

CHAPTER 4

CUMULATIVE IMPACTS

Cumulative impacts are defined by the CEQ in 40 CFR, Subpart 1508.7s as “impacts on the environment which result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.”

Cumulative impacts can result from individually minor but collectively significant actions taking place over time. The analysis area for cumulative impact analysis is stated for each resource.

4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

Past actions considered are those whose impacts on one or more of the affected resources have persisted to today. Present actions are those occurring at the time of this evaluation and during implementation of the Proposed Action. Reasonably foreseeable future actions constitute those actions that are known or could reasonably be anticipated to occur in the project area, within a time frame appropriate to the expected impacts from the Proposed Action.

The primary past, present, and reasonably foreseeable future actions that would contribute to cumulative impacts of the Proposed Action are military training activities at NAS Fallon, continued use of existing unpaved roads in the FORGE project area, continued exploration and development of geothermal resources in leased areas, continued use of land use authorizations, the continued use of the emergency canal, and livestock grazing and ranching. **Table 4-1** identifies known past, present, and reasonably foreseeable future actions in the FORGE cumulative impacts assessment areas.

**Table 4-1
Past, Present, and Reasonably Foreseeable Future Actions**

Action	Location	Description	Completion Date
Existing geothermal exploration and monitoring	Project area and immediate vicinity	There are numerous geothermal exploration and monitoring wells in and around the project area, including four deep wells in the project area operated by Ormat.	Ongoing
Salt Wells Geothermal Project	Project area and vicinity	Proposed 120-megawatt geothermal power plant and transmission lines	Construction has not begun.
Enel Geothermal Power Plant		18-megawatt geothermal power plant, approximately 8 miles southeast of the project area	In operation
Newlands Project	Churchill, Lyon, Storey and Washoe Counties	Network of canals and irrigation ditches that provide water to agricultural lands in Lyon and Churchill Counties.	Operation and maintenance is ongoing
Emergency canal	Project area and immediate vicinity	Emergency flood relief canal that was constructed to relieve flooding in Carson Lake.	Spring 2017
Carson Lake and Pasture land transfer	Churchill County	In 1990, Congress passed Public Law 101-618, Section 206(e) of which authorizes the Secretary of the Interior to transfer title of the 22,700 acres comprising the Carson Lake and Pasture area to the State of Nevada to be managed by NDOW as a wildlife management area. The transfer is pending completion.	Transfer not completed
Livestock grazing	Project area and vicinity	There is grazing on the privately owned lands in the project area. This use is expected to continue.	Ongoing
NAS Fallon military training activities	Churchill County	Military training at NAS Fallon will continue on Navy lands next to the project area.	Ongoing
Grimes Point Archaeological Area	Approximately 2 miles east of the project area	The Grimes Point Archaeological Area and Petroglyph Trail, managed by the BLM, provides visitors with a self-guided interpretive trail experience.	Year-round visitation
Invasive, nonnative species and noxious weeds	Project area	Noxious weeds and nonnative species continue to contribute to the propagation of noxious weeds in the project area.	Ongoing
Churchill County Master Plan	Churchill County	The master plan establishes the County's vision for the future and provides a decision-making framework on matters relating to growth and development throughout the county.	2015

4.2 WATER RESOURCES

The cumulative impacts assessment area for surface water and groundwater is the Fallon FORGE project area, plus a 1-mile buffer.

Combined with the other past, present, and reasonably foreseeable future actions listed in **Table 4-1**, the Proposed Action would not result in cumulatively significant impacts on water quality and quantity. Water resources in the region of influence would be affected by reasonably foreseeable future actions, such as canal construction (e.g., the Newlands Project and the emergency canal), the Salt Wells Geothermal Project, and existing geothermal exploration and monitoring.

These projects would have impacts on water resources similar to those described for the Proposed Action. For example, the primary potential impacts from surface water quality would be short term from any additional construction completed at one or more of the well pads. Impacts on surface water could occur from increased erosion and sedimentation caused by ground disturbance and removal of vegetation; however, mitigation using BMPs would control these temporary impacts on surface water quality.

Implementing stipulations, applicable environmental protection measures, and best management practices outlined in **Section 3.4**, Water Resources, would minimize cumulative impacts on water resources. Examples are imposing the controlled surface use stipulation and complying with the stormwater pollution prevention plan. Additionally, the environmental protection measures in Appendix E of the Salt Wells EIS (included as **Appendix C** of this EA) would help prevent contamination of surface water and groundwater from additional drilling.

