National Park Service
U.S. Department of the Interior
Great Sand Dunes National Park & Preserve
Mosca, Colorado

Boundary Piezometer Installation
Environmental Assessment

Revised July 2009

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Summary

Great Sand Dunes National Park & Preserve proposes to install 10 groundwater monitoring wells, known as piezometers to comply with the terms of a water right granted by the State of Colorado (Case Number 2004CW35, Water District 3) in August of 2008. This water right was acquired at the request of the US Congress in the Great Sand Dunes National Park & Preserve Act or 2000, P.L. 106-530. The Great Sand Dunes National Park & Preserve Act expanded the boundary of the former Great Sand Dunes National Monument to better protect the environments associated with the majestic dunes. An environment of prime importance is the local aquifers due to its influence on wide spread evaporite environments, stream flow, and the biological diversity. Much of the political interest in the boundary expansion was motivated by an overwhelming local desire to protect water resources of the area so the requirement to obtain a protective ground water right was directed by Congress.

This is the first non-consumptive water right issued by the State of Colorado and the water right application included a plan on how such a water right would be managed. The plan listed the placement of ten piezometers along the south, west, and north park boundaries to collect baseline water data and monitor any potential change in water levels. A piezometer is a small diameter pipe intended to measure water pressure in an aquifer. These sites were chosen for their position along the boundary where the potential for external changes to the system are likely to be noticed first. The western boundary is the critical area to measure because it is where the aquifer interfaces with land outside the park boundary. To the east, the extent of the aquifer is beneath lands managed by the National Park Service and isolated by the bedrock along the edge of the basin.

This environmental assessment has been prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet objectives of the proposal, 2) evaluates potential issues and impacts to Great Sand Dunes National Park & Preserve's resources and values, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. Resource topics included in this document that may have negligible or minor effects include: topography, geology, and soils; vegetation; wildlife, water resources, archeological resources; and soundscape management. All other resource topics were dismissed because the project would have negligible to no impact to those resources. No major effects are anticipated as a result of this project.

This environmental assessment evaluates two alternatives: a no-action alternative and an action alternative. Public scoping was conducted to assist with the development of this document and any comments are received are incorporated into this document.

Public Comment

If you wish to comment on the environmental assessment, you may mail comments to: Superintendent; Great Sand Dunes National Park & Preserve, 11500 Hwy 150, Mosca, CO 81146.

This environmental assessment would be on public review for 30 days. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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Cover photo by Kris Illenberger

PURPOSE AND NEED

Introduction

Great Sand Dunes National Park & Preserve (park) is located in south-central Colorado, 25 miles northeast of the town of Alamosa, Colorado. It was originally established as Great Sand Dunes National Monument in March 17, 1932 and later expanded by the Great Sand National Park & Preserve Act, November 22, 2000. An area of 149,513 acres is managed by the National Park Service (NPS) to preserve and protect a geologically and hydrologically fascinating environment and the ecosystems associated with it. It is also the NPS intent to interpret the park's story and provide for the enjoyment of the visiting public.

The purpose of this environmental assessment is to examine the environmental impacts associated with the proposal to install ten piezometers at Great Sand Dunes National Park & Preserve. A piezometer is a small diameter pipe intended to measure water pressure in an aquifer. The benefit of this project is to quantify and qualify water levels to establish baseline and ongoing data to record water level gains and losses in support of Court decreed water rights. The piezometers would be situated along the western half of the park boundary and are mandated by the Colorado District 3 Water Court to quantify and manage a newly acquired water right. This environmental assessment was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, regulations of the Council on Environmental Quality (CEQ) (40 CFR §1508.9), and the National Park Service Director's Order (DO)-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-Making*).

Background

Water resource concerns have been at the forefront in the NPS management of Great Sand Dunes for the past few decades. It began in the 1980s when the 100,000 acre Baca Ranch, located northwest of the park, was purchased by American Water Development Inc. (AWDI). AWDI intended to develop a commercial water production project that would pump 200,000 acre-feet of water annually. The project planning included computer modeling of the effect pumping that volume of water would have on the aquifer. The model estimated that after 20 years of pumping, water levels at Great Sand Dunes would be lowered by 50 to 150 feet. The potential for such a change alarmed the park management, who found that a lack of resource knowledge and hydrological data, made evaluating such a threat difficult.

A large scale research and monitoring effort to fill the information gap was begun by the NPS. The information gained has greatly benefited NPS management in its effort to protect the park resources and accomplish the NPS mission, as decisions could be made based on data instead of speculation.

In the AWDI case, when the company applied for a permit for commercial water development, the NPS and others objected to it. The NPS held water rights on streams within its boundary and a direct relationship between the streams and groundwater was established. AWDI wasn't able to demonstrate to the Colorado District 3 Water Court that it could pump the water it proposed without injuring the water rights that existed in the park and the permit was denied.

Additionally, this information led the NPS to the realization that the dunes were a small part of a larger sand system that included a somewhat complete hydrologic cycle. That led to a multi-agency/Congressional effort to expand the boundary managed by the NPS so that more of the system could be protected. Congress passed the Great Sand Dunes National Park and Preserve Act of 2000, P.L. 106-530, and the area of the park increased by four times, extending from the center

of a valley floor to the crest of the nearby mountains. With the expanded boundary came the authorization to acquire land within the boundary and the Baca Ranch was purchased by the Federal Government, removing the potential for commercial water development for that land parcel.

Water is a prized commodity in the western United States and a critical component of the environment. Great Sand Dunes understands this and has been active in hydrological investigations and water rights management. It values the fundamental insight to the natural system that understanding the water provides and the high level of protection offered to the natural system by holding and maintaining water rights.

Purpose and Need

The National Park Service applied for and received an in-place water right (Case Number 2004CW35, Colorado Water District 3, August 2008) for the groundwater beneath Great Sand Dunes National Park & Preserve (park). This is the first non-consumptive water right issued by the State of Colorado. A typical groundwater right is a well permit that must be pumped to meet the requirements of the permit. The water right obtained for the park is non-consumptive and intended to maintain natural water levels for the benefit of natural processes. The right does not require that water be pumped. Since the water right is the first of its kind, a plan to manage the water right was included in the application. To meet the requirement of the Colorado Water Court and the Colorado Division of Water Resources (the agency that manages water rights), the value of the water right must be quantified. The elevation of the water table and the water in the aquifer should be accurately measured in order for the water right to be defined and/or used to halt injury from a junior water right or future water right application.

To quantify the value of the right, the application requires that 10 permanent "boundary piezometers" be installed along the southern, western, and northern park boundaries, Figure 1. It is expected that the water levels would fluctuate seasonally, annually, and based on their proximity to streams and the flow of that stream. As a condition of the water right, the NPS would monitor water levels in the boundary piezometers for 10 years, reporting the results to the Colorado Division of Water Resources four times a year. After 10 years of data has been collected, a decreed value of the water right would be issued. The quantification would take into account the natural variation in water levels during the 10 year data record.

Accurate data is also critical in the management of the water right. Colorado has a priority based water right system and once an adjudication date and amount of a water right are set, younger water rights or future water right applications should not injure the water right. In order to demonstrate injury, a continuous water level record should be maintained. A continuous water record for a piezometer may range from monthly to hourly measurements depending on the measurement technique. The key is to document the position of the water table over time. So having a water right is important, but if there is no data associated with the right, then decisions on how to resolve issues cannot be made.

The water right is defined for an extensive area. Piezometers at multiple sites are needed to provide an effective picture of the nature of groundwater variations and to isolate potential sources of change. Multiple piezometers also provide the opportunity to detect changes in their early stages.

Relationship to Other Plans and Policies

Current plans and policy that pertain to this proposal include the Great Sand Dunes National Park and Preserve Act of 2000, Colorado District Water Court Case Number 2004CW35, and the 2006 General Management Plan/Wilderness Study/Environmental Impact Statement for Great Sand Dunes National Park and Preserve. Following is more information on how this proposal meets the goals and objectives of these plans and policies:

- This project is directed by Colorado District Water Court Case 2004CW35 in order to fulfill the requirements of a water right application issued by the court. Paragraphs 43 to 55 describe in detail the in-place ground water right and are too lengthy to be listed here. The Judgment and Decree states: Paragraph 64. "The Court will retain jurisdiction for a period of 10 years after the piezometers described in paragraphs 44, and 45 are constructed for the limited purpose of correcting the locations and elevations of these monitoring piezometers, and refining the accuracy of the maximum ground water table elevation extrapolations set forth in Table 1 based upon new data obtained from the piezometers or other reliable information. The additional data from the piezometers should allow more accurate extrapolation of the historical maximum water table elevation at the Park boundary. Because the maximum water table elevation subject to this decree would be limited by historical maximums prior to June 11, 2007, adjustments to the maximum ground water table elevations set forth in Table 1 based upon new data obtained from the piezometers or other reliable information shall not be considered a change or amendment of the water right decreed herein. The United States may, upon request, extend the period of retained jurisdiction for up to an additional 10 years for the limited purpose of obtaining additional data with which to further refine the accuracy of the maximum ground water table elevation extrapolation at these locations. Any party hereto may seek to invoke the Court's retained jurisdiction by filing a Motion setting forth the new data or other reliable information justifying the exercise of the Court's retained jurisdiction. The Motion shall be served upon all parties or their successors." Paragraph 65. "The United States will provide water table elevation data from its piezometers described herein to the Division Engineer on a quarterly basis."
- The water right application listed above was directed by Congress in the Great Sand Dunes National Park and Preserve Act of 2000. "In carrying out this Act, the Secretary shall obtain and exercise any water rights required to fulfill the purposes of the national park and the national preserve in accordance with the following previsions:

  (A) Such water rights shall be appropriated, adjudicated, changed and administered pursuant to the procedural requirements and priority system of laws of the State of Colorado

  (B) The purposes and other substantive characteristics of such water rights shall be established pursuant to State law, except that the Secretary is specifically authorized to appropriate water under this Act exclusively for the purpose of maintaining ground water levels, surface water levels, and stream flows on, across, and under the national park and national preserve, in order to accomplish the purposes of the national park and the national preserve and to protect park resources and park uses."
- This project is consistent with the Great Sand Dunes National Monument Water Resources Management Plan, 1997, and the Great Sand Dunes National Park and Preserve General Management Plan, 2006, for reaching desired conditions for dunes and biological diversity. More specifically it includes cooperating with partners and using science for ecosystem management, doing research and monitoring to understand natural resources and document diversity, and to actively manage water rights and monitor water quantity.

