EXECUTIVE SUMMARY

Narrows Project Supplemental Draft Environmental Impact Statement

S1.0 INTRODUCTION

The Narrows Project Supplemental Draft Environmental Impact Statement (SDEIS) updates information and analyses contained in the *Draft Environmental Impact Statement, Narrows Project* (DES-98-10) published in March 1998 (1998 DEIS). The SDEIS discloses the direct, indirect, and cumulative effects of the Proposed Action and alternative actions for water development for northern Sanpete County. This is an executive summary of the SDEIS.

S1.1 THE PROPOSED ACTION ALTERNATIVE

The Sanpete Water Conservancy District (SWCD) has applied to the Bureau of Reclamation (Reclamation) for a Small Reclamation Projects Act (SRPA) loan to help finance construction of a reservoir and related facilities (Proposed Action). SWCD also has requested authorization to use federally administered withdrawn lands as the site for dam construction. Most of the reservoir basin would be located on adjacent, privately owned land. If Reclamation approves the SRPA loan and land use and Congress appropriates the necessary funds, a supplemental water supply would be developed for presently irrigated lands and municipal and industrial (M&I) water users in northern Sanpete County. A dam and reservoir would be constructed on Gooseberry Creek, and water would be diverted through an existing tunnel and a proposed pipeline to Cottonwood Creek; the existing tunnel would be rehabilitated. Pipelines would be constructed to deliver the water to existing water distribution systems. Recreation facilities would be developed, and a 2,500-acre-foot minimum pool for fish habitat would be provided. The resulting water storage and delivery system would be a non-Federal project owned and operated by SWCD.

Mitigation measures would be implemented to offset adverse impacts. Additional water conservation measures would be required independent of the Proposed Action. To be eligible to receive water from the Narrows Project, water users would be required to use, or agree to implement, conservation measures.

S1.2 LEAD AND COOPERATING AGENCIES

Reclamation is the lead agency in preparing the SDEIS. The two cooperating agencies are the U.S. Department of Agriculture Forest Service (USDA Forest Service) and the U.S. Army Corps of Engineers (USACE).

S1.3 HISTORY AND BACKGROUND OF THE NARROWS PROJECT

The Narrows Project, as defined in this document, is a non-Federal project that

fulfills the intent of the larger Federal Gooseberry Project that was formulated more than 70 years ago but not completed. The original Gooseberry Project was formulated over a period of several years in response to efforts by Sanpete County individuals and entities to supplement existing irrigation water supplies and to alleviate shortages that consistently have occurred during the late irrigation season. The portion of that project that was not built was the proposal to appropriate and store Gooseberry Creek waters originating in Sanpete County and to transport those waters through a transmountain tunnel for use in north Sanpete County. The other component of the original Federal project, which was completed, was to enlarge Scofield Reservoir by 35,000 acre-feet to compensate Carbon County water users for the transmountain diversion of water to Sanpete County.

S1.4 PURPOSE AND NEED

Reclamation has received from SWCD its original application for a SRPA loan to build the Narrows Project, Utah (Narrows Project) and a request for authorization to use withdrawn lands to construct and operate the proposed dam and reservoir. Reclamation will receive an updated application for evaluation; and, in addition, Reclamation will complete National Environmental Policy Act (NEPA) compliance. SWCD's stated purpose and need in making its application to Reclamation serve to clarify and disclose the environmental effects of the proposed use of Federal funds and lands.

The primary purpose of the Narrows Project is to enable SWCD to develop an irrigation and M&I supply source for users in north Sanpete County, Utah, whereby the average annual shortages to irrigators in the project area might be reduced as nearly as possible to 5 percent (%), which is considered full irrigation supply for Reclamation projects. Specifically, the following are water-related needs addressed by the proposed project:

- Demand for municipal water for present and future use exceeds the currently available supply. The proposed Narrows Project would develop, through exchange, an additional supply of municipal water to offset current shortages and accomodate anticipated population growth in the project area.
- The current water supply for agricultural irrigation does not provide adequate supply and storage at the times when it is needed—typically in July, August, and September of each year. The proposed Narrows Project would provide late season irrigation water to offset at least some of the current shortages.
- The Narrows Tunnel in Sanpete County needs to be rehabilitated and improved to maintain and enhance its dependability and capability to deliver water to Sanpete County users. The proposed Narrows Project would include such rehabilitation work to prevent failure of the tunnel and ensure its continuing usefulness.

In addition to the primary purpose of supplying water to Sanpete County, the project would have the additional benefit of providing improved and additional recreation and fishery opportunities in Sanpete County.

For purposes of complete analysis and potential impacts of this project, a broad range of alternatives has been evaluated thoroughly to fully comply with NEPA requirements. Reclamation's release of this Supplemental Draft EIS does not imply either approval or denial of the SRPA loan application or the request for authorization to use withdrawn lands.

S1.5 Relationship to Other Projects

The Bonneville and Great Basins and the Upper Colorado River Basin have been the subject of several projects, plans, and programs. Construction and operation of the proposed project would reflect consideration of, and cooperation with, the following existing projects described in the SDEIS:

- Central Utah Project
- Scofield Project
- Fairview Lakes, Gunnison Reservoir, Wales Reservoir
- Price-San Rafael Rivers Unit, Colorado River Salinity Control Program
- Upper Colorado River Endangered Fish Recovery Program

S1.6 Decisions To Be Made Based on This Analysis

Based on the analysis documented in the SDEIS, the responsible official for Reclamation will make the following decisions:

- Whether Reclamation should approve SWCD's application for a SRPA loan to construct the Narrows Project
- Whether Reclamation should approve SWCD's use of Reclamation withdrawn lands for the Narrows Project, in accordance with Reclamation law
- Under what terms and conditions (of a local supplemental agreement between Reclamation and the USDA Forest Service) should the agencies administer resources within the total areas of project influence

In addition, the cooperating agencies may use the SDEIS to aid them in making the following decisions:

- Whether the USDA Forest Service should:
  1. Amend the Forest Plan to reflect Narrows Project land use changes
  2. Authorize mitigation measures on USDA Forest Service administered lands outside the Reclamation withdrawn lands
  3. Issue necessary easements to the Utah Department of Transportation (UDOT) for relocating State Route (SR) 264
  4. Accept responsibility for management of the recreation facilities
  5. Sign various agreements, such as memoranda of understanding (MOU), easements, and rights-of-way (ROW)
  6. Amend grazing permits and allotment management plans
- Whether the USACE should approve the SWCD's application for a Clean Water Act Section 404 permit authorizing the placement of discharged dredge or fill material into waters of the United States for constructing the Narrows Dam and other features of the Narrows Project

S1.7 ENVIRONMENTAL ISSUES ASSOCIATED WITH THE PROPOSED ACTION ALTERNATIVE

The issues identified through the initial scoping effort are listed below. The issues are phrased as questions. Chapter 2 of the SDEIS contains a comparison summary of the alternatives and their responses to the issues.[1] Chapter 3 presents the existing environment and the environmental consequences as they relate to the resource issues.

Issue No. 1 – How would threatened and endangered species be affected by the Narrows Project?

Issue No. 2 – How would the Narrows Project affect wildlife resources?

Issue No. 3 – What effects would there be on water resources from the Narrows Project?

Issue No. 4 – How would the Narrows Project affect the fishery resource?

Issue No. 5 – How would water quality be affected by the Narrows Project?

Issue No. 6 – What would the effect be on wetland resources from the Narrows Project?

