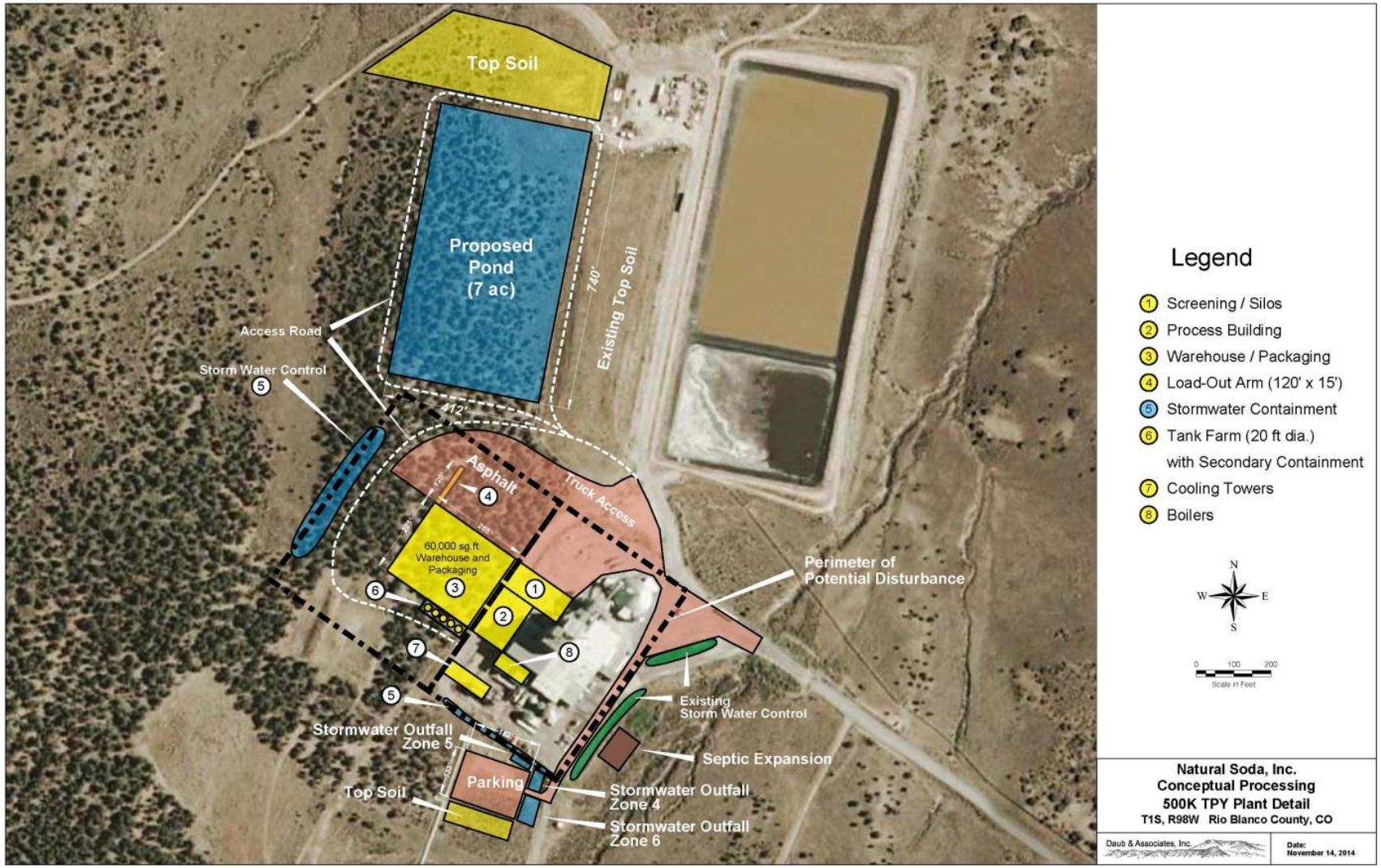


Figure 4 Field Office and Designated Air Boundaries

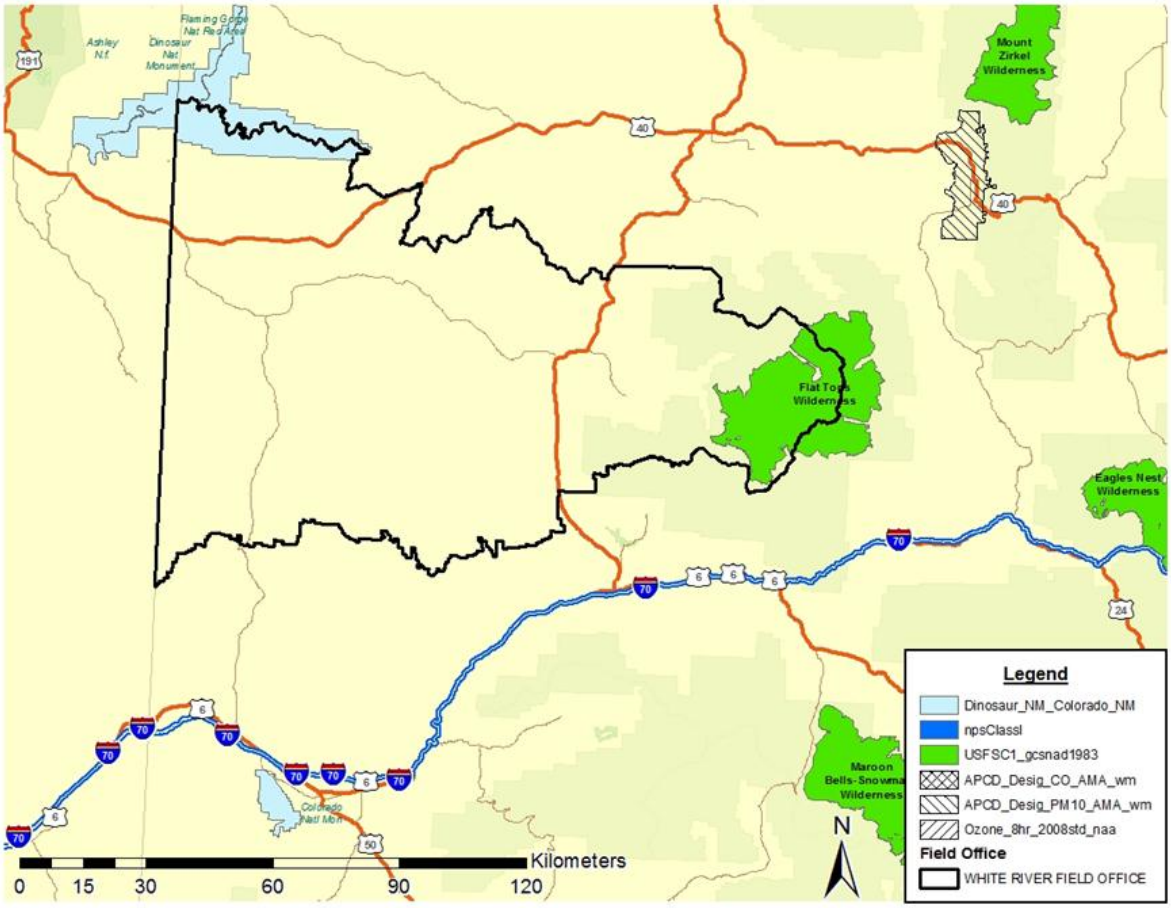