Appropriate Use

Section 1.5 of *Management Policies* (2006), "Appropriate Use of the Parks," directs that the National Park Service must ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts on, park resources and values. A new form of park use may be allowed within a park only after a determination has been made in the professional judgment of the park manager that it will not result in unacceptable impacts.

Section 8.1.2 of *Management Policies* (2006), Process for Determining Appropriate Uses, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for":

- consistency with applicable laws, executive orders, regulations, and policies;
- consistency with existing plans for public use and resource management;
- actual and potential effects on park resources and values;
- total costs to the Service; and
- whether the public interest will be served.

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts. If unanticipated and unacceptable impacts emerge, the park manager must engage in a thoughtful, deliberate process to further manage or constrain the use, or discontinue it.

From Section 8.2 of *Management Policies*: "To provide for enjoyment of the parks, the National Park Service will encourage visitor use activities that

- are appropriate to the purpose for which the park was established, and
- are inspirational, educational, or healthful, and otherwise appropriate to the park environment; and
- will foster an understanding of and appreciation for park resources and values, or will promote enjoyment through a direct association with, interaction with, or relation to park resources; and
- can be sustained without causing unacceptable impacts to park resources and values."

Section 1.8 of Management Policies (2006) directs that the National Park Service has an obligation to demonstrate and work with others to promote leadership in environmental stewardship. The Park Service must set an example not only for visitors, other governmental agencies, the private sector, and the public at large, but also for a worldwide audience. Touching so many lives, the Service's management of the parks presents a unique opportunity to awaken the potential of each individual to play a proactive role in protecting the environment.

Sections 4.6 of Management Policies (2006) direct that the National Park Service will perpetuate surface waters and groundwaters as integral components of park aquatic and terrestrial ecosystems. Water for the preservation and management of the national park system will be obtained and used in accordance with legal authorities. This project would directly affect the preservation and management of the park's water resources. This document provides an analysis of why this project meets appropriate use criteria.

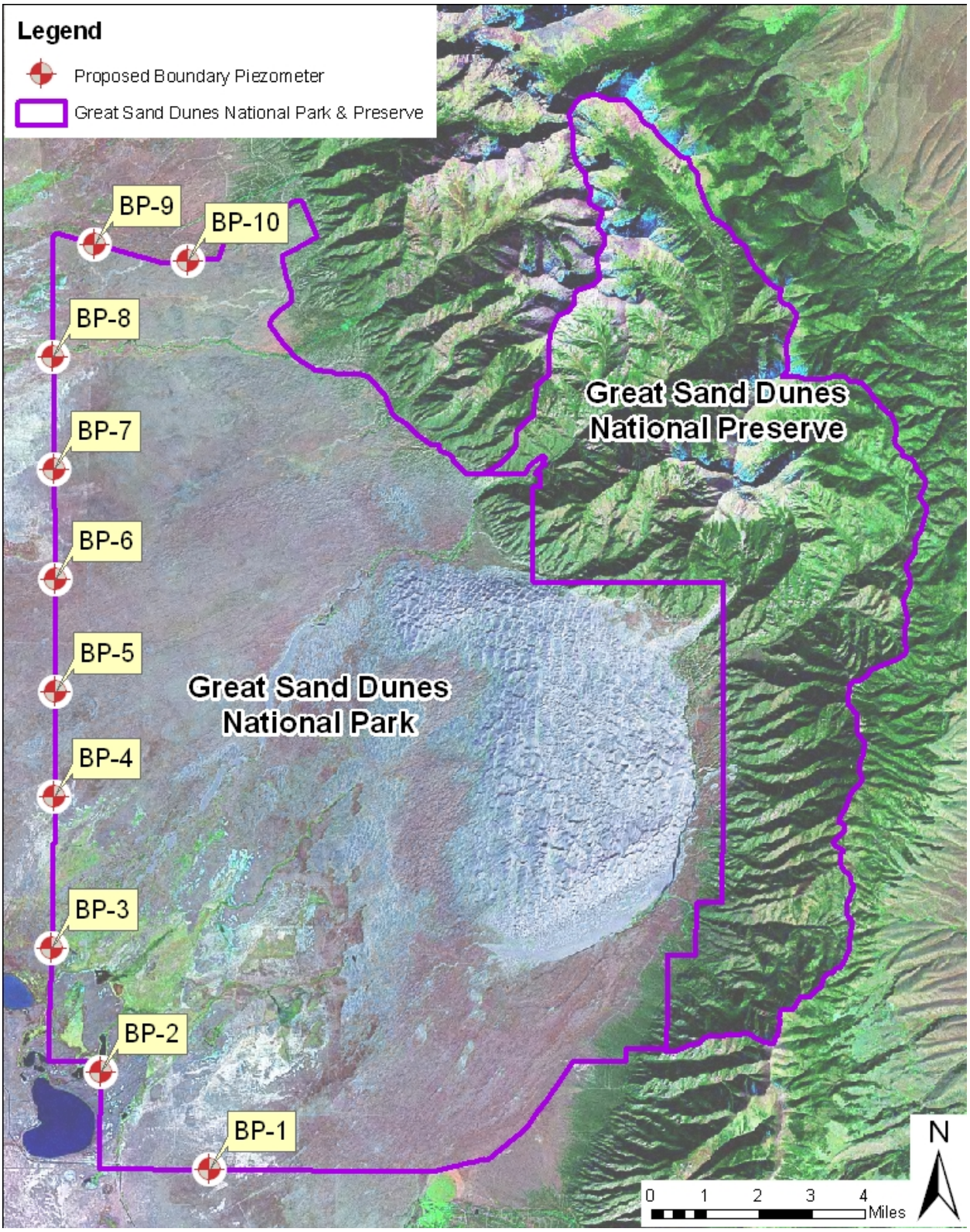
Public Scoping

Scoping is a process to identify the resources that may be affected by a project proposal, and to explore possible alternative ways of achieving the proposal while minimizing adverse impacts. Great Sand Dunes National Park & Preserve conducted both internal scoping with appropriate National Park Service staff and external scoping with the public and interested/affected groups and agencies.

Internal scoping was conducted by an interdisciplinary team of professionals from Great Sand Dunes National Park & Preserve, the National Park Service Water Resources Division, and HRS Water Consultants, Lakewood, CO. Interdisciplinary team members met on October 27, 2008 to discuss the logistics of the project; various alternatives; potential environmental impacts; past, present, and reasonably foreseeable projects that may have cumulative effects; and possible mitigation measures. Team members also conducted a site visit to view and evaluate the proposed sites for the piezometers.

External (public) scoping was conducted July 20-27, 2009 and any response(s) are included in this document. The National Park Service conducted scoping to plan and analyze the effects of this project on various resources. The impacts on topography, geology, & soils, vegetation, wildlife, water resources, archeological resources, and soundscape managed were considered. Any negative effects were found to be minor and of short duration. These topics were conveyed to the public and no other issues were raised by the public in this external scoping.

Figure 1 – Project Location showing piezometer locations described in the water right application.



Impact Topics Retained for Further Analysis

Impact topics for this project have been identified on the basis of federal laws, regulations, and orders; 2006 *Management Policies*; and National Park Service knowledge of resources at Great Sand Dunes National Park & Preserve. Impact topics that are carried forward for further analysis in this environmental assessment are listed below along with the reasons why the impact topic is further analyzed. For each of these topics, the following text also describes the existing setting or baseline conditions (i.e. affected environment) within the project area. This information will be used to analyze impacts against the current conditions of the project area in the *Environmental Consequences* chapter.

Topography, Geology, and Soils

According to the National Park Service's 2006 *Management Policies*, the National Park Service will preserve and protect geologic resources and features from adverse effects of human activity, while allowing natural processes to continue (NPS 2006). These policies also state that the National Park Service will strive to understand and preserve the soil resources of park units and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources.

The proposed project does involve soil disturbance. The process of installing a piezometer requires driving to a site, setting up a mechanical piezometer drilling operation, and excavation of the piezometer. Most sites are along existing roads, but 3 sites would require an off road drive of up to half a mile. At the piezometer site the disturbed footprint is typically less than 1,600 square feet. The piezometers are expected to be shallow, less then 200 feet deep and a spoils pile would accumulate at the surface. The spoils would be used to backfill the piezometer with little net material remaining at the surface. Occupation at any site should be no longer than a day or two.

All of the project sites are located on sand sheet type deposits. These are mostly loose sand that is partly stabilized by vegetation. Since the project has the potential to affect the stability of the sand near the piezometer, this topic has been retained for further analysis in the remainder of this document.

Vegetation

According to the National Park Service's 2006 *Management Policies*, the National Park Service strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of plants (NPS 2006). The existing vegetation in the project area primarily consists of grasses and shrubs including Indian rice grass, blowout grass, ring muhly, greasewood, and rubber rabbit brush. The most abundant forbs are surf pea and sunflowers.

The proposed project does involve trampling of vegetation at the piezometer site and where off road driving is required. As described in the preceding soils section, the stability of the sand in this are is dependent on the growth of vegetation. Since this project has the potential to impact vegetation, this topic has been retained for further analysis in the remainder of this document.

Wildlife

According to the National Park Service's *2006 Management Policies*, the National Park Service strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of animals (NPS 2006). Wildlife commonly found in the project area includes elk, pronghorn, rabbits, mice, and horned lizards. At sites with nearby wetlands, water fowl and amphibians are common. There are also numerous insect species and domestic bison.

Piezometer installation is a noisy and visual endeavor that is likely to be noticed by any nearby wildlife. The proposed project is in and traverses wildlife habitat so this topic has been retained for further analysis in the remainder of the document.

Water Resources

National Park Service policies require protection of water quality consistent with the Clean Water Act. The purpose of the Clean Water Act is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To enact this goal, the U.S. Army Corps of Engineers has been charged with evaluating federal actions that result in potential degradation of waters of the United States and issuing permits for actions consistent with the Clean Water Act. The U.S. Environmental Protection Agency also has responsibility for oversight and review of permits and actions, which affect waters of the United States.

Several of the piezometer locations are in the vicinity of seasonally flooded areas. Most locations are in areas that are normally dry, except for brief run off after heavy rain events. The effect of the project on surface water is a minor concern, but since the drilling would penetrate into the underlying aquifer, and its use as a water resource management tool, this topic has been retained for further analysis in the remainder of the document.