The use of groundwater from adjacent geothermal wells could cumulatively affect the quality and quantity of flows from the thermal spring (well 6) and seeps due to pumping, could reduce groundwater storage, and could modify deep groundwater flow paths and pressures. These impacts would occur during the period of deep groundwater pumping and for some time thereafter, until the affected deep groundwater system recovers to near equilibrium conditions.

Any surface water impacts would require a permit from the US Army Corps of Engineers; all mitigation measures outlined in the permit would be strictly adhered to, further minimizing cumulative impacts. Accordingly, based on potential impacts from past, present, and reasonably foreseeable future actions in the assessment area, no cumulatively significant impacts on water resources are anticipated from implementing the Proposed Action.

4.3 GEOLOGY

The cumulative impacts assessment area for geology is the same as that identified under the environmental consequences for the Proposed Action, which is the project area.

Geology in the region of influence would be affected by reasonably foreseeable future actions, such as canal construction (e.g., the Newlands Project and the emergency canal), Salt Wells Geothermal Project, and existing geothermal exploration and monitoring. These projects would have impacts on geology similar to those described for the Proposed Action. For example, direct impacts on surface geology would occur from the reasonably foreseeable future actions. This is because they likely would involve excavation, which would disturb the upper layers of the ground. These impacts would likely last until the beginning of any reclamation.

Under the Proposed Action, there would be direct and indirect impacts on geology and seismicity. The impacts would be negligible and minor.

The Proposed Action, when combined with the reasonably foreseeable future actions identified in **Table 4-1**, could have cumulative impacts on geology and seismicity. These would occur by constructing infrastructure and inducing microseismic events; however, it is not unreasonable to assume that continued exploration and development of geothermal resources would be implemented under practices similar to those of the Proposed Action that would minimize impacts on geology. Therefore, the cumulative impacts on geology and seismicity from the Proposed Action and the reasonably foreseeable future actions would be minor.

4.4 WETLANDS AND RIPARIAN AREAS

The cumulative impacts assessment area for wetlands and riparian areas is the Fallon FORGE project area, plus a 1-mile buffer.

Past, present, and reasonably foreseeable future actions listed in **Table 4-1** that have affected and would continue to affect wetlands and riparian areas in the assessment area are as follows: existing and future exploration and development of geothermal resources in leased areas, military training activities at NAS Fallon, continued use of unpaved roads in the project area, continued use of land use authorizations, and livestock grazing and ranching.

There are numerous geothermal exploration and monitoring wells in and around the project area, including four deep wells in the project area operated by Ormat. The proposed 120-megawatt Salt Wells Geothermal Project would also likely use geothermal resources in the analysis area. Implementing the Proposed Action, in combination with these present and reasonably foreseeable projects, could cumulatively affect wetland and riparian areas. Depending on the hydraulic connection between the geothermal resources and surrounding wetland areas, saturation and flow volumes supporting wetland areas could be altered by more geothermal wells. Altered flow characteristics could, in turn, alter wetland plant species composition, total wetland area, or surface or subsurface water levels in wetlands.

Combined with other past, present, and reasonably foreseeable future actions, the Proposed Action could also incrementally contribute to impacts on wetlands and riparian areas from wetland and riparian area disturbance or removal. Disturbance or removal may come about during well pad or other military, livestock grazing, or infrastructure construction or from increased sedimentation or weed spread into the areas facilitated by these activities.

Implementing stipulations and applicable environmental protection measures and best management practices outlined in **Section 3.6, Wetlands and Riparian Areas**, would minimize cumulative impacts on wetlands and riparian areas. Specifically, these stipulate no surface occupancy around wetland, surface water, riparian, and playa features, complying with the stormwater pollution prevention plan, minimizing vegetation removal, and preventing noxious weed spread.

Conducting a wetland delineation on federal lease lands would ensure compliance with the applicable lease stipulations relating to no surface occupancy. BLM approval of compliance would ensure impacts are minimized. Accordingly, based on potential impacts from past, present, and reasonably foreseeable future actions in the assessment area, no cumulatively significant impacts on wetlands and riparian areas are anticipated from implementing the Proposed Action.

If necessary, disturbance or fill in wetlands may require a permit from the US Army Corps of Engineers, and all mitigation measures outlined in the permit would be strictly adhered to, further minimizing cumulative impacts.