Figure 5. AQRV Visibility Data for White River National Forest

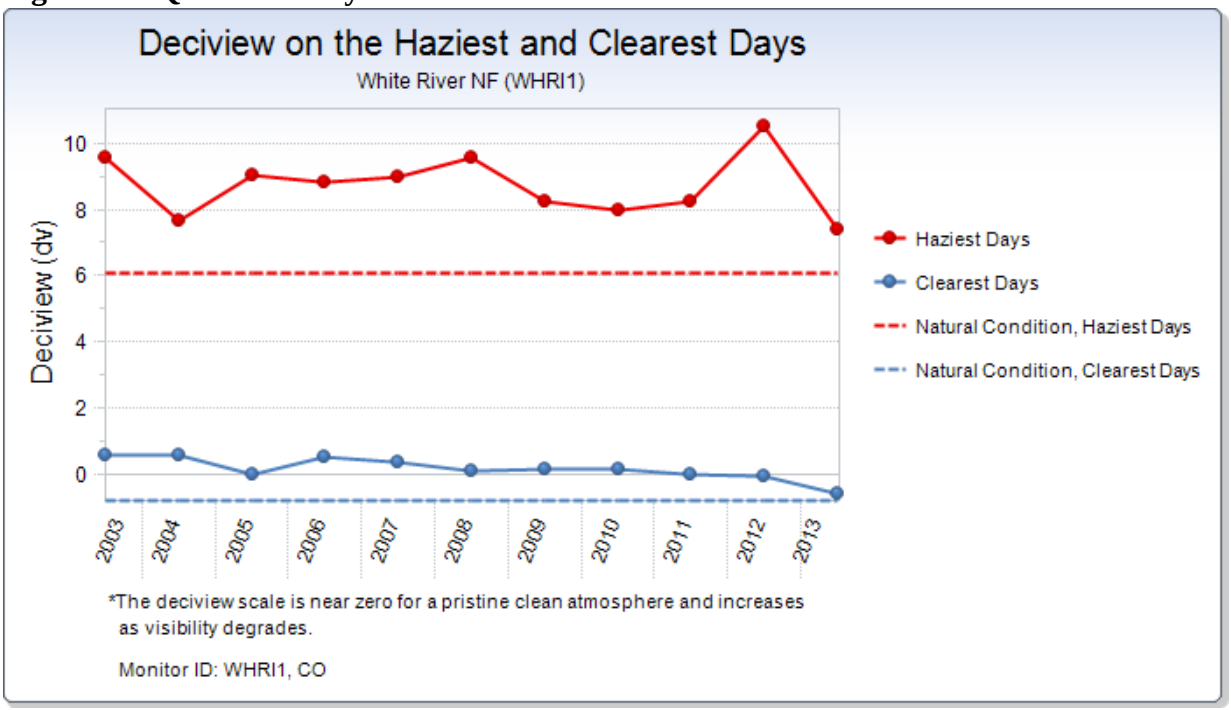
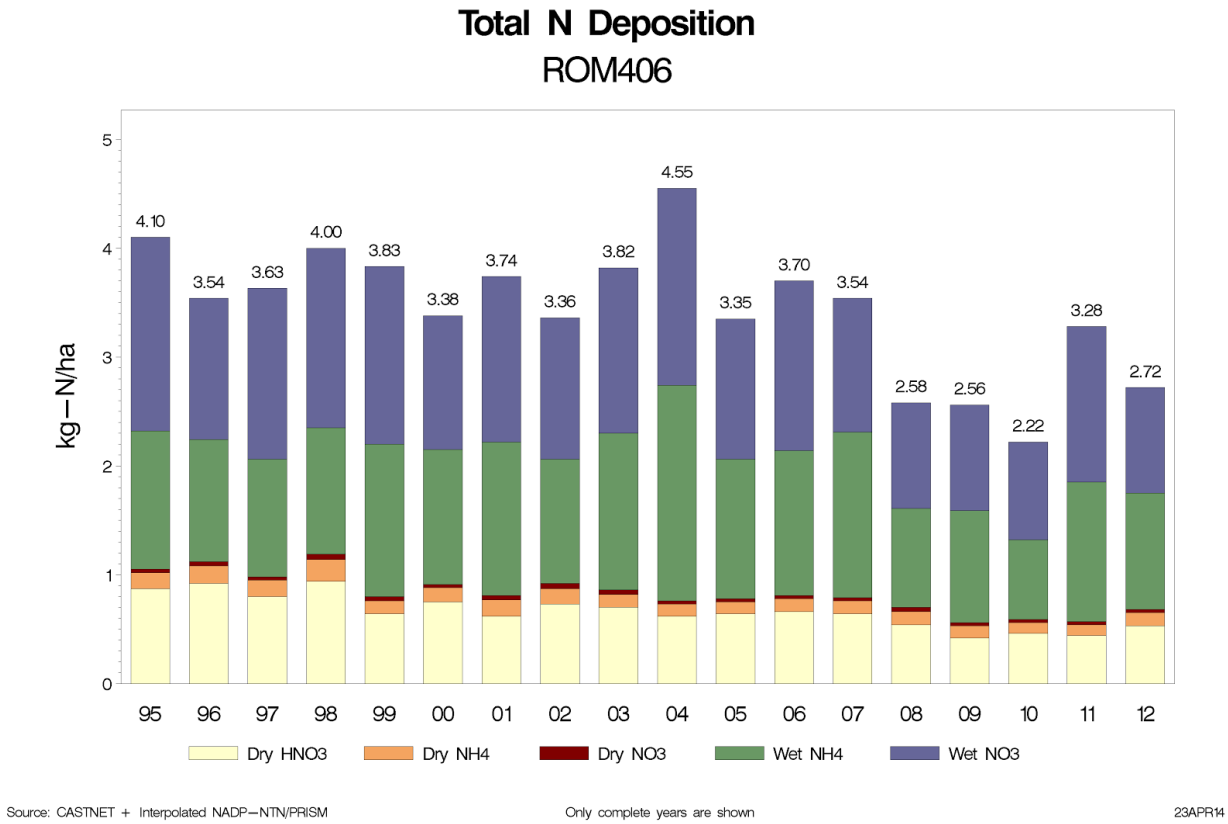