Archeological Resources

The National Park Service, as steward of many of America's most important cultural resources, is charged to preserve cultural resources for the enjoyment of present and future generations. Management decisions and activities throughout the National Park System must reflect awareness of the irreplaceable nature of these resources. The National Park Service will protect and manage cultural resources in its custody through effective research, planning, and stewardship and in accordance with the policies and principles contained in the 2006 *Management Policies* and the appropriate Director's Orders.

Section 106 of the National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq*.); the National Park Service's Director's Order-28 *Cultural Resource Management Guideline*; and National Park Service 2006 *Management Policies* require the consideration of impacts on historic properties that are listed on or eligible to be listed in the National Register of Historic Places. The National Register is the nation's inventory of historic places and the national repository of documentation on property types and their significance. The above-mentioned policies and regulations require federal agencies to coordinate consultation with State Historic Preservation Officers regarding the potential effects to properties listed on or eligible for the National Register of Historic Places.

In addition to the National Historic Preservation Act and the National Park Service 2006 *Management Policies*, the National Park Service's Director's Order-28B *Archeology* affirms a long-term commitment to the appropriate investigation, documentation, preservation, interpretation, and protection of archeological resources inside units of the National Park System. As one of the principal stewards of America's heritage, the National Park Service is charged with the preservation of the commemorative, educational, scientific, and traditional cultural values of archeological resources for the benefit and enjoyment of present and future generations. Archeological resources are nonrenewable and irreplaceable, so it is important that all management decisions and activities throughout the National Park System reflect a commitment to the conservation of archeological resources as elements of our national heritage.

The sandsheet area is known to contain cultural resources. In general they are found in deflation areas and the site selection has avoided such areas. Since there are cultural resources and the National Historic Preservation Act needs to be addressed, this topic will be evaluated.

Soundscape Management

In accordance with 2006 *Management Policies* and Director's Order-47 *Sound Preservation and Noise Management*, an important component of the National Park Service's mission is the preservation of natural soundscapes associated with national park units (NPS 2006). Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among National Park Service units as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas.

Piezometer installation does require mechanical installation with equipment that runs on diesel engines. The occupation time at each site should be a partial day, but the area is isolated and the sound of a diesel engine running would alter the soundscape, so this topic will be analyzed.

Impact Topics Dismissed From Further Analysis

Some impact topics have been dismissed from further consideration, as listed below. During internal scoping, the park's interdisciplinary team conducted a preliminary analysis of resources to determine the context, duration, and intensity of effects that the proposal may have on those resources. If the magnitude of effects was determined to be at the negligible or minor level, there is no potential for significant impact and further impact analysis is unnecessary, therefore the resource is dismissed as an impact topic. If however, during internal scoping and further investigation, resource effects still remain unknown, or are more at the minor to moderate level of intensity, and the potential for significant impacts is likely, then the analysis of that resource as an impact topic is carried forward.

For purposes of this section, an impact of negligible intensity is one that is "at the lowest levels of detection, barely perceptible, and not measurable." An impact of minor intensity is one that is "measurable or perceptible, but is slight, localized, and would result in a limited alteration or a limited area." The rationale for dismissing these specific topics is stated for each resource.

Special Status Species

The Endangered Species Act of 1973 requires examination of impacts on all federally-listed threatened, endangered, and candidate species. Section 7 of the Endangered Species Act requires all federal agencies to consult with the U.S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. In addition, the 2006 *Management Policies* and Director's Order-77 *Natural Resources Management Guidelines* require the National Park Service to examine the impacts on federal candidate species, and state-listed threatened, endangered, candidate, rare, declining, and sensitive species (NPS 2006). For the purposes of this analysis, the U.S. Fish and Wildlife Service, Lakewood, Colorado office, and the Colorado Division of Wildlife in Monte Vista, Colorado were contacted with regards to federally- and state-listed species to determine those species that could potentially occur on or near the project area.

There are three state listed special status species found in the park. The Rio Grande sucker, Catostomus plebeius, is a state listed endangered species. The Rio Grande cutthroat, Oncorhynchus clarkii virginalis, and leopard frog, Rana pipiens, are state listed species of species of special concern, which is not a statutory category. Of those three species, only the leopard frog is

found in the area of the proposed piezometers. Two piezometers, BP2 & BP3 are within a quarter mile of ponds which are potential habitat to the leopard frog, but they are sited on upland, sandy areas that would not be a suitable environment for the frogs. Because of the distance from water and the sand sheet environment that is not habitat for amphibians, it is unlikely that frog habitat would be altered so this topic is dismissed from further consideration. This project does have great potential to benefit aquatic populations such as the leopard frog. This water right is intended to protect water resources so they are maintained in a natural state, including the wetlands where the frogs live. The data the piezometers would provide also offer insight to the status and behavior of their environment.

Floodplains

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100-year floodplain unless no other practicable alternative exists. The National Park Service under 2006 *Management Policies* and Director's Order 77-2 *Floodplain Management* will strive to preserve floodplain values and minimize hazardous floodplain conditions. According to Director's Order 77-2 *Floodplain Management*, certain construction within a 100-year floodplain requires preparation of a statement of findings for floodplains.

The project area for the piezometers is not within a 100-year floodplain; therefore, a statement of findings for floodplains will not be prepared. Further, there would be no unacceptable impacts to floodplains; the proposed actions are consistent with §1.4.7.1 of NPS *Management Policies* 2006. Because there are no floodplains in the project area, and thus there would be no unacceptable impacts, this topic is dismissed from further analysis in this document.

Wetlands

For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

Executive Order 11990 *Protection of Wetlands* requires federal agencies to avoid, where possible, adversely impacting wetlands. Further, §404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate, through a permitting process, discharge or dredged or fill material or excavation within waters of the United States. National Park Service policies for wetlands as stated in 2006 *Management Policies* and Director's Order 77-1 *Wetlands Protection* strive to prevent the loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In accordance with DO 77-1 *Wetlands Protection*, proposed actions that have the potential to adversely impact wetlands must be addressed in a statement of findings for wetlands.

Piezometers, BP2 and BP3 are located within a quarter mile of seasonally flooded wetlands. All other piezometers are at a greater distance from wetlands. The installation and operation of the piezometers is localized and shouldn't affect any wetlands so they will not be retained for further analysis. Wetlands management and understanding should benefit greatly by this project.

Ethnographic Resources

National Park Service's Director's Order-28 *Cultural Resource Management* defines ethnographic resources as any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it. According to DO-28 and Executive Order 13007 on sacred sites, the National Park Service should try to preserve and protect ethnographic resources.

Ethnographic resources are not known to exist in the proposed project area based on the lack of cultural materials present. In addition, Native American tribes traditionally associated the park were apprised of the proposed project in a letter dated May 18, 2009, and two responses were received from these tribes. These responses confirmed their cultural affiliations with the area, but indicated that no impacts to significant ethnographic resources are expected. Further, such negligible impacts would not result in any unacceptable impacts; the proposed actions are consistent with §1.4.7.1 of NPS *Management Policies* 2006. Because these effects are minor or less in degree and would not result in any unacceptable impacts, this topic is dismissed from further analysis in this document.

Cultural Landscapes

According to the National Park Service's Director's Order-28 *Cultural Resource Management Guideline*, a cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. Although a cultural landscape inventory has not been conducted for the monument, the features within the general project area, including the existing administration prefabricated building and two yurt structures, are temporary in nature and not likely to contribute to a significant cultural landscape. Further, since these structures are not likely to contribute to a significant cultural landscape, no unacceptable impacts would occur; the proposed actions are consistent with §1.4.7.1 of NPS *Management Policies* 2006. Because no contributing structures are likely present within the project area, there would be no unacceptable impacts to cultural landscapes; this topic is dismissed from further analysis in this document

Museum Collections

According to Director's Order-24 *Museum Collections,* the National Park Service requires the consideration of impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript material), and provides further policy guidance, standards, and requirements for preserving, protecting, documenting, and providing access to, and use of, National Park Service museum collections.

The project area is not located near any museum collections and will not involve any museum collections. This topic is dismissed from further analysis in this document.

Air Quality

The Clean Air Act of 1963 (42 U.S.C. 7401 *et seq.*) was established to promote the public health and welfare by protecting and enhancing the nation's air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associated with National Park Service units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. Florissant Fossil Beds National Monument is designated as a Class II air quality area under the Clean Air Act. A Class II designation indicates the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter as specified in §163 of the Clean Air Act. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts (EPA 2000).

Piezometer installation activities could result in temporary increases of vehicle exhaust, emissions, and fugitive dust in the general project area. Any exhaust, emissions, and fugitive dust generated from piezometer installation activities would be temporary and localized and would likely dissipate

rapidly because air stagnation at Great Sand Dunes National Park & Preserve is rare. Overall, the project could result in a negligible degradation of local air quality, and such effects would be temporary, lasting only as long as construction. The Class I air quality designation for Great Sand Dunes National Park & Preserve would not be affected by the proposal. Further, because the Class II air quality would not be affected, there would be no unacceptable impacts; the proposed actions are consistent with §1.4.7.1 of NPS *Management Policies* 2006. Because there would be no effects on air quality, and the proposed actions would not result in any unacceptable impacts, this topic is dismissed from further analysis in this document.

Lightscape Management

In accordance with 2006 *Management Policies*, the National Park Service strives to preserve natural ambient lightscapes, which are natural resources and values that exist in the absence of human caused light (NPS 2006). Great Sand Dunes National Park & Preserve strives to limit the use of artificial outdoor lighting to that which is necessary for basic safety requirements. The park also strives to ensure that all outdoor lighting is shielded to the maximum extent possible, to keep light on the intended subject and out of the night sky. The visitor center and the existing administration building are the primary sources of light in the park.

The proposed action would largely be a daytime operation. Use of vehicle lights may occur if travel from the site occurs at dusk or after dark. Such negligible impacts would not result in any unacceptable impacts; the proposed actions are consistent with §1.4.7.1 of NPS *Management Policies* 2006. Because these effects are minor or less in degree and would not result in any unacceptable impacts, this topic is dismissed from further analysis in this document.

Socioeconomics

The proposed action would neither change local and regional land use nor appreciably impact local businesses or other agencies. Implementation of the proposed action could provide a negligible beneficial impact to the economies of nearby Alamosa, Colorado, in Alamosa County, due to minimal increases in lodging and dining by the piezometer installation contractor. Any increase in workforce and revenue, however, would be temporary and negligible, lasting only as long as the piezometer installation. Because the impacts to the socioeconomic environment would be negligible, this topic is dismissed.