Issue No. 7 – What would the effect be on aquatic and riparian resources from the Narrows Project?

Issue No. 8 – How would the Narrows Project affect the recreation and visual resources within the project area?

Issue No. 9 – What effect would there be on cultural resources from the Narrows Project?

Issue No. 10 – What social and economic effects would be expected from the Narrows Project?

Issue No. 11 – What effect would there be on existing land uses, rights-of-way, and potential mineral leasing?

Issue No. 12 – What effects on public safety would there be from the Narrows Project?

Issue No. 13 – What would be the effects upon air quality associated with constructing the Narrows Project?

Issue 14 – Would the slopes of Fairview Canyon be affected by construction and operation of the Narrows Project? What effects will there be on channel stability from the Narrows Project

Issue No. 15 – What would the geologic hazards and earthquake hazards be from the Narrows Project?

Issue No. 16 – What would the effect be upon the soils of the area from the Narrows Project?

Issue No. 17 – What would the effect upon levels of trace elements in the ground water supply be from constructing the Narrows Project?

Issue No. 18 – What would the impact of the Narrows Project be on Indian trust assets (ITA)?

Issue No. 19 – What would the impact of the Narrows Project be on environmental justice?

Issue No. 20 – What climate change issues might affect, or be affected by, the proposed action?

[1] References to chapters, tables, and figures within the Executive Summary are to the respective chapter, table, or figure within the main portion of the SDEIS.

S1.8 PERMITS, AUTHORIZATIONS, AND AGREEMENTS

Implementation of the Proposed Action could require a number of authorizations or permits from State and Federal agencies. These are summarized below.[2]

- Reclamation approval of the SRPA loan and congressional approval of the necessary funds to construct the Narrows Project
- Reclamation authorization for SWCD use of withdrawn lands to construct and operate Narrows Dam and Reservoir
- Utah Division of Water Quality authorization needed for a Storm Water Discharge Permit (Section 402 of the Clean Water Act, as amended)
- A USACE permit in compliance with Section 404 of the Clean Water Act, as amended, or Utah Department of Natural Resources authorization for a State Stream Alteration Permit (Section 404 of the Clean Water Act, as amended)
- Utah Division of Water Quality authorization for a Utah Pollution Discharge Elimination Permit (Section 402 of the Clean Water Act, as amended)
- Reclamation consultation with the State Historic Preservation Office (SHPO)

[2] Before beginning activities under the Proposed Action, SWCD would consult with both USACE and the Utah Department of Natural Resources to determine which permits would be necessary.

S2.0 THE ALTERNATIVES CONSIDERED INCLUDING THE PROPOSED ACTION ALTERNATIVE

As the lead Federal agency for the SDEIS, Reclamation's action under review is whether or not to approve SWCD's application for a SRPA loan and request to use withdrawn lands to construct and operate the Narrows Project. USACE and USDA Forest Service must also make decisions based on the environmental impact statement (EIS). To fully explore the effects of the proposed action and possible alternate courses of action SWCD, working with Reclamation and the other cooperating agencies, developed an array of alternatives to answer the issues raised in section S1.7 and chapter 1.

S2.1 DESCRIPTION OF ALTERNATIVES

S2.1.1 No Action Alternative

The No Action Alternative represents the conditions of the affected area if Reclamation does not approve the SRPA loan and use of withdrawn lands by SWCD for the Narrows Project (figure 2-1). It establishes the baseline for evaluating the environmental impacts of providing a supplemental water supply to north Sanpete County. It also establishes anticipated conditions in the affected areas without further development and assumes that irrigation operations would continue according to historic use.

Under this alternative, the Narrows Dam and Reservoir would not be constructed. Without the dam construction, there would be no need to relocate SR-264; and there would be no recreational facilities constructed at the reservoir site. The East Bench, Oak Creek, and Upper Cottonwood Creek Pipelines

would not be built. The existing Narrows Tunnel would be rehabilitated at some future date with other funding. The Cottonwood Creek Irrigation Company could not risk complete collapse and failure of the tunnel. If the tunnel were to collapse, the Cottonwood Creek Irrigation Company would have to acquire some type of emergency funding and would be required to repair it. The demand on municipal water supplies in Fairview, Mount Pleasant, Spring City, and Moroni would continue to increase as supplies for outdoor municipal uses run short and as the population increased. Most likely, there would be a conversion of agricultural water to municipal use as the demand for municipal water increased with a growing population.

Water conservation measures would continue to be implemented. These conservation measures would reduce average shortages on irrigated farmland to about 29.5% or about 15,250 acre-feet per year. Implementing new conservation measures most likely would reduce irrigation return flows now supplying wetlands, aquatic habitat, and downstream users by an estimated 3,500 acre-feet per year.

There would be no wetlands, wildlife, or fisheries mitigation measures implemented under the No Action Alternative because there would be no impact to existing wetlands and wildlife habitat. Streamflows in Gooseberry and Fish Creeks would remain unaltered from their present state. Under this alternative, no flatwater fishery would be developed in the proposed reservoir basin.

S2.1.2 Proposed Action Alternative

If Reclamation approves the SRPA loan and Congress appropriates the necessary funds and lands, a supplemental water supply would be developed for municipal water users and agricultural use in north Sanpete County under the Proposed Action. This additional water supply would satisfy the 1984 Compromise Agreement.

The Proposed Action would provide north Sanpete County an average annual supply of 4,281 acre-feet of supplemental irrigation water for 15,420 acres of presently irrigated farmland and 855 acre-feet of water for municipal use. The project would include construction of the 17,000 acre-foot Narrows Dam and Reservoir on Gooseberry Creek, pipelines to deliver the water to existing water distribution systems, rehabilitation of the existing 3,100 foot Narrows Tunnel, and relocation of 2.9 miles of State Road (SR) 264. The dam would be 120 feet high with a crest length of 550 feet and crest width of 30 feet.

The Narrows portion of the Gooseberry Project Plan would include a transmountain diversion of water from the Gooseberry Creek drainage of the Price-Green-Colorado River Basins to the San Pitch-Sevier River of the Great Basin. Geographically, the project facilities are located in close proximity to the drainage divide between the Price River system and the San Pitch River system. The general location is shown on the location map in the front of this document.

The Price River flows southeast to the Green River, a tributary of the Colorado River. The San Pitch River flows southwest to the Sevier River, which is completely consumed in the Bonneville Basin, a part of the arid Great Basin. The county line dividing Sanpete County and Carbon County is located more than 6 miles downstream from and about 3 miles east of the proposed Narrows damsite on Gooseberry Creek.

The proposed damsite, the transmountain Narrows Tunnel, and the project water distribution facilities are all located in Sanpete County. The source of the project water supply generally arises in Sanpete

County and naturally flows into Carbon County and the Price River system, unless the flows are captured and diverted transmountain to Sanpete County. The service area of the Narrows Project would be situated in the San Pitch River drainage.

A dam and reservoir would be constructed on Gooseberry Creek, and water would be diverted through an existing tunnel to Cottonwood Creek. Pipelines would be constructed to deliver the water to existing water distribution systems located near Fairview, Utah. Recreation facilities would be developed at the reservoir, and a 2,500-acre-foot minimum pool for fish habitat would be maintained.