Figure 6 AQRV Deposition Data for Rocky Mountain National Park



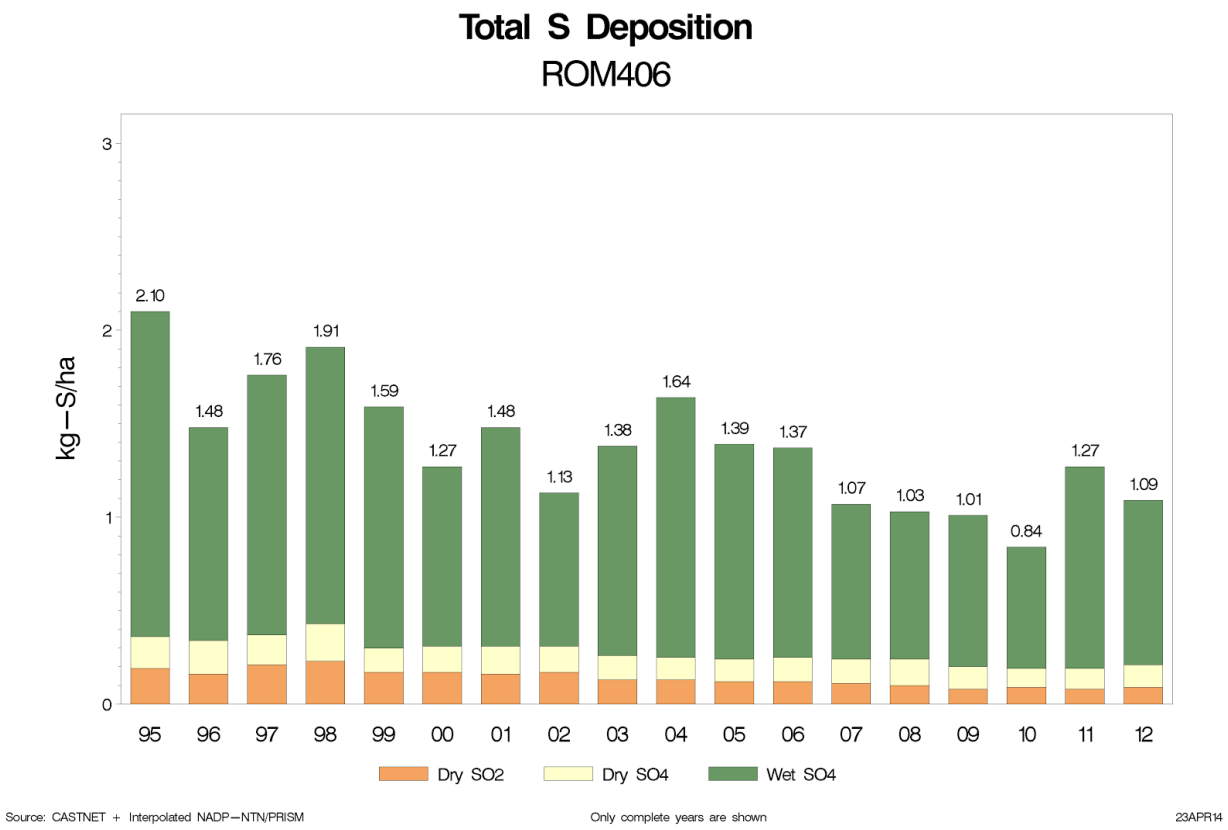


Figure 7 CARMMS Ozone Design Value Projections

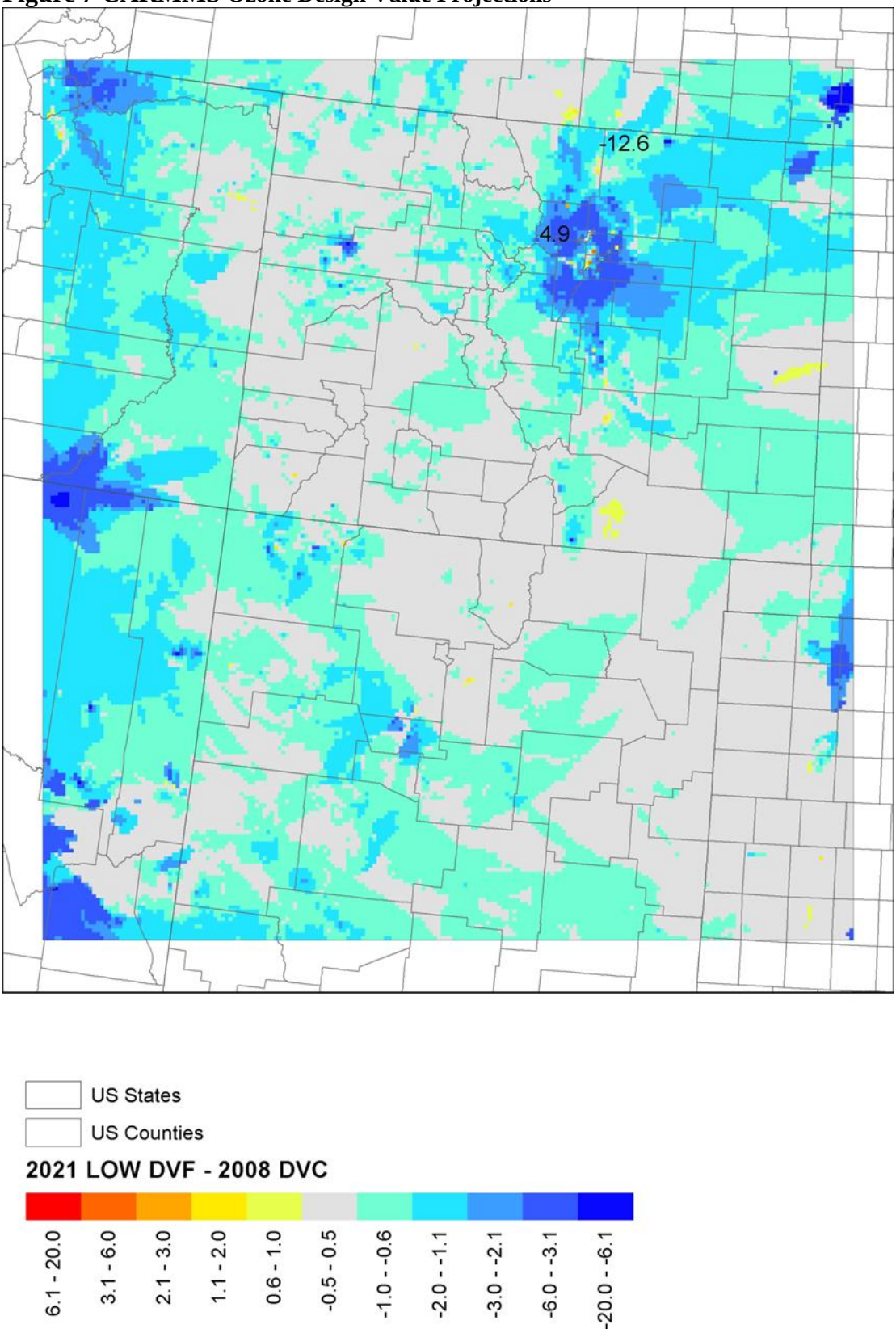