Prime and Unique Farmlands

The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conversion of these lands to non-agricultural uses. Prime or unique farmland is classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), and is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. According to the NRCS, the project area does not contain prime or unique farmlands (NRCS 2003). Because there would be no effects on prime and unique farmlands, this topic is dismissed from further analysis in this document.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by the Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources at Great Sand Dunes National Park and Preserve. The lands comprising the park are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Because there are no Indian trust resources, this topic is dismissed from further analysis in this document.

Environmental Justice

Executive Order 12898 *General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Because this project would involve a small crew to drill and install the wells and these workforces would not be hired based on their race or income, the proposed action would not have disproportionate health or environmental effects on minorities or low-income populations or communities. Because there would be no disproportionate effects, this topic is dismissed from further analysis in this document.

Park Operations

The administrative functions for the park are currently in the eastern half of the park. This project is in the western half of the park and wouldn't be noticed by the park staff. Five of the ten piezometers are within an inholding held by The Nature Conservancy. Ranch operations occur there and the ranchers would be informed of this project and have the opportunity to comment on how it may affect their operations.

This project would not have a measurable effect on the park's staff and how/where they conduct their work. For these reasons, the topic of park operations has been dismissed from further analysis in this document.

Historic Structures

The National Park Service, as steward of many of America's most important cultural resources, is charged to preserve historic properties for the enjoyment of present and future generations. Management decisions and activities throughout the National Park System must reflect awareness of the irreplaceable nature of these resources. The National Park Service will protect and manage cultural resources in its custody through effective research, planning, and stewardship and in accordance with the policies and principles contained in the 2006 *Management Policies* and the appropriate Director's Orders.

Section 106 of the National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq.*); the National Park Service's Director's Order-28 *Cultural Resource Management Guideline*; and National Park Service *2006 Management Policies* require the consideration of impacts on historic properties that are listed on or eligible to be listed in the National Register of Historic Places. The National Register is the nation's inventory of historic places and the national repository of documentation on property types and their significance. The above-mentioned policies and regulations require federal agencies to coordinate consultation with State Historic Preservation Officers regarding the potential effects to properties listed on or eligible for the National Register of Historic Places.

The term "historic structures" refers to both historic and prehistoric structures, which are defined as constructions that shelter any form of human habitation or activity. The project area contains no historic structures and this topic will not be addressed by this proposal.

Paleontological Resources

According to 2006 *Management Policies*, paleontological resources (fossils), including both organic and mineralized remains in body or trace form, will be protected, preserved, and managed for public education, interpretation, and scientific research (NPS 2006).

Paleontological resources in the project area are minimal. The sandy environment is abrasive and oxidizing and does not lend itself to the preservation of fossils. It is also a young environment and signs of past life found here are better classified as archeological resources and addressed in the archeology discussion. They include features such as grinding stones, lithic points, animal tooth enamel, and human skeletal remains. Since the area lacks the more classic fossils, this topic has been dismissed from further analysis in this document.

Visitor Use and Experience

According to 2006 *Management Policies*, the enjoyment of park resources and values by people is part of the fundamental purpose of all park units (NPS 2006). The National Park Service is committed to providing appropriate, high quality opportunities for visitors to enjoy the parks, and will maintain within the parks an atmosphere that is open, inviting, and accessible to every segment of society. Further, the National Park Service will provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks. The National Park Service 2006 *Management Policies* also state that scenic views and visual resources are considered highly valued associated characteristics that the National Park Service should strive to protect (NPS 2006).

Because this area is not accessible to the public, other than on foot, there is little to no effect on visitor use and experience. As a hiking landscape, visitors are drawn to the dunes, mountains, and creeks; but not along the boundary with the Fish and Wildlife Service and the irrigated meadows therein. For this reason, visitor use and experience is not considered a topic for inclusion in this document.

ALTERNATIVES CONSIDERED

During summer/fall of 2008, an interdisciplinary team of National Park Service employees, consulting hydrologists, and Department of Justice lawyers met for the purpose of developing project alternatives. This meeting resulted in the definition of project objectives as described in the *Purpose and Need,* and a list of alternatives that could potentially meet these objectives. A total of four action alternatives and the no-action alternative were originally identified for this project. Of these, three of the action alternatives were dismissed from further consideration for various reasons, as described later in this chapter. One action alternatives and the no-action alternative are carried forward for further evaluation in this environmental assessment. A summary table comparing alternative components is presented at the end of this chapter.

Alternatives Carried Forward

Alternative A – No-Action

Under this alternative, the piezometers would not be installed and ground water data from the US Bureau of Reclamation (BoR) Closed Basin Project would be used (Figure 2). This would result in the NPS not complying with the terms of the water right. The court requires that 10 years of data be collected at the locations within the Park boundary to quantify the water right. Without quantification, the water right would be undefined and much less effective should it be needed in future water issues. Also, if water measurements are lacking, the Colorado Division of Water Resources considers the water right would not be administrable, meaning that the NPS could not claim injury. Another problem with the BoR monitoring wells is they are within the BoR Closed Basin Project boundary where water elevations vary in response to the project's pumping and they would not represent the natural levels needed to quantify the water right.

Alternative B – Full Installation of Piezometers with Relocation of Six of the Ten Piezometers

This alternative consists of installing 10 piezometers along the south, west, and north Great Sand Dunes National Park boundary. The location of six of the ten piezometers has been modified from the water right proposal with permission from the Colorado District 3 Water Engineer. The district engineer has the authority to do that if he/she feels that the new location meets the requirements of the water right. The decision to move these piezometers was made by park personnel so that the five off road piezometers (BP-2, BP-6, BP-7, BP-8, & BP-10) are adjacent to existing road ways to minimize off-road disturbance. Another piezometer, BP-1 was also moved to avoid an archeological site. The maximum distance that any piezometer would be moved from its original proposed site would be 0.6 miles.

The water right was issued for the uppermost aquifer of the area, known as the unconfined aquifer. Each piezometer location was selected to represent and monitor aquifer conditions at a specific site. They are on the down gradient edge of the aquifer along or near the park boundary at the interface with the aquifer outside the park. Any impacts due to groundwater pumping outside the park would be detected at these sites first. Each Piezometer would consist of a 2 or 4 inch pvc pipe that would be slotted throughout the thickness of the aquifer. This would yield an average water pressure for the aquifer. Using the average aquifer pressure was chosen in response to critiques by the opposition during the water right application process. Using an average water pressure is believed to offer a simpler management alternative than measuring the pressure at a discrete depth within the aquifer thickness. Penetrating the entire thickness of the aquifer also

provides information about the capacity of the aquifer. At most of the proposed sites the unconfined aquifer is believed to have a thickness of 200 feet or less.

The installation equipment can vary based on the bidder. A conventional drill rig is mounted on a semi type truck and may have difficulty accessing the off road sites. A tracked vehicle or farm tractor may be required to tow such a rig to the site. Drill rigs can also be mounted on an all terrain vehicle, and the tracked vehicle/tractor assist shouldn't be necessary. Preference in the contract selection process would be given to contractors that provide the option of using an all terrain drilling vehicle since they are smaller and better suited for maneuvering in the sandy environment.

The installation process consists of the drill rig and support vehicles arriving on site and setting up for the drilling process. Once set up the rig would auger or pound drill stem into the ground until the bottom of the aquifer is reached as determined by an onsite geologist. Generally the bottom of the unconfined aquifer is defined by the "blue clay layer." When the bottom of the aquifer is reached, the piezometer pipe is emplaced, the drill stem removed, and the void backfilled with sand. The installation equipment is then mobilized and driven to the next site. Typically the installation time per well is less then a day.