Mitigation measures would be implemented to offset adverse impacts to wetlands, terrestrial wildlife, and stream fisheries. In addition to mitigation measures to offset project impacts, other measures would be included to enhance or improve fish and wildlife habitat. Additional water conservation measures would be required independent of the Proposed Action. However, only those water users who have implemented or would agree to implement water conservation measures would be eligible to receive project water. These practices would include improved water conveyances such as lined canals, pipelines, or improved irrigation practices such as sprinklers or gated pipe.

S2.1.3 Mid-Sized Reservoir Alternative

This alternative would be similar to the Proposed Action except that the reservoir capacity would be limited to 12,450 acre-feet. Of that amount, 9,950 acre-feet would be active capacity, and 2,500 acre-feet would be inactive storage. The 110 feet high dam, with a crest length of 475 feet and crest width of 30 feet, would be in the same location as that for the Proposed Action (figure 2-11). Other features of the project would be the same as those for the Proposed Action and would include the construction of pipelines, rehabilitation of the existing Narrows Tunnel, relocation of SR-264, and provide recreation opportunities. Exceptions and differences between this alternative and the Proposed Action are described in the SDEIS.

S2.1.4 Small Reservoir Alternative

This alternative would be similar to the Proposed Action except that the reservoir capacity would be limited to 7,900 acre-feet. Of that amount, 5,400 acre-feet would be active capacity, and 2,500 acre-feet would be inactive storage. The 100-feet-high dam, with a crest length of 425 feet and crest width of 30 feet, would be in the same location as that for the Proposed Action (figure 2-12). Other features of the project would be the same as those for the Proposed Action and would include the construction of pipelines, rehabilitation of the existing Narrows Tunnel, relocation of SR-264, and provide recreation opportunities. Exceptions and differences between this alternative and the Proposed Action are described in the SDEIS.

S2.2 ALTERNATIVES CONSIDERED AND ELIMINATED FROM THE STUDY

Several alternatives considered were determined to be nonviable. Those alternatives are listed below and described in detail in the SDEIS.

- Direct Diversion Without Reservoir
- Direct Diversion with Reservoir in Sanpete Valley

- Conservation Without Development of Other Water Supplies
- Mammoth Damsite Alternative
- Valley Damsite Alternative
- Skyline Mine Alternative
- Year-round Release with Ground Water Exchange and Pumping Alternative
- New Ground Water Development
- New Surface Water Development in Sanpete County Alternative
- Central Utah Project Water Alternative
- Conservation Through Retirement of Irrigation
- Purchase of Sanpete County's Water Rights by Carbon County Water Interests
- Carbon County Proposed Recharge Alternative

S2.3 COMPARISON OF ALTERNATIVES

Table 2-8 in the SDEIS compares the closely examined alternatives against the issues associated with the Proposed Action that are outlined in chapter 1. The scientific and analytical basis for these comparisons can be found in chapter 3.

S3.0 AFFECTED ENVIRONMENT/ PREDICTED EFFECTS

This section summarizes chapter 3, which discusses the affected environment and environmental consequences that would result from the construction, operation, and maintenance of the project features associated with the Proposed Action and alternatives of the Narrows Project. The affected environment discussions describe existing conditions for resources within the project area. The impact analyses focus on potential direct, indirect, total, and cumulative impacts on these resources. Potentially significant impacts, together with criteria developed at the beginning of this study for assessing the significance of potential impacts, are identified. Resource specialists reviewed all data and results of the 1998 DEIS analysis and updated data where appropriate in the SDEIS. Mitigation measures that would reduce or avoid certain adverse impacts or would compensate for some unavoidable adverse impacts also are identified.

S3.1 THREATENED AND ENDANGERED SPECIES

No plant species currently receiving protection under the Endangered Species Act are known to exist in the project area.

A biological assessment of potential effects on endangered, threatened, and candidate wildlife and fish species was conducted for the Narrows Project. Federally listed or otherwise protected species addressed in the assessment included: bald eagle (*Haliaeetus luecocephalus*); Colorado pikeminnow, (*Ptychocheilus lucius*); bonytail chub (*Gila elegans*); humpback chub (*Gila cypha*); and razorback sucker (*Xyrauchen texanus*).

The U.S. Fish and Wildlife Service (Service) issued a final biological opinion on August 24, 2000, (appendix C) that found that the proposed project would have no effect upon the bald eagle, which was subsequently delisted in 2007. The Service believes that the southwestern willow flycatcher (SWWF) found at the Fish Creek site is not the endangered subspecies; therefore, no discussion was offered specifically in

reference to the SWWF. The Service concluded, however, that the project and associated depletion of water from the Colorado River system may affect the four endangered Colorado River fishes. While the opinion concluded that the proposed project may affect the four endangered fishes, it also stated that the project is not likely to jeopardize their continued existence, provided measures are implemented to offset project impacts (i.e., payment of a one-time financial contribution by SWCD).

S3.2 WILDLIFE

The wildlife species found in the general project area are common in the Great Basin Desert valleys and Rocky Mountain Range. There are about 364 species of terrestrial vertebrates that may inhabit the project area. Approximately 88 bird species and 33 mammal species use the habitats that would be disturbed by the proposed project.

Table 3-1 summarizes the impacts to wildlife habitat that would result from construction of the Proposed Action. In an assumed worst-case situation where the most habitat would be lost at one time, it would take the reservoir 2 years to fill to capacity. The *1994 Fish and Wildlife Coordination Act Report* evaluates the impacts of the proposed Narrows Project on fish and wildlife resources and recommends appropriate mitigation (see appendix D).

A wildlife mitigation program has been designed to provide at least full mitigation for each impacted species. Because the wetland and upland wildlife mitigation measures are intended to provide full mitigation for project impacts, there would be no residual impacts.

S3.3 WATER RESOURCES

Gooseberry Creek and its three unnamed tributaries are located high in the Price River drainage. This tributary of Fish Creek flows directly into Scofield Reservoir (see the location map at the front of this document). Other tributaries to Scofield Reservoir include Mud Creek and Pondtown Creek. The Price River, which flows out of Scofield Reservoir, is a tributary of the Green River—a tributary of the Colorado River. These three rivers are all located in the Colorado River Basin.

Cottonwood Creek, located in the San Pitch River Basin, is located on the opposite side of the divide from Gooseberry Creek.

Cottonwood Creek and the San Pitch River are located in the Sevier River subbasin of the Great Basin.

Typical of Wasatch Mountain streams, flows in these creeks are greatest in the spring, when snowmelt runoff is peaking. Peak flows during May and June are estimated to range from 15 to over 100 cubic feet per second (cfs) in Upper Gooseberry Creek near the proposed damsite. The flow declines considerably in late summer and reaches a minimum in late fall or winter. Late-season flows are estimated to be 1.5 to 5 cfs in Upper Gooseberry Creek.

The average annual natural runoff volume of Upper Gooseberry Creek, near the proposed damsite, is 9,032 acre-feet. Of this amount, an average of 1,815 acre-feet presently is stored in Fairview Lakes and diverted transmountain to Cottonwood Creek through the Narrows Tunnel. The remaining water continues down Gooseberry Creek to Fish Creek. An average of 35,800 acre-feet per year enters Scofield Reservoir from Fish Creek. The total annual inflow to Scofield

Reservoir from all tributaries averages 57,500 acre-feet. The average total contents of Scofield Reservoir are about 42,360 acre-feet. All of these values are for the 1960–2002 hydrologic period.