Figure 8 CARMMS 8th highest daily average $PM_{2.5}$ concentrations (2021 Low Scenario minus Base Year 2008 concentrations)

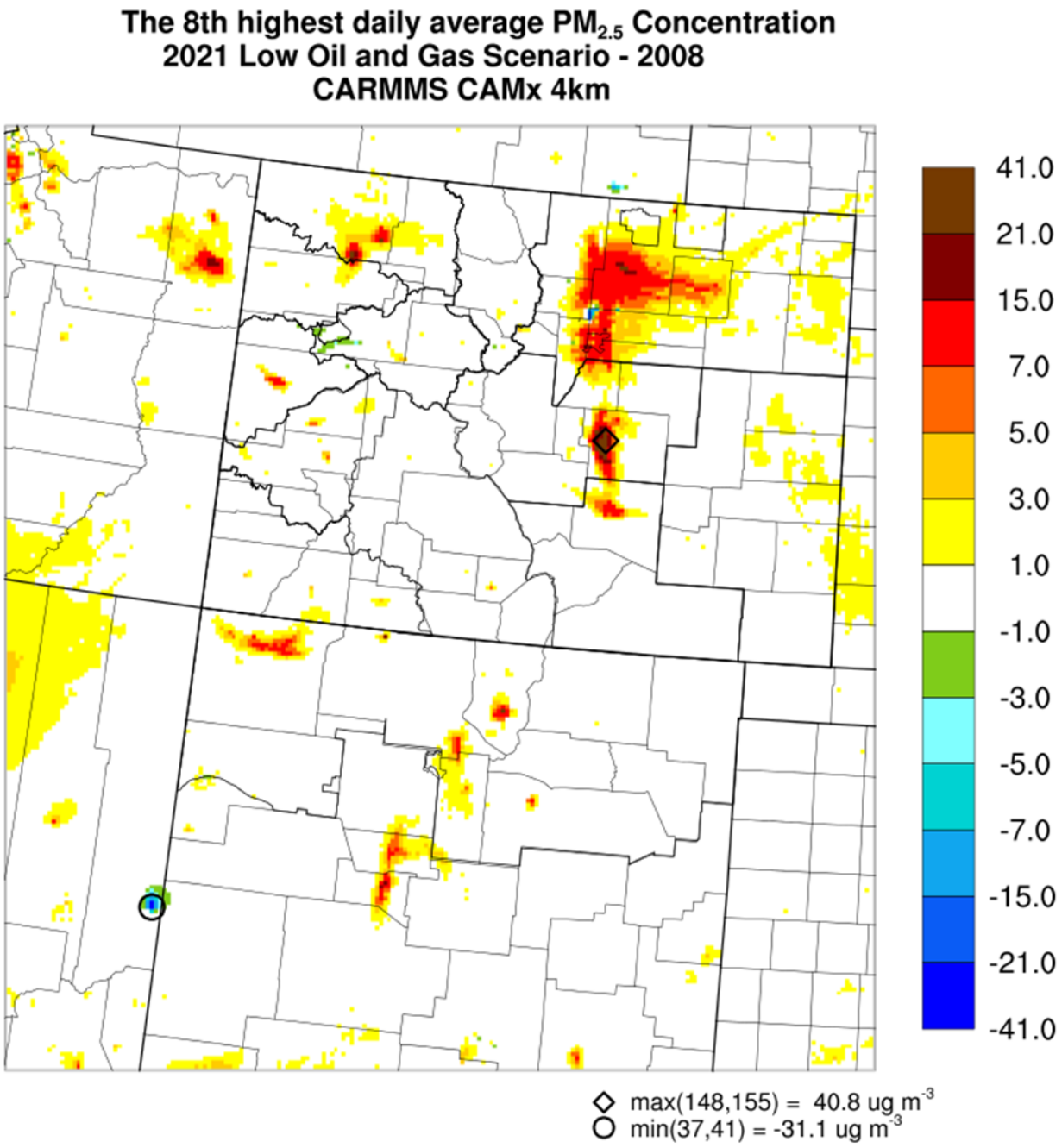
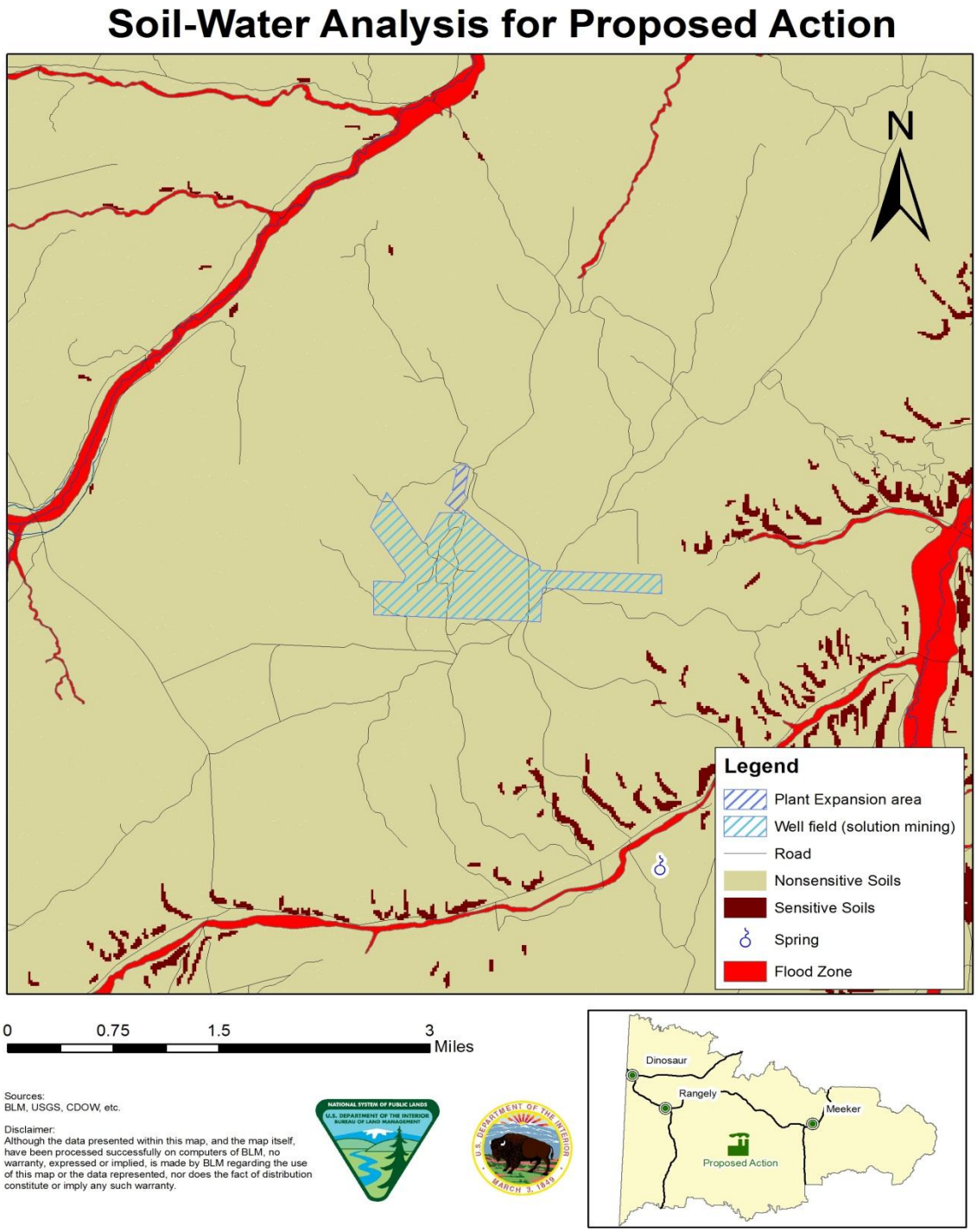