Figure 2 – Alternative A, No Action Alternative

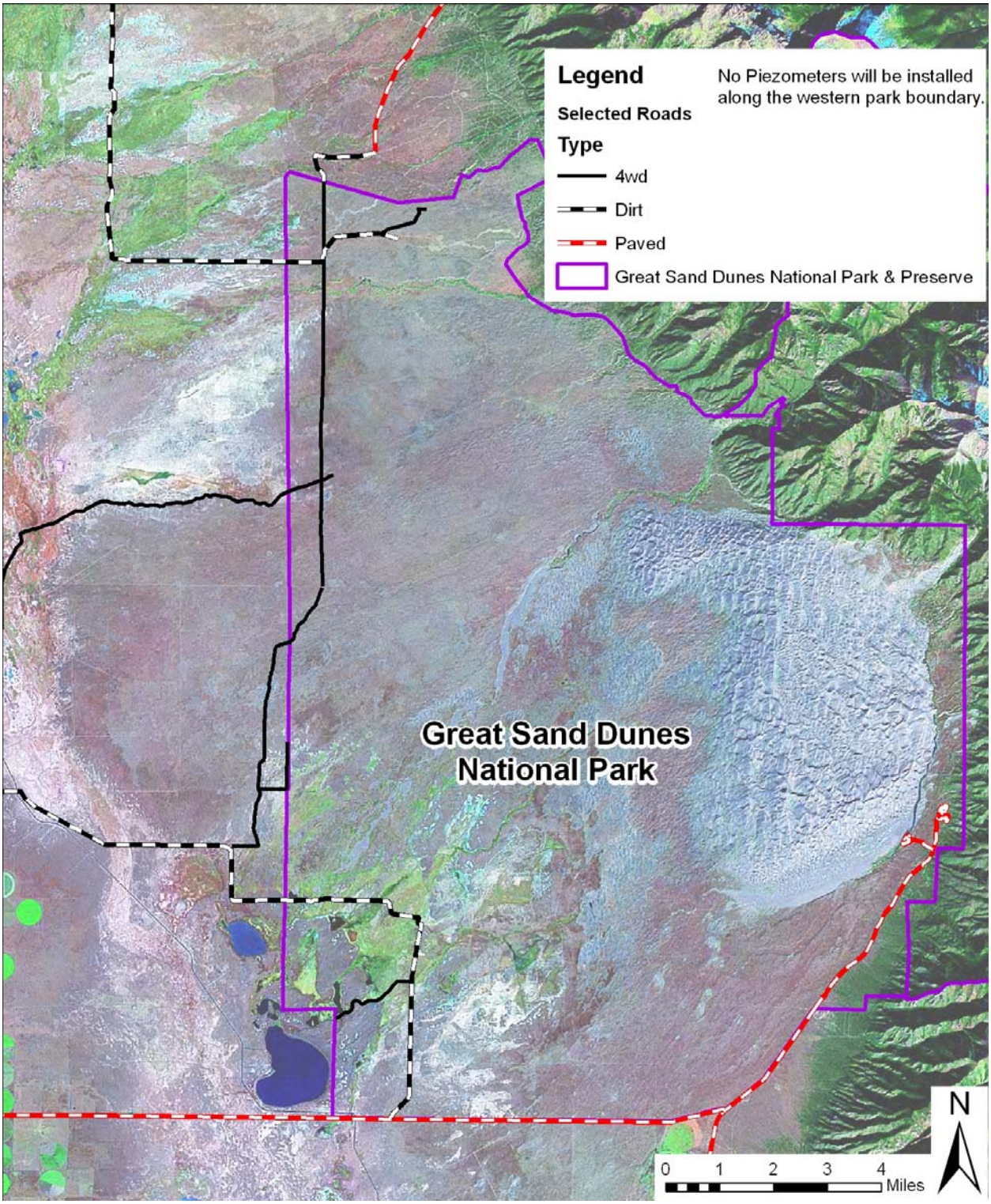
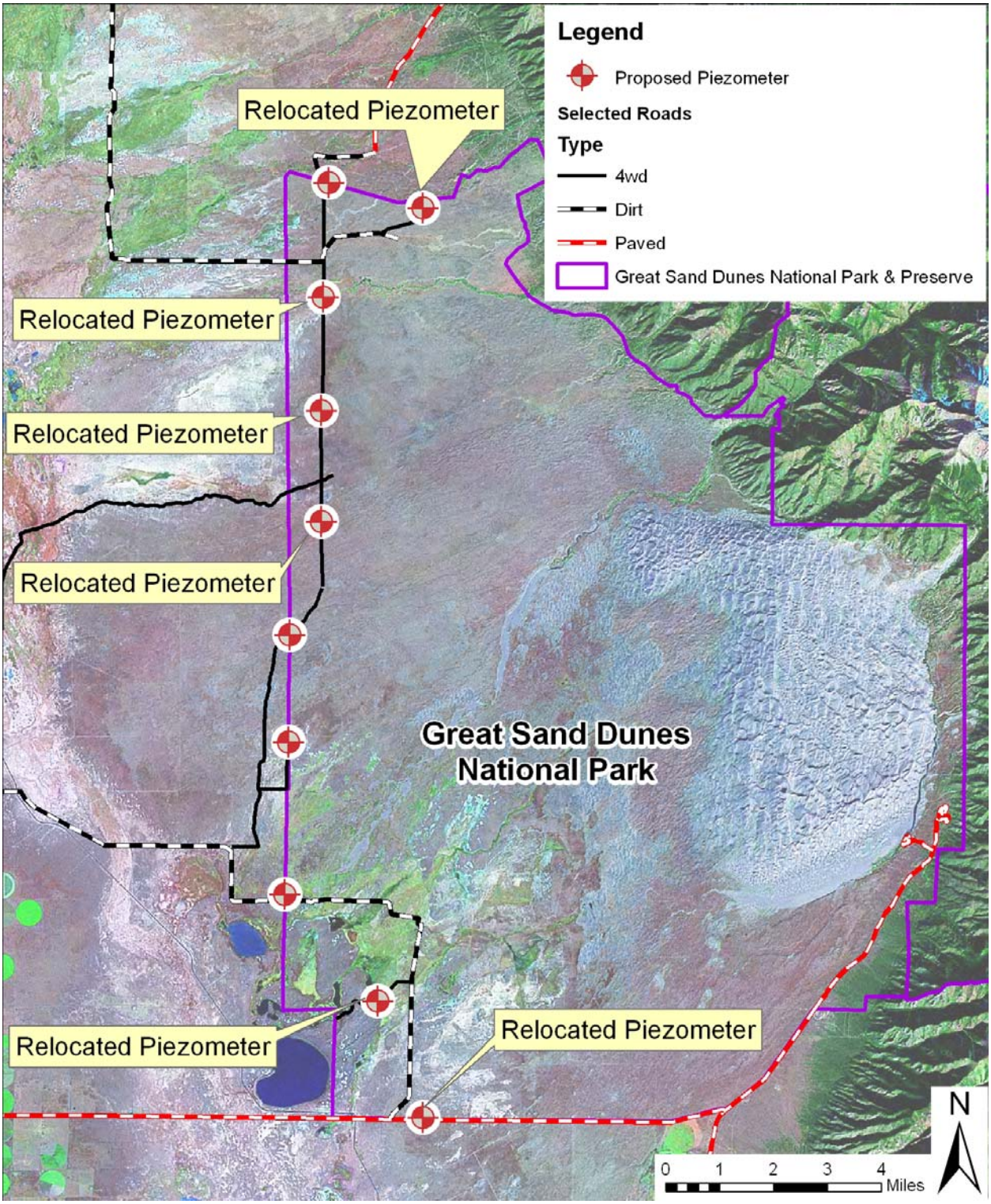


Figure 3 – Alternative B, Full Installation of Piezometers with Relocation of Off Road Piezometers



Mitigation Measures

The following mitigation measures were developed to minimize the degree and/or severity of adverse effects and would be implemented during implementation of the action alternative, as needed:

- To minimize the amount of ground disturbance, five off road piezometer sites have been moved closer to existing roads. Vehicle tracks at the drilling site would be raked smooth after installation. Areas of desert pavement would be avoided as desert pavement tends to allow vehicle tracks to persist.
- To minimize the amount of vegetation trampling, the ideal time to install the piezometers would be during the fall, winter, or early spring when the vegetation is dormant.
- Installation during the fall, winter, or early spring would also minimize soil compaction, since the soils tend to be frozen. The soil in this case is sand.
- Cold season installation should also improve access to the sites. The frozen ground will firm up the sandy surface which can be difficult to navigate when soft and dry. Access can be improved by misting a pathway the afternoon prior to travel to ensure that the sand is frozen by overnight freezing.
- Because the vegetation on the sand sheet is sparse, a drill site can be selected that is on barren ground minimizing the need to revegetate. Should revegetation be determined to be necessary, the park does have access to native grass seed which can be applied. In past piezometer installation efforts, native shrubs have been transplanted to help conceal the piezometer.
- Because the topography is flat and the sandy substrate rarely produces runoff, erosion control is not necessary.
- Fugitive dust generated by the installation should not be a problem since the medium being drilled is sand and the drilling technique circulates water, trapping fine grained material that would produce dust.
- To reduce noise and emissions, support equipment would not be permitted to idle for long periods of time.
- To minimize possible petrochemical leaks from drilling equipment, the contractor would regularly monitor and check construction equipment to identify and repair any leaks.
- Workers and supervisors would be informed about special status species. Contract provisions would require the cessation of construction activities if a species were discovered in the project area, until park staff re-evaluates the project. This would allow modification of the contract for any protection measures determined necessary to protect the discovery.
- Should the project unearth previously undiscovered cultural resources, work would be stopped in the area of any discovery and the park would consult with the state historic preservation officer and the Advisory Council on Historic Preservation, as necessary, according to §36 CFR 800.13, *Post Review Discoveries*. In the unlikely event that human remains are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (1990) would be followed.
- The National Park Service would ensure that all contractors and subcontractors are informed of the penalties for illegally collecting artifacts or intentionally damaging archeological sites, or

historic properties. Contractors and subcontractors would also be instructed on procedures to follow in case previously unknown paleontological or archeological resources are uncovered during construction.

- This project is proposed for parts of the park that are isolated in regard to public visitation. There is little potential for the public to be exposed to the installation of this project except for piezometer BP-1 which is adjacent to a highway. Piezometers BP-1 to BP-5 are located in a private in-holding of The Nature Conservancy (TNC). TNC would be informed of this and allowed to comment. TNC supported the park's application for the water right that directed the installation of these piezometers.

Alternatives Considered and Dismissed

The following three alternatives were considered for project implementation, but were ultimately dismissed from further analysis. Reasons for their dismissal are provided in the following alternative descriptions.

Full Piezometer Installation at sites listed in the Water Right.

This was the original alternative. Ten piezometers would be installed along the south, west, and north park boundary to collect ground water level data for quantification and administration of a water right. Most of the piezometer sites are in a sandy environment known as a sand sheet and after discussions with subject matter experts, the alternative evolved so that moving off road piezometers closer to existing roads was preferred. It increased the feasibility of the project and decreased environmental impacts. To move a piezometer location requires approval from the local judge who issued the decree. Judge Kuenhold deferred the decision to the Department of Justice (DOJ) who represented the park, and the State Water Court, through their respective attorneys. Attorney Jim Dubois, DOJ, is in agreement that those sites be changed. A favorable decision from the State Water Attorney is currently pending.

Hand Dug Piezometers.

In this alternative the piezometers would be installed using a hand auger. This technique has been used before at the park as the sandy substrate lends itself to this form of excavation. It has its limits though. Without the aid of a mechanical crane, installation depths are limited to around 25 feet. Another limitation is the auger can not penetrate more than a couple of feet past the top of the water table. The water saturated sand collapses and prevents the auger from penetrating deeper. Some of the proposed sites are in areas where the water table is believed to be greater than 25 feet below the ground surface. In order for the piezometer to be a reliable, long term monitor of the ground water, they should have the capacity to measure water level variations. If a piezometer only penetrates a foot below the water table, a small drop in the water table could leave the piezometer dry and nonfunctional. Since this technique has very limited potential for success, it will not be considered further.

Move Road to Park Boundary

An alternative that was considered to address the problem of off road access was to establish a boundary road. Then the piezometer sites, which are also along the boundary, could be accessed directly without the need to traverse off road. This would affect piezometers BP-6, BP-7, and BP-8. Under this plan the existing road that is about half a mile east of these sites would be abandoned and allowed to recover. A new road way would be established along the park boundary by repeated driving of the course by a pickup truck. This alternative was dismissed because it created new ground disturbance and having a one-time off road excursion by the installation vehicle would have less of an impact.

Alternative Summaries

Table 1 summarizes the major components of Alternatives A and B, and compares the ability of these alternatives to meet the project objectives (the objectives for this project are identified in the *Purpose and Need* chapter). As shown in the following table, Alternative B meets each of the objectives identified for this project, while the No Action Alternative does not address all of the objectives.