The Price River below Scofield Reservoir, referred to as lower Fish Creek, has a wide range of flows that vary according to downstream water demands and hydrologic conditions. Releases consist of direct flow right bypasses and Scofield Reservoir storage deliveries for Scofield Project users. Spills occur when the reservoir is full and water flows over the spillway or when releases are made in excess of downstream demands. These total releases and spills have averaged 51,815 acre-feet for 1960–2002 but historically have varied from 13,762 to 154,475 acre-feet. Low flow conditions generally occur from November through March. There are no minimum flow requirements in the Price River, and it is not unusual for the flow below the dam to be completely shut off during winter months. Peak flows below the dam occur in wet years when the reservoir spills. While normal dam releases in June are about 150 cfs, the total releases with these spills have ranged up to more than 1,100 cfs. Since spills are in excess of downstream consumptive use requirements, they usually increase river flows throughout the lower Price River to the confluence with the Green River. From 1960 to 2002, the reservoir filled and spilled 17 times. This indicates that, on the average, the reservoir historically has spilled about every 2 to 3 years.

About 25 miles downstream from Scofield Reservoir near the small community of Heiner, the average annual flow of the Price River is about 81,000 acre-feet based on 1935–81 data. Within 5 miles of Heiner, numerous diversions from the river occur. The largest diversion is the head of the Carbon and Price Wellington Canals, located about 1.5 miles south of Spring Glen. Except during high water conditions when the flow of the river exceeds the capacity of the canals, the river essentially is dry below this diversion. In addition to irrigation water, winter flows also are diverted for stockwatering.

Irrigation return flows in this area discharge back to the river, and the flow of the river increases after passing through the Price-Wellington area. Near its confluence with the Green River, the average annual flow of the river is 94,929 acre-feet, based on 1960–92 records. The stream gauging station on the Price River at Woodside was discontinued in September 1992 and renewed in July 2000.

As mentioned previously, Cottonwood Creek, located in the San Pitch River Basin, has typical flow conditions as compared with other streams in the area with one noted exception. After spring runoff flows subside in late May or early June, natural flows are supplemented with releases from Fairview Lakes. These releases are made through an existing transmountain tunnel. Flows from Fairview Lakes are used by the Cottonwood-Gooseberry Irrigation Company as a source of supplemental irrigation water in the Fairview area. These supplemental releases generally occur in July and August. The historic average annual flow volumes at the tunnel outlet and the mouth of Cottonwood Creek have been 2,055 and 8,600 acre-feet, respectively.

Operation of the Narrows Project would affect streamflows in Gooseberry Creek, Fish Creek, Price River, Green River, Colorado River, Cottonwood Creek, and about 3 miles of the San Pitch River. Table 3-2 provides a comparison of average monthly streamflows under the four project alternatives evaluated. Monthly streamflow data were used to develop this table because reliable daily streamflow data were not available.

Impacts to Lower Gooseberry Creek and Fish Creek would occur primarily during the spring snowmelt period as water is stored in Narrows Reservoir for release later in the summer. Impacts to Lower Gooseberry Reservoir would consist of reduced inflow. However, the effect would be negligible because the reservoir is not operated as a storage reservoir. As a result, the outflow would be reduced in the same proportion as the inflow would be reduced. Impacts to Scofield Reservoir would be in the form of reduced inflows, resulting in a lowering of average reservoir storage. Impacts to regulated releases from Scofield Reservoir for Scofield Project use would occur only during multiple successive drought years, such as occurred in the early 1960s, early 1990s, and the early 2000s. Impacts to the Price, Green, and Colorado Rivers would result primarily in reduced spills from Scofield Reservoir.

The impacts of the Narrows Project on water resources are most pronounced near the reservoir. About 1 mile of Upper Gooseberry Creek and 4.3 miles of small streams in the proposed reservoir basin would be inundated by the reservoir. In addition, annual flows in the middle 3 miles of Gooseberry Creek between Narrows Reservoir and inflow into Lower Gooseberry Reservoir would be reduced by about 74%. Under the Proposed Action, a 1.0-cfs minimum flow would be made from Narrows Reservoir to Gooseberry Creek to provide a 1.5-cfs minimum flow at the USDA Forest Service campground ⅛ mile downstream from the proposed damsite. If the 1.5-cfs flow at the campground is not met, up to an additional 0.25 cfs would be released from the reservoir to meet the required flow. Minimum streamflow releases from Narrows Reservoir would eliminate periodic dry stream channels in the Middle Gooseberry Creek segment. An average of 300 acre-feet per year also would be released for channel maintenance or other instream flow purposes.

Flows in Cottonwood Creek would increase during the irrigation season, with the import of project water through Narrows Tunnel. However, during the irrigation season, these flows would be less than peak flows that occur naturally during the spring snowmelt period. The Upper Cottonwood Creek Pipeline would convey these increased flows outside the stream channel between the tunnel outlet and the confluence with Left Hand Fork. About 300 feet below the Left Hand Fork confluence, the project flows would be discharged to the stream. At this point, the increase in average July and August flows from current conditions would be about 200%.

Depletions to the Price River drainage would average 5,597 acre-feet per year. This amount would consist of 5,227 acre-feet of transbasin diversions and 370 acre-feet of increased evaporation in the Price River Basin. When measured in Gooseberry Creek below Narrows Reservoir, the reduction in annual streamflow varies between 1,760 and 10,200 acre-feet, depending on the storage level of Narrows Reservoir and the magnitude of the streamflow into the reservoir. As shown in table 3-2, the greatest impact would occur during the spring snowmelt runoff period. Releases from Narrows Reservoir to Gooseberry Creek would remain at a minimum of 1.0 cfs; and when the reservoir is spilling or when flushing releases are made, the flow would be greater.

As a result of constructing Narrows Reservoir, the operation of Scofield Reservoir would be altered within the normal historic range. Scofield Reservoir would operate at a lower level with implementing the Proposed Action, as shown in figure 3-1. Under project conditions, the average total contents of Scofield Reservoir would be reduced from about 42,360 acre-feet to about 31,500 acre-feet. Average reduction in storage releases to irrigators in the Price area

would be about 753 acre-feet per year. Total depletions to the Price River drainage would average 5,597 acre-feet per year. Both the volume and frequency of spills from the reservoir would be reduced. The average reservoir surface area would be reduced from 2,370 acres in the No Action Alternative to about 2,125 acres. This is about a 10% reduction or about 245 acres of the surface area of the No Action Alternative.

Since Scofield Reservoir would operate at a lower level, there is an increased potential for the reservoir to be drained to the bottom of its active storage. The frequency of this occurrence increases from 3 times in 43 years for the No Action Alternative to 12 times in 43 years with the Proposed Action.

During most years, controlled releases from Scofield Reservoir to meet Scofield Project demands would remain unaltered.

In summary, the residual impacts (after mitigation) of the Proposed Action include the inundation of 1.0 mile of Gooseberry Creek and 4.3 miles of unnamed tributaries. Flows in Gooseberry Creek below Narrows Reservoir, Fish Creek, and the Price River would be reduced as shown in table 3-2. The flow in Cottonwood Creek below the confluence with Left Hand Fork would be increased during the nonrunoff portions of the irrigation season. Scofield Reservoir would operate at a lower level in most years; and reductions in storage releases to irrigators in the Price area would occur only after several successive years of drought but would average about 753 acre-feet per year. However, on the average, these reductions would be about 1,500 acre-feet less than those that would have occurred if Scofield Reservoir had not been enlarged to accommodate the Gooseberry Project (Narrows Project).