4.5 WILDLIFE AND KEY HABITAT

The cumulative impacts assessment area for wildlife and key habitat is the Fallon FORGE project area, plus a 1-mile buffer.

Past, present, and reasonably foreseeable future actions listed in **Table 4-1** that have affected and would continue to affect wildlife and key habitat in the assessment area are as follows:

- Military training at NAS Fallon
- Continued use of unpaved roads in the project area
- Continued exploration and development of geothermal resources in leased areas
- Continued use of existing land use authorizations
- Construction and use of Newlands Project irrigation canals and construction and use of the emergency canal
- Livestock grazing and ranching

The Carson Lake and Pasture Land Transfer (pending) would transfer management of the Carson Lake and Pasture to NDOW for wildlife habitat.

This would have a beneficial cumulative impact by maintaining or increasing the amount of high-quality habitat for general wildlife species in the assessment area.

Combined with other past, present, and reasonably foreseeable future actions, the Proposed Action would incrementally contribute to impacts on wildlife and key habitat. The primary potential impacts would come from key habitat disturbance or removal during well pad construction and from the potential interference with wildlife disturbance, injury, mortality, or movement.

Implementing stipulations and applicable environmental protection measures and best management practices outlined in **Section 3.7** would minimize cumulative impacts on wildlife and key habitat. These are stipulating no surface occupancy around wetlands and playa habitats, imposing measures to prevent noxious weed spread, providing environmental education for workers, preventing overland travel, avoiding sensitive habitats, minimizing vegetation removal, and using measures to prevent wildlife entrapment or injury.

Accordingly, based on potential impacts from past, present, and reasonably foreseeable future actions in the assessment area, no cumulatively significant impacts on wildlife and key habitat are anticipated from implementing the Proposed Action.

4.6 BLM SENSITIVE SPECIES

The cumulative impacts assessment area for BLM sensitive species is the project area, plus a 1-mile buffer.

Past, present, and reasonably foreseeable future actions listed in **Table 4-1** that have affected and would continue to affect BLM sensitive species in the sensitive species cumulative assessment area are as follows:

- Military training at NAS Fallon
- Continued use of unpaved roads in the project area
- Continued exploration and development of geothermal resources in leased areas
- Continued use of land use authorizations
- Construction and use of Newlands Project irrigation canals and construction and use of the emergency canal
- Livestock grazing and ranching

The Carson Lake and Pasture Land Transfer (pending) would transfer management of the Carson Lake and Pasture to NDOW for wildlife habitat. This would have a beneficial cumulative impact by maintaining or increasing the amount of high-quality habitat for BLM-sensitive species in the assessment area.

Combined with other past, present, and reasonably foreseeable future actions, the Proposed Action would incrementally contribute to impacts on BLM sensitive plants and wildlife. The primary impacts would be the potential for foraging habitat loss for raptors and bat species from habitat loss during well pad construction and the potential for disturbance during construction. The Proposed Action could also reduce the amount of suitable habitat for BLM-sensitive plants, either through habitat disturbance or weed establishment and spread.

Implementing stipulations and applicable environmental protection measures and best management practices outlined in **Section 3.8**, BLM Sensitive Species, would minimize cumulative impacts on these species. These measures are as follows: adhering to applicable measures in the approved avian protection plan for the Salt Wells projects, imposing the no surface occupancy stipulation around wetlands and playa habitats, implementing measures to prevent noxious weed spread, providing environmental education for workers, preventing overland travel, avoiding sensitive habitats, minimizing vegetation removal, and using measures to prevent wildlife entrapment or injury.

Accordingly, based on potential impacts from past, present, and reasonably foreseeable future actions in the assessment area, no cumulatively significant impacts on BLM sensitive species are anticipated from implementing the Proposed Action.

4.7 MIGRATORY BIRDS

The cumulative impacts assessment area for migratory birds is the project area, plus a 1-mile buffer.

Past, present, and reasonably foreseeable future actions that have affected and would continue to affect migratory birds in the cumulative assessment area are as follows:

- Military training at NAS Fallon and the NAS Fallon BASH program
- Continued exploration and development of geothermal resources in leased areas
- Construction of the Salt Wells Geothermal projects and construction and use of Newlands Project irrigation canals
- Construction and use of the emergency canal

The Carson Lake and Pasture Land Transfer (pending) would transfer management of the Carson Lake and Pasture to NDOW for wildlife habitat. This would have a beneficial cumulative impact by maintaining or increasing the amount of high-quality habitat for numerous species of migratory birds, including waterfowl, in the assessment area.