Table 1 – Alternatives Summary and Project Objectives

Alternative A – No Action	Alternative B – Full Installation of Piezometers with Relocation of Off Road Piezometers
No piezometers would be installed to comply with the water right issued by Case Number 2004CW35, Colorado Water District 3, August 2008.	Ten piezometers would be installed as directed by Case Number 2004CW35, Colorado Water District 3, August 2008. The piezometers located off the roadways would be moved closer to the road with permission of the Colorado Water District 3 Engineer to reach an environmentally preferred situation.
Meets Project Objectives?	**Meets Project Objectives?**
No. The project objective is to quantify groundwater variations within the park. Without the groundwater data, the water right intended to protect natural water levels cannot be given a value or administered by the Colorado Division of Water Resources.	Yes. This project was designed to provide the water court with the necessary data to qualify the water right, manage the water right, and offer protection against injury to the water right.

Table 2 summarizes the anticipated environmental impacts for alternatives A and B. Only those impact topics that have been carried forward for further analysis are included in this table. The *Environmental Consequences* chapter provides a more detailed explanation of these impacts.

Table 2 – Environmental Impact Summary by Alternative

Impact Topic	Alternative A – No Action	Alternative B – Full Installation of Piezometers with Relocation of Off Road Piezometers
Topography, Geology, and Soils	No disturbance.	Minor disturbance to ground surface temporary as the sand is a mobile substrate and will re-equilibrate to natural conditions.
Vegetation	No disturbance. The ability to protect wetland vegetation is decreased.	Minor disturbance to vegetation by trampling. Effects of trampling would be minimal since the project would occur during the vegetation's dormant season.
Wildlife	No disturbance. The ability to protect water related environments is decreased.	Minor disturbance to animals to the presence of vehicles and the sound emitted by them. The time at each drill site should be one to two days.
Water Resources	No disturbance physically. The ability to use the water right to protect water resources would be negatively impacted.	No negative impact on water resources anticipated. This alternative does affect water resources because it's required in order to obtain the legal protection to natural conditions in the aquifer beneath Great Sand Dunes and the other resources dependent on it.
Archeological Resources	No disturbance.	Possible minor disturbance if artifacts are encountered during the installation. Archeological surveys have been completed and one site (BP-1) was moved to avoid an archeological site.
Soundscape Management	No disturbance.	Minor alteration of the soundscape would result from human made sounds during the piezometer installation process.

Identification of the Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which guides the Council on Environmental Quality (CEQ). The CEQ provides direction that the environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in NEPA's §101:

- fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

- assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
- preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
- achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities; and
- enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Alternative A and B represent a choice of whether to install or not to install ten piezometers to quantify and manage a newly acquired water right. This water right is a first of its kind in Colorado as it offers legal protection to natural ground water levels. Obtaining such a right is considered to be a great example of environmental leadership by the National Park Service. So even though alternative A, the no action alternative, would result in no physical impacts on the environment, alternative B is chosen as the environmentally preferred alternative since it would offer very strong legal protection for groundwater and the resources dependent on it.

ENVIRONMENTAL CONSEQUENCES

This chapter analyzes the potential environmental consequences, or impacts, that would occur as a result of implementing the proposed project. Topics analyzed in this chapter include natural resources, visitor use and experience, and park operations. Direct, indirect, and cumulative effects, as well as impairment are analyzed for each resource topic carried forward. Potential impacts are described in terms of type, context, duration, and intensity. General definitions are defined as follows, while more specific impact thresholds are given for each resource at the beginning of each resource section.

- **Type** describes the classification of the impact as either beneficial or adverse, direct or indirect:
  - *Beneficial*: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
  - *Adverse*: A change that moves the resource away from a desired condition or detracts from its appearance or condition.
  - *Direct*: An effect that is caused by an action and occurs in the same time and place.
  - *Indirect*: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.
- **Context** describes the area or location in which the impact would occur. Are the effects site-specific, local, regional, or even broader?
- **Duration** describes the length of time an effect would occur, either short-term or long-term:
  - *Short-term* impacts generally last only during construction, and the resources resume their pre-construction conditions following construction.
  - *Long-term* impacts last beyond the construction period, and the resources may not resume their pre-construction conditions for a longer period of time following construction.
- **Intensity** describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this environmental assessment.

Cumulative Effects

The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act of 1969 (42 USC 4321 et seq.), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results 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" (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and preferred alternative.

Cumulative impacts were determined by combining the impacts of the preferred alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Great Sand Dunes National Park and Preserve (park) and, if applicable, the surrounding region. The geographic scope for this analysis includes elements mostly within the park's boundaries, while the temporal scope includes projects within a range of approximately ten years. Given this, the following projects were identified for the purpose of conducting the cumulative effects analysis:

- **Ranching operations on the Medano/Zapata Ranch 1999 to present:** The Nature Conservancy (TNC) is a major in-holder of private and leased lands in the southern third of Great Sand Dunes National Park which make up the Medano/Zapata Ranch. TNC operates a bison ranch which commonly contains over 1,000 bison. The bison operation began several years prior to the TNC purchase in 1999. Prior to that, the Medano/Zapata Ranch has a long history of cattle ranching. There is potential in the future for a wild bison herd in the area. Piezometer installation accounts for the presence of bison by protecting the piezometer with a protective culvert enclosure.
- **Great Sand Dunes boundary expansion 2000:** The Great Sand Dunes National Park & Preserve Act of 2000, P.L. 106-530 expanded the NPS boundary at Great Sand Dunes from one that surrounded the main dune field to a larger area that includes the surrounding environments that are related to the dunefield. The expansion to the west was onto a couple of large ranches. The Medano/Zapata and Baca Ranches. The Baca Ranch has been purchased by the federal government and the Medano/Zapata portions within the boundary may be purchased in the future. The Baca Ranch acquisition has changed the management of the lands within the park from a cattle operation, to a wildlife habitat. It also ended the possibility of commercial water development projects on the Baca Ranch.
- **Bureau of Reclamation Closed Basin Project:** The US Bureau of Reclamation operates a groundwater salvage project in the Great Sand Dunes area known as the Closed Basin Project (CBP). The CBP is largely outside the Park boundary, but does overlap in the southwest corner of the Park. The project construction began in 1980 and was completed in the early 1990s. Its purpose is to pump up to 100,000 acre-feet of water annually out of the unconfined aquifer and deliver it to the Rio Grande River, San Luis Lakes State Park, and Blanca Wetlands for beneficial use. The project includes a maximum water table lowering of 2 feet at the project boundary. Production has been significantly less than the 100,000 acre-feet limit with a maximum annual production in the 40,000 acre-foot range. The well permits held by the CBP are senior to the newly acquired water right held by the Park.

Impairment

Management Policies 2006 require analysis of potential effects to determine whether or not actions would impair park resources (NPS 2006). The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values.

Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

1. necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
2. key to the natural or cultural integrity of the park; or
3. identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. A determination on impairment is made in the *Conclusion* section for each of the resource topics carried forward in this chapter.

Unacceptable Impacts

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the Park Service applies a standard that offers greater assurance that impairment would not occur by avoiding unacceptable impacts. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values, but that does not mean the impact is unacceptable or that a particular use must be disallowed. Therefore, for the purposes of these policies, unacceptable impacts are impacts that, individually or cumulatively, would

- be inconsistent with a park's purposes or values, or
- impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthful environment for visitors or employees, or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with
    - park programs or activities, or
    - an appropriate use, or
    - the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park.
    - NPS concessioner or contractor operations or services. (NPS 2006)

In accordance with *Management Policies*, park managers must not allow uses that would cause unacceptable impacts to park resources. To determine if unacceptable impact could occur to the resources and values of Great Sand Dunes National Park, the impacts of proposed actions in this environmental assessment were evaluated based on the above criteria. A determination on unacceptable impacts is made in the *Conclusion* section for each of the physical resource topics carried forward in this chapter.

Topography, Geology, and Soils

Intensity Level Definitions

The primary resource of Great Sand Dunes is the aeolian system. In this case the aeolian system consists of various wind blown sand deposits. This project is situated in a sand deposit knows as a sand sheet which is a generally flat sand deposit often stabilized by sparse vegetation. The

methodology used for assessing impacts to topography, geology, and soils is based on how the project would affect the features for which the structure is significant. The thresholds for this impact assessment are as follows:

Negligible: The impact is at the lowest levels of detection, barely perceptible and not measurable.

Minor: The impact is measurable or perceptible, but it is slight and affects a limited area of the piezometer site. The impact does not affect the long term character of the site.

Moderate: The impact is measurable and perceptible. The impact changes one or more character defining feature(s) of the sand sheet, but do not diminish the integrity of the resource.

Major: The impact is substantial, noticeable, and permanent. The impact changes one or more character defining features(s) of the sand sheet.

Impacts of Alternative A (No-Action Alternative)

The no-action alternative would result in negligible impacts to the sand sheet, because no human activity would occur to change natural processes.

Cumulative Effects: Cumulatively, this alternative would have a negligible effect on topography, geology and soil, because no new activity would occur .

Conclusion: The no-action alternative would result in negligible impacts to the sand sheet because no construction activities would be conducted. As such, this alternative would not contribute to any cumulative disturbance of the sand deposit, when considered with other past, present, and reasonably foreseeable future actions. Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Great Sand Dunes National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of the park's resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of NPS *Management Policies* 2006.

Impacts of Alternative B (Preferred Alternative)

The preferred alternative would result in minor to moderate adverse effects to the sand sheet due to ground disturbance that occurs at each piezometer site and the structure of the well and its protective housing. The ground disturbance is the minor adverse effect and would consist of vegetation trampling and vehicle tracks in the sand. There is also may be surficial deposits of a fine grained mud, used in the drilling process. The ground disturbance would be temporary as the mud would be removed after drilling, the tracks can be racked out or smoothed by the wind, and the vegetation should recover in the next growing season. The protective well housing is the moderate adverse effect since it consists of a metal culvert with a lid and attached to it would be a metal pipe with a solar panel and transmission antennae that would be in place for the life of the well.

A moderate beneficial effect is the protection offered by an administrable water right issued in Case Number 2004CW35, Colorado Water District 3, August 2008. The piezometers are a critical component as the data they provide would define the value of the water right and be used should a claim of injury or an objection to future water right applications be needed. Although the decision to file for the water right came from Congress, the process involved demonstrating to the state of Colorado that this right was essential in the NPS mission at Great Sand Dunes. Assisted by

legal representation by the Department of Justice and expert witnesses, it was shown that resources such as gaining streams, interdunal ponds, wetland vegetation, and amphibians were all dependant on groundwater and that there was value in maintaining natural water levels. So having legal protection for natural groundwater levels is a major benefit.