S3.4 FISHERIES

Most of the Narrows Project alternatives have the potential to affect aquatic resources in Gooseberry Creek, Fish Creek, three unnamed headwater tributaries to Gooseberry Creek, Cottonwood Creek, Lower Gooseberry Reservoir, Fairview Lakes, and Scofield Reservoir (see the location map). Cottonwood Creek is in the San Pitch River Basin, whereas all of the others are in the Price River drainage. Cottonwood Creek flows into the San Pitch River downstream from Fairview, Utah; but the San Pitch River, within the project area, does not support a sport fishery because of low summer flows.

Flows in Gooseberry Creek, its unnamed tributaries, and Cottonwood Creek presently are affected by the operation of Fairview Lakes, which store water during spring runoff. Water from the lakes is delivered during the irrigation season via one of the unnamed tributary streams and a canal to the Narrows Tunnel that discharges into Cottonwood Creek. The released water then is diverted for irrigation in Sanpete County.

Lower Gooseberry Creek and Fish Creek downstream from the confluence with Gooseberry Creek also are affected by the operation and limited regulation offered by Fairview Lakes. If the project is approved, an operating agreement would have to be negotiated between SWCD and Cottonwood-Gooseberry Irrigation Company (CGIC) to regulate seasonal releases from Fairview Lakes in connection with downstream discharges from the Narrows Reservoir.

Aquatic resources vary considerably between the different reservoirs and stream segments that could be affected by the Narrows Project. Fish habitat study reaches are shown in figure 3-4.

The State Engineer stipulates that a minimum of 1.0 cfs is to be released downstream from the proposed Narrows Dam; and, if the flow is not 1.5 cfs at the Gooseberry campground, SWCD is required to release 1.25 cfs from the dam. It also is stipulated that the dam be constructed with a multiple-level outlet to regulate water temperature for the trout located downstream from the dam.

The proposed project would cause flow reductions in Gooseberry and Fish Creeks as shown in table 3-2. Flows in Middle Gooseberry Creek immediately downstream from the proposed dam would be expected to be reduced on average by 74%, whereas flows downstream from Lower Gooseberry Reservoir would be expected to be reduced by 43%. In Fish Creek, flows would be expected to be reduced approximately 15%.

The 5,400-acre-feet diversion of project water into Cottonwood Creek would cause about a 200% increase in the base summer flow in Upper Cottonwood Creek (table 3-2). As shown, the base summer flows in Lower Cottonwood Creek would be increased by about 160%. However, the increased flows would occur only during the July-to-October period and not during the peak runoff or the low flow months (November–April). Additionally, these base summer flows would be less than the peak flows that currently shape the stream channel. Therefore, the stream channel itself would remain stable.

Providing a 2.0-cfs winter release through the Narrows Tunnel is expected to greatly increase the weighted usable area (WUA) for all fish species in Cottonwood Creek. This increased flow particularly would benefit the upper reaches of the creek and would be expected to facilitate the overwintering of fish.

The length of time required initially to fill Narrows Reservoir would, of course, depend on hydrologic conditions in the basin. During wet years, the reservoir could fill during a single spring runoff. For more normal conditions, if no diversions were made to Cottonwood Creek until the reservoir filled, it likely would fill in 2 years—almost certainly within 3 years. Under dry conditions, if diversions to Cottonwood Creek did occur during the filling period, it could take 5 to 15 years to fill Narrows Reservoir. Due to these hydrologic uncertainties, there is no firm filling schedule for the reservoir.

At maximum storage, the proposed Narrows Reservoir would inundate about 1 mile of Upper Gooseberry Creek and approximately 4.3 miles of the three headwater tributaries with permanent flows that join to form Gooseberry Creek.

Based on the stream habitat that would be inundated by the proposed reservoir, it is expected that 1.3 and 2.1 acres of stream-based aquatic habitat would be lost in Gooseberry Creek and the tributaries, respectively. Using the standing crop estimates, approximately 230 pounds of stream-based cutthroat trout would be lost, of which 22% would occur in Gooseberry Creek and 78% would occur in the tributary streams, although the trout biomass likely would be converted into a flat-water equivalent.

The Utah Division of Wildlife Resources (UDWR) does not recognize the creation of a reservoir fishery as adequate compensation for the loss of stream aquatic resources. Creating an additional reservoir fishery would compensate for adverse effects that may occur on Lower Gooseberry Reservoir and Scofield Reservoir. This would represent a cumulative beneficial project impact to reservoir fishery.

In summary, the Proposed Action would result in loss of cutthroat trout stream habitat attributable to reservoir inundation and flow alteration. The project also would result in more reservoir habitat for cutthroat trout. The

reservoir cutthroat trout habitat that would be created by the project would compensate for any adverse impacts that may occur on Gooseberry or Scofield Reservoirs. Therefore, mitigation for reservoir habitat has not been proposed.

A total of 11 fishery improvement and mitigation measures have been proposed by SWCD to compensate for the adverse aquatic impacts that have been identified with the proposed project. To the extent possible, an attempt was made to mitigate "in place" and "in kind." These measures have been developed in coordination with various Federal and State agencies and were described in detail in chapter 2, section 2.2.2.2.1. Table 3-11 is a summary of the aquatic impacts and proposed improvement and mitigation commitments for the Proposed Action.

The intent of the aquatic mitigation measures is to provide full mitigation for all adverse impacts resulting in no residual cumulative or overall impacts.

S3.5 WATER QUALITY

S3.5.1 Upper Gooseberry Creek

On the basis of data collected from Upper Gooseberry Creek and Cottonwood Creek, where much of the flow is from Gooseberry Creek through the Narrows Tunnel, the water is considered very good quality. As shown in table 3-14, the dominant chemical constituents are calcium and bicarbonate, with other common ions being minor in concentration. Total dissolved solids (TDS) are low, ranging from 184–258 milligrams per liter (mg/L) in Gooseberry Creek, and 160–316 mg/L in Cottonwood Creek. Trace elements are very low in concentration, with most below detection limits.

Although most of the phosphate levels in these samples were considerably less than 0.05 mg/L, previous studies conducted by the UDWR indicate that the 0.05-mg/L guideline for streams is often exceeded in Cottonwood Creek. Existing soil and rock erosion may be the major sources of phosphates exceeding this pollution indicator, with livestock grazing, recreation, and wildlife also contributing. At levels of 0.05 mg/L or greater, Utah Division of Environmental Quality (UDEQ) indicates that investigations should be conducted to develop more information concerning the sources of the phosphate.

S3.5.2 Lower Gooseberry Reservoir

The Utah Division of Water Quality completed a limnological assessment of Lower Gooseberry Reservoir that indicates it is a fairly stable mesotrophic (moderate levels of organic and mineral nutrients) system with good water quality (State of Utah, Department of Environmental Quality, Division of Water Quality, 2008). The only parameters to exceed State water quality standards for defined beneficial uses are phosphorus, pH, and dissolved oxygen (DO). The average concentration of total phosphorus in the water column has not exceeded the recommended pollution indicator for phosphorus of 0.025 mg/L; but on occasion, higher values are reported at various depths in the water column. On occasion, DO levels and pH values have violated State standards near the bottom of the reservoir, mainly during winter ice coverage. The extensive macrophyte coverage of the bottom of the reservoir is the only factor in the reservoir responsible for this phenomenon. The reservoir is shallow, with a mean depth of 3.7 feet, has good light penetration throughout the water column, and does not stratify. UDWR has expressed

concern about nutrient loading of Lower Gooseberry Reservoir and its effect upon DO levels in the reservoir. The oxygen depletion of the reservoir during the winter is believed to result from low winter inflows combined with decomposition of organic material resulting from the extensive macrophyte growth during the summer, as mentioned above.