Figure 9


Soil-Water Analysis for Proposed Action
N
Legend
Plant Expansion area
Well field (solution mining)
Road
Nonsensitive Soils
Sensitive Soils
Spring
Flood Zone
0
0.75
1.5
3
Miles
Sources:
BLM, USGS, CDOW, etc.
Disclaimer:
Although the data presented within this map, and the map itself, have been processed successfully on computers of BLM, no warranty, expressed or implied, is made by BLM regarding the use of this map or the data represented, nor does the fact of distribution constitute or imply any such warranty.
Dinosaur
Rangely
Meeker
Proposed Action

APPENDIX B. LEASE STIPULATIONS

Lease Stipulations COC119986-01 From 2014 Lease Modification

Design Features

1. All operations would conform to Natural Soda's approved Mine and Reclamation Plans.

Air Quality

2. Natural Soda will limit unnecessary emissions from point or nonpoint pollution sources and prevent air quality deterioration from necessary pollution sources in accordance with all applicable state, federal and local air quality law and regulation.
3. If the Natural Soda processing plant requires a stationary emission source permit, it is incumbent upon the applicant to apply and obtain a permit for the facility and provide BLM with a copy of this permit for its project files.
4. Natural Soda will treat all access roads with water and/or a chemical dust suppressant during construction and drilling activities so that there is not a visible dust trail behind vehicles. Any technique other than the use of freshwater as a dust suppressant on BLM lands will require prior written approval from BLM.

Soils

5. All construction activity and use of unsurfaced roads shall cease when soils or road surfaces become saturated to a depth of three inches unless there are safety concerns or activities are otherwise approved by the Authorized Officer.
6. All maintenance and construction of access roads should comply with the most recent version of the BLM's "The Gold Book".

Surface and Groundwater

7. To protect surface waters below the project area, keep road inlet and outlet ditches, sediment retention basins, and culverts free of obstructions, particularly before and during spring run-off and summer convective storms. Provide adequate drainage spacing to avoid accumulation of water in ditches or on road surfaces.
8. Install culverts and low-water crossings with adequate armoring of inlet and outlet. Patrol areas susceptible to road or watershed damage during periods of high runoff.
9. Locate drainage dips and drainage ditches in such a manner as to avoid discharge onto unstable terrain such as headwalls or slumps. Provide adequate spacing to avoid accumulation of water in ditches or dips.
10. To reduce erosion adjacent to roads and protect water quality in downstream public lands by maintaining the drainage features of the access roads, access roads will be surfaced with six inches of road base and/or gravel. Maintenance will include restoring the travel surface shape, road surfacing to maintaining an effective all-weather surface when required.
11. When drilling to set the conductor and surface casing, drilling fluid will be composed only of fresh water, bentonite, and/or a benign lost circulation material that does not pose a risk of harm to human health or the environment (e.g., cedar bark, shredded cane stalks, mineral fiber and hair, mica flakes, ground and sized limestone or marble, wood, nut hulls, corncobs, or cotton hulls).