Cumulative Effects: Alternative B would have a moderate beneficial effect on the sand sheet. It is a dynamic resource with much of its diversity coming from the water. An unnatural lowering of the water table could easily shift the sand sheet out of balance. A moderate adverse effect would be a permanent installation of a well with its protective housing and communication equipment. Each piezometer site is located next to a road and often next to a fence, so the visual impact would be less than if the housing were placed in a visually pristine environment.

Conclusion: The preferred alternative would result in moderate beneficial effects to the sand sheet from the legal protection to the aquifers offered by this water right.

Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Great Sand Dunes National Park & Preserve; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of the park's resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of NPS *Management Policies* 2006.

Vegetation

Intensity Level Definitions

Vegetation at Great Sand Dunes National Park & Preserve is important for its role in the food cycle and its effect on sand mobility. The growth of vegetation on sand is one of five important physical processes that affect the development of the Great Sand Dunes aeolian system. Where it establishes itself, vegetation creates surface roughness reducing wind energy at the sand level and effectively minimizing the wind's ability to transport sand. The roots also help give the sand stability. Therefore vegetation growth is a major control on how much sand moves across the sand sheet and into the dunefield. Vegetation on the sand sheet is generally sparse and can be highly variable. Even a sparce vegetation cover of 10% has an effect on sand mobility. The thresholds for this impact assessment are as follows:

Negligible: The impact to vegetation is at the lowest levels of detection, not perceptible and not measurable.

Minor: The impact to vegetation would be noticeable, but would not alter the integrity of the sand sheet.

Moderate: The impact to vegetation would be more noticeable, and may alter the integrity of the sand sheet.

Major: The impact to vegetation would be readily apparent, and would alter the integrity of the sand sheet.

Impacts of Alternative A (No-Action Alternative)

The no-action alternative would result in negligible impacts to the vegetation at Great Sand Dunes National Park & Preserve because no piezometer installation activities would be conducted, and natural conditions would persist.

Cumulative Effects: Piezometer installation involves setting up a drill rig just off an established road and that would result in vegetation trampling. Under this alternative, no piezometers would be installed therefore, this project would have negligible effects on vegetative resources.

Conclusion: The no-action alternative would result in negligible impacts to vegetation because no drilling activities would occur. Therefore, this alternative would not have any cumulative disturbance of vegetation.

Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Great Sand Dunes National Park & Preserve; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of the park's resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of NPS *Management Policies* 2006.

Impacts of Alternative B (Preferred Alternative)

The preferred alternative would result in minor adverse impacts to vegetation from ground disturbance and drilling activities. At a piezometer site a drill rig and a support vehicle would drive off road and set up for drilling. The drillers suggest that an area with a radius of 100 feet could be impacted by vehicle traffic. The time at each site is expected to be no longer than two days, after which the drill rig would move off site and back onto the road. The road is within 100 feet of each piezometer site. The projected time of drilling would be in the fall when vegetation is dormant and that should lessen the impact of vegetation trampling. The majority of vegetation is grasses and forbes that die off in the fall and grow from ground level in the spring. So the trampling would occur on dead vegetation. There is some rabbit brush in the area and trampling could cause injury to a part of the plant, however, the plant would be active during the next growing season. The recovery of the vegetation is largely dependant on precipitation during the next growing season.

Cumulative Effects: Cumulatively, this would contribute a negligible to minor amount of disturbance to vegetation which should become negligible after one growing season.

Conclusion: The preferred alternative was planned to minimize the amount of vegetation trampling. In the water right proposal, about half the piezometers were off road and would have required up to a 0.6 mile of road trek in each direction. The off road piezometer sites were moved closer to existing roads in part to minimize vegetation trampling. The trampling that would occur at each drill site should be temporary and vegetation is expected to recover. The National Park Service and Bureau of Reclamation have completed similar projects and vegetation recovery has been as described above.

Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Great Sand Dunes National Park & Preserve; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of the park's resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of NPS *Management Policies* 2006.

Wildlife

Intensity Level Definitions

Great Sand Dunes National Park & Preserve contains a variety of ecosystem types that range from alpine tundra to saline playas. The piezometer project is exclusively in the sandy shrub/grasslands

of the sand sheet. The wildlife common to this area include elk, pronghorn antelope, coyote, and a variety of insect species. A few of the piezometer sites are proximal to wetlands and those areas commonly contain water fowl, amphibians, snakes, and rodents. Protection of wildlife is directed by the Park's enabling legislation. A domestic bison herd is present in the area of piezometers BP-1 to BP-5. The thresholds for this impact assessment are as follows:

Negligible: Wildlife would not be affected or changes in visitor use and/or experience would be below or at the level of detection. Any effects would be short-term. The wildlife would not likely be aware of the effects associated with the alternative.

Minor: Changes in wildlife would be detectable, although the changes would be slight and likely short-term.

Moderate: Changes in wildlife would be readily apparent and likely long-term.

Major: Changes in wildlife would be readily apparent and have substantial long-term consequences.

Impacts of Alternative A (No-Action Alternative)

The no-action alternative would have negligible effect on wildlife in regards to wildlife disturbance. No action means the drilling operations would not occur and the presence of human activity during that time would not alter the location of wildlife such as elk. The no-action alternative also reduces the NPS ability to use its water right to protect wildlife dependent resources such as stream flow, ponds, and wet meadows.

Cumulative Effects: The cumulative effects of no-action alternative on wildlife behavior are negligible as no disturbance would occur.

Conclusion: The no-action alternative would result in negligible effects on wildlife behavior. Should the need arise to protect hydrological resources that the wildlife is dependant on, then the no-action alternative could have a moderate negative effect. The no-action alternative results in the NPS and Colorado Division of Water Resources lacking the data necessary to manage and administer the water right that is intended to protect the natural levels of groundwater that the wildlife is adapted to.

Impacts of Alternative B (Preferred Alternative)

Implementation of the preferred alternative would involve a drill crew working in coyote, elk, and pronghorn habitat for about a month, during the fall. The drill crew would consist of a drill rig, support vehicle, and frequently a NPS vehicle. During the fall, vehicle traffic occurs on a weekly basis as park rangers do hunting patrols in the area. The normal response of these animals to vehicle traffic is to run away from the vehicles until they are a safe distance away. During the project installation, the drill rig would move from one site to the next on a two to three day schedule with crew traveling to and from the site each day. So vehicle traffic would increase from weekly to twice daily resulting in more wildlife disturbance. Also the drill rig is powered by a diesel engine and noise from that would keep wildlife away from the drill site. The project would result in the installation of ten piezometers with protective housing. The housing consists of a metal culvert and may affect wildlife by providing a scratching post. The housing is in place to protect the piezometers from wildlife. The information provided by the installation of the piezometers would provide a strong layer of protection to the natural environment on which the wildlife relies.

Minor, temporary, adverse impacts to wildlife would result from the increased traffic. Wildlife would flee from vehicles, but do have enough space that they can maintain a safe distance and still be within the park or adjacent refuge. Once a piezometer site is complete, the wildlife should occupy the area freely. Sites BP-2 and BP-3 are near ponds and the human disturbance there

includes disturbance of water fowl. What typically happens in this case is the water fowl would fly to the far end of the pond or to the next pond. Again, this disturbance should be less than 3 days per site. Land based wetland wildlife, such as amphibians and reptiles should not be impacted as much since the activity does not occur in the wetland.

The potential for moderate beneficial effects exists should the need to protect water resources in the park arise. The piezometers installed by this project provide the data needed to define a ground water right and to make it administrable. This gives the NPS a legal tool to stop junior water pumping that artificially lowers the water table and requires that proposals for new groundwater pumping projects show that they would not impair the natural water levels that exist beneath the park.

Cumulative Effects: This project would result in increased, short term wildlife disturbance that would last approximately one month. The project area is remote and vehicle traffic would increase from one vehicle per week, to several vehicles per day. When wildlife is encountered, they would be startled and flee until they reach a safe distance. When the piezometer installation is complete the daily wildlife disturbance would cease.

Conclusion: Under the preferred alternative, the installation of ten piezometers would scare any wildlife that encounter the vehicle traffic during the month long installation period. The effect shouldn't threaten the health or lives of the wildlife as they frequently encounter traffic. The protection of the natural environment offered by the water right that this project is associated with, results in strong, long term legal protection to the groundwater beneath that park. In the sand sheet, a change in water table elevation of just a few feet can dry up wetlands, ponds, and streams. The changes can be natural or human caused. Natural changes tend to not lower the water table too greatly, making them able to recover to the pre-change level. Human caused changes have the potential to greatly lower the water table, making recovery to previous levels very difficult. Major water pumping projects have been proposed for the area and it's likely that more would occur in the future. So having this water right that is backed by piezometer data is critical in the protection of the natural environment and the wildlife that the NPS is charged with.

Water Resources

Intensity Level Definitions

This piezometer installation is directly related to how the NPS manages water resources at Great Sand Dunes National Park & Preserve. It makes a case for strong environmental leadership by the NPS as it is the first time the state of Colorado has offered legal protection to natural ground water levels beneath a large area. The water resources at Great Sand Dunes National Park & Preserve include precipitation, ponds, streams, and groundwater. The methodology used to assess potential changes to water resources is defined as follows:

Negligible: Water resources would not be affected or the effect would be at or below the lower levels of detection.

Minor: The effect would be detectable, but would be of a magnitude that would not have an appreciable adverse or beneficial effect on water resources. If mitigation were needed to offset adverse effects, it would be relatively simple and successful.

Moderate: The effects would be readily apparent and would result in a substantial adverse or beneficial change in water resources. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.

Major: The effects would be readily apparent and would result in a substantial adverse or beneficial change in water resources. Mitigation measures to offset adverse effects would be needed, could be expensive, and their success could not be guaranteed.

Impacts of Alternative A (No-Action Alternative)

The no-action alternative would have a negligible physical effect on water resources at Great Sand Dunes National Park & Preserve. Since no action is taken, there would be no disturbance or modification to water resources. This alternative does have a moderate adverse effect on the NPS effort to manage its water resources. The NPS received instruction from Congress in the legislation that established Great Sand Dunes National Park & Preserve to seek a protective groundwater right for the aquifer beneath the Park. The legislation also stated that the NPS must follow the State of Colorado legal procedure for obtaining this water right. That has been accomplished and the final step is to define the value of the water right and to monitor water levels as part of the management of that right. The no-action alternative results in the NPS not gathering the data needed to define the water right value or to manage it.