S3.5.3 Scofield Reservoir

Recent studies indicate that Scofield Reservoir is mesotrophic in its present state. Data collected in 1990 and 1991 depict the reservoir as hypereutrophic, while data in 1992 after treatment and eradication of trash fish indicate a moderately eutrophic system. Data collected between 1995 and 2003 indicate a mesotrophic system (State of Utah, Department of Environmental Quality, Division of Water Quality, 2006). Eutrophication is a term applied to the organic degradation of a body of water and is associated with elevated levels of carbon, nitrogen, phosphorus, and other inorganic nutrients. The degree of eutrophication generally is exhibited by the growth and appearance of large colonies of algae in highly eutrophic waters, coupled with a green cast or color to the water. This generally occurs during the warm summer months.

Trophic State Index (TSI) is a general measure of the level of eutrophication in a reservoir. The Carlson TSI is determined using measures of secchi depth, chlorophyll, and phosphorus (Carlson, 1977). TSI values greater than 50 are indicative of a eutrophic system, and TSI values between 40–50 are indicative of a mesotrophic system. The average TSI value for Scofield Reservoir of 53.3 (for 1979–80) was reported by UDEQ in a report entitled *Scofield Reservoir Restoration Through Phosphorus Control.* For the period 1981-2007 the average TSI value was computed to be 47.1 (see figure 3-5).

The water quality of Scofield Reservoir is considered fair. Average constituent levels of the reservoir and its tributaries are listed in table 3-15. The average detention time is about 1.4 years. The maximum depth is 66 feet, and the mean depth is 26 feet. The shallow areas with water less than about 15 feet deep normally are covered with extensive macrophyte growth, although these are normally submergent. This adds to the oxygen deficit problem during parts of the year.

The principal pollutants are nutrients, sediments, and trace elements associated with erosion and mining and nonpoint sources such as construction of roads and mine portals, domestic waste disposal, animal grazing, and natural deposits of rock containing phosphates.

Several independent water quality studies of Scofield Reservoir (listed in the "Bibliography") show that phosphorus is the limiting nutrient. This means that all available phosphorus is used up in producing algae or other cell bodies, while there remains a surplus of carbon, nitrogen, and other nutrients. Thus, without the input of additional phosphorus into the system, no additional algal cells can form. About 53% of the phosphorus loading to Scofield Reservoir enters from Fish Creek, according to a 1983 Utah Department of Health study. Indications are that the source of most of the phosphorus consists of naturally occurring, phosphorus-laden soils in the upper watershed.

Fish kills in Scofield Reservoir have been reported during 14 of the 46 years from 1960–2005. These fish kills are minor and generally occur in late summer. They are an indicator of water quality problems with low DO levels being the most probable cause of the fish dying.

In 1984, UDEQ received a Clean Lakes Phase II grant pursuant to the Clean Water Act, Section 314, to rehabilitate Scofield Reservoir through a program to reduce total phosphorus loading to the reservoir. UDEQ had concluded that

> *"the most pragmatic and effective means to control the further eutrophication of Scofield Reservoir, or possibly to effect a moderate reversal of the eutrophication process, appears to be a reduction of the phosphorus load to the lake."*

The restoration project consisted of installing stream revetments and checkdams, revegetation of denuded streambanks, replacing water diversion systems for irrigation, providing a fish cleaning station, and developing a public awareness and education program to alert people of the pollution problem and solicit their support in reducing phosphorus loads to the reservoir. Streambank rehabilitation activities occurred on segments of Mud Creek and Fish Creek. The overall streambank work was designed to reduce stream sediments and erosion through streambank stabilization and revegetation of denuded soils in highly eroded areas.

A postproject monitoring program indicated that the project was initially effective. Streambank stabilization and revegetation occurred in the project area. Visual observations indicated that sediments were being removed from the streams. Although there is insufficient empirical data to conclusively support the effects of the implementation effort, the data indicated a decline in total phosphorus concentrations. However, many aspects of the project were voluntary on the part of the landowners. Since the project completion, many of the project measures have not been maintained. In particular, one aspect included fencing Mud Creek to prevent cattle from entering the stream, damaging the streambanks, and defecating in the stream. This was initially effective, but the landowners currently keep the gates open, thus allowing cattle access to the stream.

Utah Division of Water Quality officials believe that the presence of "rough fish," such as carp and suckers, also contribute to the water quality problems in Scofield Reservoir. These fish feed on the reservoir bottom and stir up sediments. This agitation could increase the internal phosphorus loading of the reservoir. In critical water quality years, removal of these fish species might improve the water quality of the reservoir. For example, 1992 was a critical year for Scofield Reservoir operation. Reservoir levels were extremely low, and fish kills were anticipated. However, a fish eradication program was conducted the previous year that killed the undesirable fish. No fish kills were observed in 1992 even though water levels were critically low.

In 2000, the Utah Department of Water Quality submitted, and the U.S. Environmental Protection Agency (EPA) approved, a phosphorus total maximum daily load (TMDL) for Scofield Reservoir (State of Utah, Department of Environmental Quality, Division of Water Quality, 2000). The TMDL identifies total phosphorus and DO as pollutants of concern, which have attributed to the impairment Scofield Reservoir's Class 3A beneficial use for cold water species of game fish. The TMDL focuses on total phosphorus as the pollutant of concern because low DO is linked to high phosphorus levels. The loading assessment quantified the current total phosphorus load to the reservoir at 6,723 kilograms per year (kg/year). The TMDL identified three endpoints to improve reservoir water quality:

1. Shift in phytoplankton dominance from blue-green algae

2. DO level of no less than 4.0 mg/L in 50% of water column
3. TSI values between 40 and 50

These endpoints are to be met by reducing the total phosphorus load to the reservoir by 1,881 kg/yr.

S3.5.4 Colorado River Salinity

At its headwaters in the mountains of north-central Colorado, the Colorado River has a salinity concentration of 50 mg/L. As a tributary to the Colorado River, the Price River contributes to the salinity load of the river system. The concentration progressively increases downstream as a result of water diversions and salt contributions from a variety of sources. Near Yuma, Arizona, the Imperial Dam, built in the 1930s, diverts Colorado River water into three different canals and holds the river water until it can be directed into a desilting plant. Annual salinity concentrations at Imperial Dam are expected to decrease from the 1987 measured average level of 850 mg/L to an estimated average of 779 mg/L by the year 2025, assuming continuing successful implementation of the salinity control program.

Water in the Price River suffers major quality deterioration as the stream crosses the irrigated sectors of the river basin. The deterioration results from both geologic and human factors. From about November–April, little water is released from Scofield Reservoir, and the upper portion of the basin contributes little water to the river. During this period, irrigation return flow is not significantly diluted by better quality water. Although major releases are made from Scofield Reservoir from May–October, a large part of the flow is diverted during this period into major irrigation canals in the upstream part of the basin. Significant amounts of irrigation return flow of poor quality enter the river downstream from points where most of the flow is diverted from the river.

Accordingly, during most of the year, the flow in Price River in the central basin is composed of relatively small amounts of good quality water from the upper basin and variable amounts of irrigation return flow and natural flow from tributaries that drain the marine shales. This increases the TDS level from about 300 mg/L to about 2,000 mg/L as measured above and below the areas of principal use. Although some deterioration in the chemical quality of the Price River probably would occur in the absence of stream regulation and irrigated agriculture in the central basin, deterioration is intensified with the presence of both.