Combined with other past, present, and reasonably foreseeable future actions, the Proposed Action would incrementally contribute to impacts on migratory birds. The primary impacts would be the potential for habitat loss and disturbance or displacement from habitat during construction. Disturbance during the nesting season could result in songbird or waterfowl nest abandonment; however, conducting surveys for and avoiding nests would eliminate the potential for this.

Further, applicable environmental protection measures and best management practices would reduce or avoid impacts on migratory birds and their habitat. This would come about by providing environmental education for workers, preventing overland travel, minimizing vegetation removal, and implementing measures to prevent wildlife entrapment or injury.

Accordingly, based on potential impacts from past, present, and reasonably foreseeable future actions in the assessment area, no cumulatively significant impacts on migratory birds are anticipated from implementing the Proposed Action.

4.8 INVASIVE, NONNATIVE, AND NOXIOUS SPECIES WEED

The cumulative impacts assessment area for weeds is the Fallon FORGE project area, plus a 1-mile buffer.

Past, present, and reasonably foreseeable future actions listed in **Table 4-1** that have affected and would continue to affect weeds in the cumulative impacts assessment area are as follows:

- Military training activities at NAS Fallon
- Continued use of unpaved roads in the project area
- Continued exploration and development of geothermal resources in leased areas
- Continued use of land use authorizations
- Construction and use of Newlands Project irrigation canals and construction and use of the emergency canal
- Livestock grazing and ranching

Combined with other past, present, and reasonably foreseeable future actions, the Proposed Action would incrementally contribute to impacts on weeds. The primary potential impact would be the potential for weed establishment and spread during construction, resulting in surface disturbance and vegetation removal. Side-cast soils along the emergency canal would continue to provide suitable substrate for weed establishment and propagation throughout the project area.

Implementing stipulations and applicable environmental protection measures and best management practices outlined in **Section 3.10**, Invasive, Nonnative, and Noxious Weed Species, would minimize cumulative impacts. Even so, weeds would continue to become established due to canal disturbance, regardless of preventive weed measures incorporated into the Fallon FORGE project. New weed populations originating from this source may reduce the efficacy of adopted preventive measures, such as those from the approved Salt Wells projects.

4.9 NATIVE AMERICAN RELIGIOUS CONCERNS

The cumulative impacts study area for Native American religious concerns in the project area and surrounding lands that tribes and individual Native Americans value for religious or traditional cultural purposes. In this area, cumulative impacts have occurred on lands that have provided, and continue to provide, sustenance and spiritual and religious renewal for the indigenous people. Mineral development, water conveyance systems, cattle grazing, and other actions cumulatively have affected, or would affect, these resources and Fallon Paiute-Shoshone tribal tradition and lifeways.

No additional impacts are anticipated from the Proposed Action; therefore, no change in the nature, type, or extent of cumulative impacts is anticipated, when combined with reasonably foreseeable future actions.

4.10 LAND USE, AIRSPACE, AND ACCESS

The cumulative impacts assessment area for land use, airspace, and access is the same as that identified under impacts for the Proposed Action.

Past, present, and reasonably foreseeable future actions listed in **Table 4-1** that have affected and would continue to affect land use, airspace, and access in the cumulative impacts assessment area are military training activities at NAS Fallon (including within accident potential zones), continued use of existing and newly created unpaved roads in the project area, continued exploration and development of geothermal resources, continued use of existing land use authorizations, use of the emergency canal, and livestock grazing and ranching.

Combined with other past, present, and reasonably foreseeable future actions, the Proposed Action would incrementally contribute to impacts on land use, airspace, and access. The primary potential impact would be from conflicts with nearby land uses, from the increase or modification of access in the region of influence, or from the conflict with airspace safety zones designated by the Navy; however, any future projects would require approval from the land management agency with jurisdiction over the project lands. The projects would be developed to be consistent with federal, state, and local land use plans and policies; therefore, potential cumulative impacts on land uses, airspace, or access would be minimized.

There would be ongoing cumulative impacts on access through the project area from the emergency canal. Until new road crossings are constructed, or it is filled in, the canal would prevent through-travel on any access road that the canal bisects. Where the canal prevents access, there may be a cumulative impact on access in the project area, unless new roads can compensate for the loss of access.