Migratory Birds and Wildlife

12. Where practical, schedule pad and pipeline construction and drilling and completion operations to avoid the core migratory bird nesting season (May 15 to July 15).
13. Surface disturbing activities involving pad, pipeline, or access preparation or construction, the drilling and completion of wells, and routine activity-intensive maintenance and production activities would not be allowed on this lease between December 1 and April 30 to reduce cumulative impacts on wintering big game. This timing restriction would be subject to most-current exception and modification provisions developed in the White River RMP, as amended.
14. Lease developments would be subject to siting considerations that are intended to reduce long term and residual impacts on the utility and continued availability of suitable shrubland and woodland wildlife habitat in the lease tract. It is recommended that the operator consider these objectives to the extent practicable when planning lease development operations. These objectives would be used, where appropriate, by WRFO staff during project-specific on-sites and NEPA analysis to develop siting adjustment recommendations to meet those objectives. Siting considerations would apply equally to shrubland or woodland habitats and may include, but are not limited to, locating pads, access and pipeline corridors in the following manners:
    - on stand edges (i.e., avoiding the bisect of, or a centralized disturbance source in larger habitat patches);
    - more closely to existing long-term sources of disturbance (e.g., county roads);
    - in smaller or disconnected patches rather than larger and more cohesive stands;
    - among more heavily pinyon-juniper encroached shrubland;
    - in less mature/more open canopied woodland types;
    - in stands with more poorly developed understories; and
    - in stands more strongly represented by invasive annuals or introduced grazing-tolerant grasses.

Cultural and Paleontological

15. The holder is responsible for informing all persons who are associated with the project that they will be subject to prosecution for knowingly disturbing archaeological sites or for collecting artifacts.
16. If any archaeological materials are discovered as a result of operations under this authorization, activity in the vicinity of the discovery will cease, and the BLM WRFO Archaeologist will be notified immediately. Work may not resume at that location until approved by the AO. The holder will make every effort to protect the site from further impacts including looting, erosion, or other human or natural damage until BLM determines a treatment approach, and the treatment is completed. Unless previously determined in treatment plans or agreements, BLM will evaluate the cultural resources and, in consultation with the State Historic Preservation Office (SHPO), select the appropriate mitigation option within 48 hours of the discovery. The holder, under guidance of the BLM, will implement the mitigation in a timely manner. The process will be fully documented in reports, site forms, maps, drawings, and photographs. The BLM will forward documentation to the SHPO for review and concurrence.
17. Pursuant to 43 CFR 10.4(g), the holder must notify the AO, by telephone and written

confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, pursuant to 43 CFR 10.4(c) and (d), the holder must stop activities in the vicinity of the discovery and protect it for 30 days or until notified to proceed by the AO.

18. No new surface disturbance is permitted within T 1S, R 98W, Sec 35 NENE of Lot 4, and T 1S, R 98W, Sec 35 N1/2NW of Lot 3.
19. The holder is responsible for informing all persons who are associated with the project operations that they will be subject to prosecution for disturbing or collecting vertebrate or other scientifically important fossils, collecting large amounts of petrified wood (over 25lbs./day, up to 250lbs./year), or collecting fossils for commercial purposes on public lands.
20. If any paleontological resources are discovered as a result of operations under this authorization, the holder or any of his agents must stop work immediately at that site, immediately contact the BLM Paleontology Coordinator, and make every effort to protect the site from further impacts, including looting, erosion, or other human or natural damage. Work may not resume at that location until approved by the AO. The BLM or designated paleontologist will evaluate the discovery and take action to protect or remove the resource within 10 working days. Within 10 days, the operator will be allowed to continue construction through the site, or will be given the choice of either (a) following the Paleontology Coordinator's instructions for stabilizing the fossil resource in place and avoiding further disturbance to the fossil resource, or (b) following the Paleontology Coordinator's instructions for mitigating impacts to the fossil resource prior to continuing construction through the project area.
21. Any excavations into the underlying native sedimentary stone must be monitored by a permitted paleontologist. The monitoring paleontologist must be present before the start of excavations that may impact bedrock.

<u>Hazardous or solid Waste</u>

22. Comply with all Federal, State and/or local laws, rules and regulations addressing the emission of and/or the handling, use, and release of any substance that poses a risk of harm to human health or the environment. All spills or leakages of oil, gas, produced water, toxic liquids or waste materials, blowouts, fires, shall be reported by the operator in accordance with the regulations and as prescribed in applicable orders or notices
23. Where required by law or regulation to develop a plan for the prevention of releases or the recovery of a release of any substance that poses a risk of harm to human health or the environment, provide a current copy of said plan to the BLM WRFO.
24. All substances that pose a risk of harm to human health or the environment shall be stored in appropriate containers. Fluids that pose a risk of harm to human health or the environment, including but not limited to produced water, shall be stored in appropriate containers and in secondary containment systems at 110% of the largest vessel's capacity. Secondary fluid containment systems, including but not limited to tank batteries shall be lined with a minimum 24 mil impermeable liner.
25. Construction sites and all facilities shall be maintained in a sanitary condition at all times; waste materials shall be disposed of promptly at an appropriate waste disposal site. "Waste" means all discarded matter including, but not limited to, human waste, trash, garbage, refuse, oil drums, petroleum products, ashes, and equipment.

26. As a reasonable and prudent lessee, acting in good faith, all lessees and right-of-way holders will report all emissions or releases that may pose a risk of harm to human health or the environment, regardless of a substance's status as exempt or nonexempt and regardless of fault, to the BLM WRFO (970) 878-3800.
27. As a reasonable and prudent lessee and right-of-way holder, acting in good faith, all lessees and right-of-way holders will provide for the immediate clean-up and testing of air, water (surface and/or ground) and soils contaminated by the emission or release of any substance that may pose a risk of harm to human health or the environment, regardless of that substance's status as exempt or non-exempt. Where the lessee/operator or right-of-way holder fails, refuses or neglects to provide for the immediate clean-up and testing of air, water (surface and/or ground) and soils contaminated by the emission or release of any quantity of a substance that poses a risk of harm to human health or the environment, the BLM WRFO may take measures to clean-up and test air, water (surface and/or ground) and soils at the lessee/operator's expense. Such action will not relieve the lessee/operator of any liability or responsibility.