S3.5.5 Cottonwood Creek and San Pitch River

As indicated above, Cottonwood Creek has good water quality and generally meets all of its present beneficial use classifications. The San Pitch River is also generally good quality water above Fairview. However, the San Pitch River degrades downstream since most of the water is diverted; and near Moroni, the river is composed mostly of return flows from irrigation and municipal waste water. However, the TDS levels are generally below 500 mg/L in this reach, and the water is very suitable for irrigation. Most of the water is diverted from the stream about 2.5 miles west of Mt. Pleasant. Table 3-16 summarizes the water quality in this reach of the San Pitch River. Levels of trace elements (metals) in both streams are normally below detection levels.

Table 3-17 summarizes the water quality in the lower section of the San Pitch River and in Sixmile Creek near the mouth. Water in Sixmile Creek is very good quality with

TDS levels averaging about 350 mg/L. Waters in the lower San Pitch River consist of mostly return flows and are further degraded below the proposed project area. The average TDS in the San Pitch River above Gunnison Reservoir is about 1,050 mg/L and is about 1,635 mg/L below Gunnison Reservoir. The recommended TDS criteria for irrigation water are 1,200 mg/L. Levels of trace elements (metals) in both streams are normally below detection levels.

S3.5.6 Predicted Water Quality Effects

Under the Proposed Action, there could be some water quality impacts during construction; however, measures would be implemented to minimize those impacts. The contractor would be required to comply with applicable Federal and State laws, orders, and regulations concerning the control and abatement of water pollution. The contractor's construction activities would be performed by methods that would prevent entrance or accidental spillage of solid matter, contaminants, debris, and other objectionable pollutants and wastes into streams, lakes, and underground water sources. Sanitary wastes would be disposed of by approved methods.

The construction contract would require the contractor to develop and implement a Water Quality Management Plan (Erosion Control Plan) and a Storm Water Pollution Prevention Plan. The contractor also would be required to implement the best management practices (BMPs) specified in the *Nonpoint Source Water Pollution Control Plan for Hydrologic Modifications in Utah*, which is an addendum to the *Utah Nonpoint Source Management Plan*. Specifically, applicable sections, such as Hydromod Planning Process, Measures to Control Construction Activities, and Impoundments, would be followed and implemented. Under a worst case scenario, if sediment control facilities temporarily failed and any stream sections were significantly impaired, remediation/restoration work would be implemented to the satisfaction of the appropriate government agencies.

Any construction work occurring in streams or associated wetlands would be conducted in compliance with USACE's 404 Permit and/or Utah State Engineer's stream alteration permit, which would include the State 401 certification process.

S3.5.6.1 Lower Gooseberry Reservoir

The average annual inflow (based on 1978–2005 data) to Lower Gooseberry Reservoir would be reduced by 40%. The average annual phosphorus load levels below the proposed Narrows Reservoir would be reduced by about 113 kg/yr, resulting from phosphorus export and uptake in the Narrows Reservoir. This would result in a 45% reduction in the average nutrient load in the total inflowing water. The average in-lake phosphorus concentration would be reduced from 0.0131 to 0.0119 mg/L, and the probability of eutrophication would be reduced from 24.3 to 19.7%. Because the DO levels are greatest near the stream inlet, a decrease in inflow is expected to decrease the overall DO level of the reservoir in winter during iced-over conditions, thus increasing the potential for fish kills, unless mitigation were implemented. Mitigation is planned for this, which would include additional storage in the Narrows Reservoir and minimum streamflow releases as discussed in section 3.4, "Fisheries."

S3.5.6.2 Scofield Reservoir

The results of the eutrophication study (Franson-Noble Engineering) with the Narrows Dam and Reservoir show that, under the Proposed Action, there would be a reduction of average annual phosphorus

mass loading into Scofield Reservoir (105 kg/yr) and a slight increase of 10.8% in phosphorus in-lake concentration from 0.0279 to 0.0309 mg/L. The reduction in phosphorus loading results from basin export and uptake in Narrows and Lower Gooseberry Reservoirs. The overall probability of eutrophication for the period studied shows an increase from 68.3 to 73.5% (about a 5.2% increase). The probability of eutrophication was increased slightly every year except 1984. Figure 3-6 shows a comparison of the future without project and project phosphorus level in Scofield Reservoir based on external loading.

As a result of the Proposed Action, the inflow to Scofield Reservoir would be reduced by an annual average of 5,726 acre-feet (about 9.2%). This means that Scofield Reservoir generally would operate at a lower elevation and smaller surface area. Its average flushing rate would decrease slightly, from 1.15 to 1.14. However, the flushing rate would drop below 0.85 in 10 of the 46 years studied, instead of 8 of 46 years as would occur in the future without the project (see figure 3-7). The critical low flushing rate would occur 22% of the time with the project as compared to 17% of the time without the project. During these periods of critical flushing rate, the probability of fish kills could be somewhat higher.

Taking into account the slight increase in in-lake phosphorus concentration and essentially no change in flushing rate, professional judgment would indicate that the overall water quality in Scofield Reservoir would be degraded only slightly by the Proposed Action without mitigation. Mitigation measures to offset this potential impact are described in section 3.5.3.2.6.

S3.5.6.3 Proposed Narrows Reservoir

The overall water quality in the proposed Narrows Reservoir is projected to be good. The probability of eutrophication would be about 12% (compared to 73.5% for Scofield Reservoir and 19.7% for Lower Gooseberry Reservoir). The proposed Narrows Reservoir is not expected to strongly stratify due to its shape, water budget, and location. The active pool (the storage above the inactive pool) would only be 45 feet in depth, with an average drawdown of 9 feet during the recreation season and 12 feet annually. The proposed plan is to have three outlets spaced 20 feet apart, at elevations 8,640; 8,660; and 8,680 feet, respectively. The normal water surface elevation is 8,690 feet. If a mild thermocline develops, it normally would start at about 16 to 20 feet and, over the summer season, migrate down to a depth of 32 to 45 feet depending upon the release pattern, level of water withdrawn, and type of year. Once the reservoir was constructed, filled, and operated for several years, an operating plan would be developed jointly with the State and Federal agencies to enhance habitat for fish and wildlife downstream. As a result of the small releases and stream channel conditions downstream, the water would reach ambient conditions within the first one-fourth to one-half mile downstream, relative to temperature and dissolved oxygen, even if conditions were less than optimum in waters released.

Water quality at the proposed Narrows Reservoir would be protected by establishing protection zones adjacent to the reservoir. Within these protection zones, land use practices would be restricted to eliminate activities that would impact reservoir water quality.

S3.5.6.4 Price and Colorado Rivers

The Narrows Project would have virtually no effect on the lower Price River water quality during the November–April high TDS period,

because the effects of depletions caused by the proposed Narrows Project would consist primarily of reduced spills from Scofield Reservoir during the snowmelt runoff period.

Implementing the Proposed Action would have a slight detrimental impact on Colorado River salinity. Construction and operation of the proposed Narrows Dam and Reservoir would remove about 1,520 tons of salt per year from the Colorado River system.

However, the project also would cause a depletion of about 5,597 acre-feet of water to the Colorado River system. An increased salinity concentration of about 0.54 mg/L would occur at Imperial Dam.