Accordingly, based on potential impacts from past, present, and reasonably foreseeable future actions in the assessment area, no cumulatively significant impacts on land use, airspace, and access are anticipated from implementing the Proposed Action.

4.11 FARMLANDS (PRIME OR UNIQUE)

The region of influence for cumulative impacts on farmlands includes areas where soil would be directly disturbed in the Proposed Action area.

The largest threat to potential Prime Farmlands near Fallon is the removal of water rights. Changes in upstream water rights and the purchases of water rights in the area could change the number of water rights available. NAS Fallon has instituted a program to purchase and conserve adjacent lands in agricultural uses, and Churchill County has an easement purchasing program to promote farmland conservation. Residential development pressure has occurred but has been partially offset by the previously described conservation programs (BLM 2011a).

Due to the deficiency in precipitation (approximately 5 inches per year [Western Regional Climate Center 2016]), compared to evapotranspiration (over 60 inches per year [Western Regional Climate Center 1992]), irrigation is necessary for productive farming near Fallon; however, the Proposed Action would not divert irrigation water from agricultural application. Water needed for the EGS testing operations would be supplied from groundwater sources.

The Proposed Action, when combined with the reasonably foreseeable future actions identified in **Table 4-1**, could have cumulative impacts on potential Prime Farmlands. This would result from implementing activities or construction that would preclude lands from being used for agricultural purposes, such as construction of the Salt Wells Geothermal Project.

Also, projects that increase surface water availability for irrigation, such as construction of additional canals in the Newlands Project, could affect potential Prime Farmlands. Cumulative impacts on potential Prime Farmlands from the Proposed Action and the reasonably foreseeable future actions are expected to be minor.

4.12 SOCIOECONOMICS

The region of influence for cumulative impacts on socioeconomics is the same as that identified under the impacts for the Proposed Action, which is Churchill County.

Past, present, and reasonably foreseeable future actions that have affected and would continue to affect socioeconomics are regional employment and potential seismicity from EGS. Proposed actions, including future geothermal development (see **Table 4-1**), represent additional regional employment needs. The level of demand for employment would depend on the degree of overlap with the Proposed Action. Although the Proposed Action presents the potential for additional employment, particularly in the construction sector, the jobs would be either temporary or would only nominally increase the permanent population, employment, or spending in the region. The Proposed Action would not strain public services; therefore, contributions to cumulative impacts on socioeconomics would be minimal.

The potential for damage or disturbance from induced seismicity depends on the distance from the source and the magnitude of the seismic event. Implementing best practices to limit induced seismicity would reduce the level of cumulative impacts (see **Section 3.5**, Geology, for additional discussion of induced seismicity).

4.13 NO ACTION ALTERNATIVE

Under the No Action Alternative, there would be no additional wells drilled to support geothermal research. There would be no impacts on any of the identified resources or activities.

4.14 SUMMARY OF CUMULATIVE IMPACTS

All resource values have been evaluated for cumulative impacts. Cumulative impacts from implementing the Proposed Action or No Action Alternative have been determined to be negligible.

4.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The irreversible commitment of resources is described as the “loss of future options.” It applies primarily to nonrenewable resources, such as cultural resources, or resources that are renewable after a regeneration period, such as soil productivity. The term may also apply to the loss of an experience as an indirect impact of a permanent change in the nature or character of the land.

An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of production foregone is irretrievable, but the action is not irreversible. No irreversible and irretrievable commitment of resources is expected as a result of the Proposed Action.

4.16 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF THE HUMAN ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM NATURAL RESOURCE PRODUCTIVITY

Development and construction proposed to occur from implementing the Proposed Action is not expected to result in the types of impacts that would reduce environmental productivity, have long-term impacts on natural resources or resource uses, affect biodiversity, or narrow the range of long-term beneficial uses of the environment. As discussed in Chapter 3, the Proposed Action would not result in short- and long-term significant environmental effects.

Short-term uses of the environment associated with the Proposed Action would include constructing well pads and drilling production/injection and monitoring wells to support EGS activities. Project-related construction activities would result in localized, temporary impacts, such as noise from vehicles and well drilling. Noise from construction activities would be short-term and would not be expected to result in permanent damage or long-term changes in wildlife productivity or habitat use.