Forest Management

28. In accordance with the 1997 White River RMP/ROD, all trees removed in the process of construction must be purchased from the BLM. Trees should first be used in reclamation efforts and then any excess material made available for firewood or other uses.
    a) Woody materials required for reclamation must be removed in whole with limbs intact and stockpiled along the margins of the authorized use area separate from the topsoil piles. Once the disturbance has been recontoured and reseeded, the operator will scatter stockpiled woody material across the reclaimed area where the material originated. Redistribution of woody debris will not exceed 20% ground cover. Limbed material must be scattered across reclaimed areas in a manner that avoids the development of a mulch layer that suppresses growth or reproduction of desirable vegetation. Woody material will be distributed in such a way to avoid large concentrations of heavy fuels and to effectively deter vehicle use.
    b) Trees that must be removed for construction and are not required for reclamation will be cut down to a stump height of 6 inches or less prior to other heavy equipment operation. These trees will be cut in four foot lengths (down to 4 inches diameter) and placed in manageable stacks immediately adjacent to a public road to facilitate removal for company use or removal by the public.

Rangeland Management

29. Prior to any construction, a representative will coordinate with the appropriate WRFO Rangeland Management Specialist (970) 878-3800 to conduct a field inspection of the rangeland improvement project (water line) and address how to relocate the waterline and ensure that it is fully functional.
30. The holder will repair any future damage caused to this water line caused by development or operational activities.
31. Any damage caused to the pasture division fence caused by development or operational activities must be repaired to BLM specifications in a timely manner (to prevent livestock movement between these two pastures).

32. If it becomes apparent that livestock grazing use is negatively impacting establishment of seeded areas, fence those areas for a minimum of two to three growing seasons to prevent them from being grazed before they are adequately established. Installation, maintenance and removal of any fencing are the responsibility of Natural Soda. Any fencing installed must be built to BLM specifications.

Realty Authorization

33. Coordinate with existing ROW holders (Qwest, Rio Blanco County, Enterprise Gas Processing, Williams Northwest Pipeline, WPX Energy Rocky Mountain, Bargath, and White River Electric Association) prior to any construction activity.

Lease Stipulations COC119986-01
(COC118327 stipulations are the same except no Floodplains)

Sec. 15. SPECIAL STIPULATIONS - Special stipulations (a) Cultural Resources, (b) Paleontological Resources, (c) Threatened and Endangered Species (Plants), (d) Wildlife, (e) Floodplains, (f) Access, and (g) Mine and Reclamation Plans are attached to and made a part of sodium lease COC-0119986. These stipulations are also imposed upon lessee's employees and agents. The failure or refusal of any of these persons to comply with these stipulations shall be deemed a failure of the lessee to comply with the terms of the lease. Lessee shall require its agents, contractors, and subcontractors involved in activities on this lease to include these stipulations in the contracts between and among them. The special stipulations maybe revised or amended, in writing, by mutual consent of the lessor and the lessee.

(a) Cultural Resources. Lessee shall undertake measures in accordance with instructions from the authorized officer to protect cultural resources on the leased lands. The lessee shall not commence any surface disturbing activities until permission to proceed is given by the authorized officer. For this cultural resources stipulation, the authorized officer of the BLM will be the White River Field Office Manager.

(1) Before undertaking any activities that may disturb the surface of the leased lands, lessee shall conduct a cultural resource Class III inventory on those lands that have not been previously inventoried and that may be affected by lease-related activities. The inventory shall be conducted by a qualified professional cultural resource specialist (i.e., archaeologist, historian, or historical architect, as appropriate) approved by the authorized officer of the BLM and in the manner specified by the authorized officer. Lessee shall submit a report of the inventory and recommendations for protecting any identified cultural resources to the authorized officer.

(2) Lessee shall protect all known cultural resource properties within the lease area from lease-related activities until the cultural resource mitigation measures can be implemented as part of an approved exploration plan or an approved mining plan.

(3) The cost of conducting the inventory, preparing reports, and carrying out mitigation measures shall be borne by the lessee.

(4) If cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the authorized officer. The lessee shall not disturb such resources except as subsequently authorized by the BLM. Within five (5) working days of notification, the authorized officer will evaluate or have evaluated any cultural resources discovered and will determine if any action may be required to protect or to preserve such discoveries. The cost of data recovery for cultural resources discovered during lease operations shall be home by the lessee.

(b) Paleontological Resources. (1) Before undertaking any activities that may disturb the surface of the leased lands, lessee shall employ a qualified professional paleontologist to map the extent of the Class I and II geologic formations. The paleontological appraisal shall be conducted as directed by the authorized offices who may require a field survey of all outcrops within identified Class I and Class II areas. The BLM reserves the right to designate portions of any Class I or Class II areas as unsuitable for mining under this lease due to their sensitivity or to protect significant scientific value(s).

(2) Lessee shall not knowingly disturb, alter, destroy, or take any paleontological resources. Lessee shall immediately cease activities in the vicinity of any paleontological specimen that is discovered during its operations. Lessee shall protect the resource and report the discovery to the authorized officer. A paleontological specimen shall not be removed from the site until evaluated by a qualified professional paleontologist. Operations may not proceed until specifically authorized by the BLM. Lessor expressly reserves title to paleontological resources.

(3) Lessor reserves the right to conduct periodic compliance checks or to have these checks conducted by a qualified professional paleontologist during the stripping of overburden and the construction of appurtenant facilities in order to check for the existence of paleontological localities and to evaluate their significance.

(4) If a fossil is discovered which has projectile points or other human artifacts in or near it; is charred, split, or cut; or shows features indicative of human activity, all work, including construction work, excavation, and removal, shall immediately cease until a qualified professional archaeologist can evaluate on the fossil resource and determine its cultural affiliation and significance. If the archaeologist determines that a human association exists, the specimen shall be handled as a cultural resource under Sec. 15(a) as directed by the authorized officer.

(c) Threatened and Endangered Plants. (1) Before undertaking any activities that may disturb the surface of the leased lands, lessee shall have a qualified professional conduct an intensive field inventory for threatened, endangered, sensitive, and rare plants in the manner specified by the authorized officer on those portions of the exploration area, mine plan area, or adjacent areas that were not previously inventoried at such a level of intensity and which may be adversely affected by lease-related activities.