Cumulative Effects: The no-action alternative would have negligible effect on the physical nature of the water resources at Great Sand Dunes National Park & Preserve, but would prevent the NPS from acquiring the hydrologic data needed to define and manage its water right on the unconfined aquifer.

Conclusion: The no-action alternative prevents the NPS from implementing the water right that it obtained from the State of Colorado as directed by Congress.

Impacts of Alternative B (Preferred Alternative)

The installation of ten piezometers would occur in the upper groundwater aquifer known as the unconfined aquifer. A drill rig would bore through the thickness of the unconfined aquifer and a pvc pipe would be emplaced. As the drill stem is removed, the bore space between the pipe and the outer walls of the bore would be back filled with sand removed during the drilling process. A clay additive would be mixed and circulated in the borehole during drilling but would be pumped out once the piezometer is in place. The aquifer thickness is estimated to be up to 200 feet think, but may exceed that at a site or two. So ten pvc pipes roughly 2 miles apart would be installed in the aquifer. They would be fully slotted so that water flows through them much like it would have flowed through the sediment that was in place prior to the piezometer. So the effect of installing piezometers is considered to be a minor adverse effect on the aquifer because the pipe is detectable, but it has little effect on the flow within the aquifer. The data provided by the piezometers would be considered to have a major beneficial effect on water recourses.

Cumulative Effects: The cumulative effect to water resources from a physical standpoint is negligible to minor. The water resource affected is the unconfined aquifer. The impairment that a piezometer creates is on a micro scale as the flow of groundwater could be slightly altered by the slotted pvc pipe that comprises the piezometer. On a macro scale the impairment of groundwater flow created by the piezometers is negligible. From a management standpoint, the data provided by the piezometers has a major beneficial impact. It would be directly responsible for allowing the NPS to define and manage the water right that protects water resources.

Conclusion: Installation of piezometers under the preferred alternative would fulfill the direction given by Congress when it directed the NPS to acquire water rights for the aquifer beneath GRSA. The intent of this water right is to protect water levels in the unconfined aquifer at their natural levels. The piezometers would provide the data to define what the natural level of the aquifer is and to detect changes. Water related issues have been prominent at GRSA in the past and may be

again in the future. Having a protective water right and aquifer data offers the highest level of protection with the negligible effect of having a small structure penetrating the aquifer.

Archeological Resources

Intensity Level Definitions

The piezometer installation would occur in an area known as the sand sheet. This is a sandy environment that is mostly stabilized by vegetation. In areas where vegetation looses its foothold, erosion can occur resulting in deflation of the ground surface. It is common to find artifacts in these deflational areas, because the sand is removed, exposing older layers. There are numerous archeological sites ranging from Paleo Indian to historic. Each piezometer site has had an archeological survey and is sited on stable sand where surfical archeological sites are unlikely. The methodology used to assess potential changes to water resources is defined as follows:

Negligible: Archeological resources would not be affected or the effect would be at or below the lower levels of detection.

Minor: The effect would be detectable, but would be of a magnitude that would not have an appreciable adverse or beneficial effect on archeological resources. If mitigation were needed to offset adverse effects, it would be relatively simple and successful.

Moderate: The effects would be readily apparent and would result in a substantial adverse or beneficial change in archeological resources. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.

Major: The effects would be readily apparent and would result in a substantial adverse or beneficial change in archeological resources. Mitigation measures to offset adverse effects would be needed, could be expensive, and their success could not be guaranteed.

Impacts of Alternative A (No-Action Alternative)

The no-action alternative would have a no impact on archeological resources at Great Sand Dunes National Park & Preserve. As no action implies, no disturbance would occur therefore there is no potential to impact the archeological recourses.

Cumulative Effects: The no-action alternative would have a negligible impact on archeological resources.

Conclusion: The no-action alternative neither benefits nor hinders archeological resources at Great Sand Dunes National Park & Preserve.

Impacts of Alternative B (Preferred Alternative)

The preferred alternative does have potential to interact with archeological resources. Ten piezometers would be installed and the installation process involves drilling. There is the possibility that an artifact could be encountered in the upper ten feet of sand at each site. The subsurface disturbance at each site should have an area of around two square feet. Efforts to minimize the possibility of encountering archeological resources include; site BP-1 was moved 2,000 feet west to avoid a known archeological site (5AL169). Each piezometer site has had an archeological survey and the project has been presented to and approved by the State Historic Preservation Officer (SHPO) for section 106 compliance, June 8, 2009. Also during the drilling, the drilling would be monitored for the presence of any artifacts in the drill cuttings.

Cumulative Effects: The preferred alternative has potential for minor negative impacts to archeological resources. Should an artifact be dug up during the drilling process, it would be out

of context, but the integrity of a potential subsurface archeological site should not be affected. If any artifacts are encountered, then the effect would negligible.

Conclusion: Based on past drilling at Great Sand Dunes, the likelihood of encountering archeological resources at each drill site is low. Over 30 drill sites exist at GRSA and none has encountered an artifact during the drilling. The ground surface has been surveyed and the subsurface area affected is small so that also lessens the probability of encountering archeological resources, making a negligible effect to these resources.

Soundscape Management

Intensity Level Definitions

The piezometer sites are along the western boundary of Great Sand Dunes National Park. It is an isolated area, with little human activity. As a result, sound levels are near pristine levels. Limited sound data for the area does exist. In September-October, 2008, the NPS monitored sound for two weeks, in the northwest corner of GRSA, near piezometer site BP-8. The sound levels measured were among the quietest measured to date. Sounds of wildlife, wind, and aircraft were identified. The soundscape at the other piezometers should be similar with the exception of site BP-1 which is adjacent to County Road Lane 6N where there is significant vehicle traffic. The installation of ten piezometers would result in an increase in vehicle traffic along the western park boundary over a month period. In addition, while each site is drilled, the sound of a diesel engine powered drill rig would also be audible. The time at each site is estimated to be one to three days. The drilling is a short process that can be completed in a manner of hours, but additional time is needed for setup, completion of the well, and breakdown and travel to the next site. The methodology used to assess potential changes to water resources is defined as follows:

Negligible: Soundscape management would not be affected or the effect would be at or below the lower levels of detection.

Minor: The effect would be detectable, but would be of a magnitude that would not have an appreciable adverse or beneficial effect on soundscape management. If mitigation were needed to offset adverse effects, it would be relatively simple and successful.

Moderate: The effects would be readily apparent and would result in a substantial adverse or beneficial change in soundscape management. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.

Major: The effects would be readily apparent and would result in a substantial adverse or beneficial change in soundscape management. Mitigation measures to offset adverse effects would be needed, could be expensive, and their success could not be guaranteed.

Impacts of Alternative A (No-Action Alternative)

The no-action alternative would have no effect on the soundscape of the piezometer area. Installation of the piezometers would not occur therefore the noise associated with it wouldn't happen.

Cumulative Effects: The no-action alternative would have a negligible impact on the soundscape.

Conclusion: The no-action alternative does not alter the soundscape. Soundscape management would not be affected or the effect would be at or below the lower levels of detection.

Impacts of Alternative B (Preferred Alternative)

The preferred alternative would increase human activity along the western boundary of Great Sand Dunes National Park for about a month. Typically during the fall, park patrols travel through the area several times a week. This project would result in daily activity in the area and an increase in the sound of vehicular traffic and noise from the drilling process.

Cumulative Effects: The preferred alternative would have a minor adverse effect on soundscape during the piezometer installation from crew access to and from the site each day. The effect would become moderate adverse every second or third day when the drill rig is engaged with the drilling process. Then the sound level would increase to the level of a large diesel engine for an estimated one to two hours while the borehole for the piezometer is being drilled.

The effect would be detectable, but would be of a magnitude that would not have an appreciable adverse or beneficial effect on soundscape management. If mitigation were needed to offset adverse effects, it would be relatively simple and successful.

Conclusion: The preferred alternative would introduce sounds of human activity to an otherwise mostly pristine environment for about a month period. Once the installation is complete, the operation of the piezometers would not alter the soundscape except for vehicular sounds during the occasional (bi monthly or less) visits to field check the equipment gathering water data.

CONSULTATION AND COORDINATION

Internal Scoping

Internal scoping was conducted by an interdisciplinary team of professionals from Great Sand Dunes National Park & Preserve, the National Park Service Water Resources Division (NPS WRD), HRS Water Consultants, US Bureau of Reclamation, and the US Geological Survey. Input by the Department of Justice and Colorado Division of Water Resources was received via the NPS WRD. Input from The Nature Conservancy and US Fish and Wildlife Service were received via Great Sand Dunes staff. Interdisciplinary team members met on November, 13, 2008 and May 8, 2009 to discuss the logistics; various alternatives; potential environmental impacts; past, present, and reasonably foreseeable projects that may have cumulative effects; and possible mitigation measures. Archeological surveys were conducted from April 22 to April 27 by local and regional NPS staff. Team members have conducted individual site visits to view and evaluate the proposed piezometer sites. The results of the May 2009 meeting are documented in this environmental assessment. Approval for the park determination of no cultural resources in project site was received from the State Historical Preservation Office on June 8, 2009 indicating Section 106 compliance has been met.

External Scoping

External (public) scoping was conducted July 20-27, 2009. Only favorable comment(s) were received, and no new issues were raised.

In addition to the aforementioned public entities, the following agencies and Native American tribes were sent scoping information or were contacted for information regarding the project:

Federal Agencies
U.S. Department of the Interior – Fish and Wildlife Service
U.S. Department of the Interior – Bureau of Reclamation

State Agencies

Colorado Historical Society (office of the State Historic Preservation Officer)
Colorado Division of Water Resources

Affiliated Native American Groups
Southern Ute Tribe
Jicarilla Apache Nation
Uintah and Ouray Tribal Business Committee
Ute Mountain Ute Tribal Council
Pueblo of Jemez
Navajo Office of Historic Preservation
Pueblo of Picuris
Pueblo of San Ildefonso
Pueblo of Santa Clara
Pueblo of Taos
Pueblo of Zuni
Ohkay Owingeh
Pueblo of Acoma
Pueblo of Laguna
Cochiti Pueblo
Pueblo of Santa Ana

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