(2) The inventory shall be conducted by a qualified professional approved by the authorized officer. A report of the inventory and recommendations for the protection of any species identified shall be submitted to the authorized officer. The lessee shall not commence any surface disturbing activities until the authorized officer has reviewed the report, determined whether mitigation is required, and given approval to proceed.

(d) Wildlife. (1) Lessee shall develop, in consultation with the BLM, Colorado Division of Wildlife, and the U.S. Fish and Wildlife Service, a plan for replacing or offsetting impacts to animal populations and/ or habitats identified as being impaired or lost due to mining operations. Key target species and habitats include, but are not limited to, raptors and mule deer and their associated habitats and riparian/ wetland habitats and associated fauna.

(2) Lessee shall compensate for and/or offset the loss, displacement, or adverse modification of wildlife populations and/or associated habitats, on or off lease, which occur as the result of lease development and operation.

(3) *Wildlife Recovery and Replacement Plan.* At the time it submits its mine plan, lessee shall submit for approval by the authorized officer a wildlife recovery and replacement plan.

The final wildlife recovery and replacement plan shall indicate the methods lessee shall employ to ensure that the carrying capacity of the recovered or replaced lands will fully support populations of the indicator species as agreed upon by the BLM, the Colorado Division of Wildlife and the U.S. Fish and Wildlife Service. The wildlife recovery and replacement plan will include the following:

(A) A habitat and population analysis of the mine area that identifies which of these species occupy the mine area and shall include, but not be limited to, advance raptor nest surveys of woodland and cliff substrates within 2 mile of any proposed development. The survey shall be conducted by a qualified professional approved by BLM and shall include an analysis of the quality or carrying capacity of the habitat for each species identified.

(B) A detailed description of the methods selected by the lessee to mitigate animal and/or habitat loss, together with comparative analysis of alternative methods that were considered but rejected by the lessee and the rationale for the decision to select the proposed methods. The methods utilized by the lessee for recovery and replacement may include, but are not limited to, the following techniques:

(i) Increasing the quantity and quality of forage available to these species;

(ii) Acquiring critical wildlife habitats;

(iii) Implementing mechanical manipulation of low quality wildlife habitat to increase its carrying capacity for selected wildlife species; and

(iv) Ensuring recovery, replacement, or protection of important wildlife habitat to increase its carrying capacity for selected wildlife species.

(C) A timetable giving the periods required to accomplish the habitat recovery or replacement plan and showing its relationship to the overall mining plan.

(e) Floodplains. Lessee shall not construct facilities or conduct operations in the 100-year floodplain described below without the express written permission of the authorized officer.

T. 1 S., R. 98 W., 6th P.M.
sec. 29, SE¼NE¼, and S½SW¼

If facilities are allowed, lessee shall provide adequate protection for any building or improvement against flooding.

f) Access. (1) Lessee shall maintain public access to public lands adjacent to the lease by means of existing roads, trails, or ways. If the lessee must destroy or obstruct any existing route, lessee shall provide public access by means of an alternate route of equal quality.

(2) Lessee shall allow the public access to public lands within the lease and on roads, trails, and ways constructed by the lessee, unless the authorized officer determines that allowing such access would interfere with mining operations or would create a public safety hazard.

(g) Mine and Reclamation Plans. (1) Before any operations may commence, lessee shall file for approval by the authorized officer an exploration or mining and reclamation plan, as appropriate, that addresses the following items:

(A) A description of the location and the area affected by the operations together with two copies of a suitable map or aerial photograph showing the topography, the area covered by the lease, the name and location of major topographic and cultural features, and the drainage plan for the affected area.

(B) A statement of proposed methods of operating, including a description of the surface or underground mining methods, proposed roads or vehicular trails, the size and location of structures and facilities to be built, the timing for grading and backfilling areas affected by the operations, and the proposed manner and length of time required to reclaim areas disturbed by the operations.

(C) An estimate of the quantity of water to be used and the pollutants that may enter receiving waters together with a design for the necessary impoundment, treatment, or control of all runoff water and drainage from workings to reduce soil erosion and sedimentation and to prevent the pollution of receiving waters.

(D) A description of measures to be taken to prevent or control fire, soil erosion, pollution of surface and groundwater, pollution of air, damage to fish and wildlife or other natural resources, and hazards to public health and safety.

(E) A revegetation plan for areas affected by operations that describes:

(i) Proposed methods of preparation of the soil prior to replanting;

(ii) Types and mixtures of shrubs, trees, or tree seedlings, grasses, or legumes to be planted;

(iii) Types and method of planting, including the amount of grasses, forbs, shrubs, or legumes per acre, or the number of spacing of trees, or tree seedlings, or combinations of the above.

(2) Lessee shall store or stockpile ore, by-products, or waste material in a manner to deter the production of leached products and other pollutants and to prevent downward percolation of such products or pollutants into aquifers. Oil shale ore shall be stockpiled to protect the mineral resources as determined by the authorized officer.

(3) Lessee shall develop, and submit as part of its mine plan, a reclamation plan specifically for those areas of disturbance defined as having low or very low reclamation potential. The plan must demonstrate to the complete satisfaction of the authorized officer that the lands can be reclaimed utilizing current technologies. The authorized officer shall deem the subject lands unsuitable for surface occupancy or disturbance if the plan does not adequately demonstrate a high probability for success of reclamation.

(4) As part of its mine plan, lessee shall submit social, economic and transportation impact data concerning offsite aspects of the proposed development including:

(A) The estimated number and type of employees the lease operations will require during phases of construction and operation and the specific years each number and type of employees will be required.

(B) The contemplated construction of transportation facilities and the estimated transportation model(s), route(s), and frequency, of trips for the extracted resources; and the estimated effect of any truck movement on the rate of roadway pavement deterioration, on the design life of the transportation mode, on the level of surface repair, and on overall safety to the motoring public.

(C) The estimated effect of the influx of population on the transportation system at the county and local level resulting from the proposed development.

(D) Lessee shall update the data annually to the satisfaction of the authorized officer until its operations reach a full or stable level. Lessee then shall update its data whenever it plans a major change in its operations (such as expansion, transportation mode change, closing, etc.) and prior to implementation of the change(s).