S3.5.6.5 Cottonwood Creek and San Pitch River

The overall water quality of Upper Gooseberry Creek is better than that of Cottonwood Creek (see table 3-14), so the additional water imported to Cottonwood Creek would improve slightly its quality. The exception may include temporary periods of slightly higher turbidity from the increased summer flows. Flows in Cottonwood Creek (below Left Hand Fork) would increase in July and August due to the increased irrigation releases, but these flows would be significantly less than peak flows that naturally occur during the spring snowmelt period. As discussed in the DEIS and the FEIS in section 3.14, "Slope and Channel Stability," the Narrows Tunnel operating gate would be automated to regulate releases through the tunnel so that even during thunderstorms, the channel forming discharge would not increase above historical conditions. Consequently, even though the Proposed Action would increase the summer base flow, it would have no effect on Cottonwood Creek channel stability because the increase would be well below the 50-year channel forming discharge.

Except during spring runoff and winter conditions, flows in the San Pitch River below the project area consist mostly of return flows from irrigation and municipal waste water. The project would increase the volume of return flows from both of these sources; but since no new lands receive project water, the quality of return flows would be similar to existing flows or possibly be of slightly better quality because lands would receive a more complete water supply. Consequently, the concentration of dissolved salts should be more diluted in the increased volume of return flows. The potential decrease in irrigation return flows resulting from increasing agricultural efficiencies would be offset by the increase of return flow from the additional project irrigation water. Even if the overall volume of return flow were reduced significantly due to increased efficiencies, the quality of the return flows likely would not change significantly, nor would the existing quality of the San Pitch River change significantly since it is already composed mostly of return flows.

As shown in table 3-17, the salinity of lower San Pitch River is about 1,150 to 1,635 mg/L TDS compared to about 350 mg/L in Sixmile Creek. If the Manti Meadows Alternative wetland mitigation area is selected, and water is delivered from Sixmile Creek and replaced with project return flows delivered to Gunnison Reservoir in exchange, there could be some impact to effected irrigated lands.

Diversions to the wetland area would have to be timed to not significantly affect the exchanged irrigation water supply, or replacement waters would need to be blended with higher quality Sixmile water to avoid impact to crops using the water. Under worst case conditions, an agreement with the Manti Irrigation Company might be needed, and minimal compensation might be required.

S3.6 WETLAND RESOURCES

The wetlands affected by the project are not unique to the area. They consist of wetland plant communities common to high elevation mountain areas. Much of the area has been used for livestock grazing to the extent that rangeland restoration was necessary. In 1908, the USDA Forest Service established a controlled grazing plan for rangelands on the Manti-La Sal National Forest. Cattle and sheep grazing are still allowed in this area.

Major plant community types occurring in the reservoir basin have been mapped (see figure 3-8). The three major plant communities that would be affected most by reservoir inundation are:

1. Vasey sagebrush
2. Silver sagebrush
3. Riparian areas including wetlands

Within the proposed reservoir basin, water collects and forms wet meadows, riparian wetlands, and willow thickets. The wet meadows are located adjacent to streamside vegetation and on higher ridges where spring seeps occur. Vegetation consists of rushes (*Juncus* spp.), sedges (*Carex* spp.), and various hydric grasses, such as tufted hairgrass (*Deschampsia casepitosa*). Riparian wetlands occur in a dendritic pattern along small drainages within the basin. They consist of similar rush, sedge, and grass species and form narrow bands (usually 3–6 feet wide) of streamside vegetation. Less common in the reservoir basin are willow thickets. They occur primarily in the upper reaches of the proposed inundation area, usually along stream channels within the basin, and along Gooseberry and Cottonwood Creeks. Willow species include Drummond's willow (*Salix drummondaiana*), Booth willow (*S. boothii*), and Wolf willow (*S. wolfii*).

The proposed Narrows Reservoir would inundate 89 acres of wetlands.

Hydrologic and hydraulic studies were conducted to determine the potential impacts to the riparian and wetlands vegetation of Gooseberry Creek resulting from decreased flows. Flow measurements conducted by the Utah Division of Water Rights indicate that the stream is a "gaining stream." This means that the stream flow increases as it moves downstream because the stream is being fed by the adjacent ground water aquifer. Because the stream is serving as a drain for the ground water system, an increase or decrease in stream water level would result in a corresponding increase or decrease in the elevation of the ground water table adjacent to the stream.

Water surface profile studies were conducted to determine the depth of flow in Gooseberry Creek between the Narrows damsite and Lower Gooseberry Reservoir. The studies indicated that, with the reduced flows proposed by the Proposed Action and with the existing stream cross section, the depth of flow would decrease by 6 to 11 inches under worst case conditions. However, the project plan includes proposed modifications to this portion of the Gooseberry Creek channel. These modifications include narrowing the channel to maintain the depth of flow. In designing the stream channel modifications, the intent would be to create a stream channel that is more naturally suited to the new flow regime and that will have the same depth of flow as under baseline conditions. Therefore, the depth of ground water adjacent to the stream would not decrease, nor would there be any adverse effects on riparian and wetland vegetation adjacent to the stream. If anything, it is entirely possible that the wetland communities would be enlarged as a result of the project impacts; the current outer bounds of those communities likely would be unchanged as a result of the shallow ground

water flowing toward the stream, but the wetlands likely would be increased precisely to the degree that the stream channel itself (or at least, the open water surface of the stream) narrows.

The process of narrowing the stream, as described in the SDEIS, is planned so that the configuration of the narrowed streambanks would conform to that of the original streambank with respect to slope, materials, material size, and frequency as well as the water depth. The only change would be in the width of the channel and available open water surface. The result is that the same opportunity for overbank flows and wetted perimeter would exist as in the natural configuration. The gaining nature of the stream in this reach means that ground water is flowing toward and into the stream channel and that the stream does not provide the primary supply for the riparian community. The "wetted perimeter," therefore, should continue to be supplied from this source; and the stream will continue to gain as it flows. Bank saturation will not be affected here, as it would on many streams, because the direction of the ground water flows into the stream rather than away from it. While overbank flows may be reduced in frequency, such flows, for this same reason, also are not critical to the bank saturation that supports the riparian community.

About 160 square feet (0.004 acre) of wetlands adjacent to Cottonwood Creek would be impacted by constructing the discharge structure at the end of the Upper Cottonwood Creek Pipeline. The remainder of the stream channel would not be affected. The channel presently is stable and adequately protected by natural cobble armoring.

Wetland mitigation measures are included in the project alternatives to mitigate for impacts to wetlands. The wetland mitigation measures would provide similar wildlife habitat values lost due to the inundation of the reservoir.

S3.7 VEGETATIVE RESOURCES

Vegetation located in the study area consists primarily of plant communities common to high elevation mountain areas. Historically, the area has been used for livestock grazing and other reservoir impoundments. Cattle and sheep were introduced into the area in the 1800s and, subsequently, overgrazed the area to the extent that rangeland restoration became necessary. In 1908, the USDA Forest Service established a controlled grazing plan for the Manti-La Sal National Forest. Cattle and sheep grazing is still allowed in the area.

Major plant community types occurring in the reservoir basin have been mapped (see figure 3-8). The three major plant communities that would be affected most by reservoir inundation include vasey sagebrush, silver sagebrush, and wetlands. There are also areas within the basin that have been disturbed previously by diverting water to Cottonwood Canyon through the existing Narrows Tunnel. In addition, there are those disturbed areas associated with SR-264 that cross the north end of the basin.

The areas that are disturbed during project construction have a high probability of being infested by noxious weed species. People using the area may spread the weeds by carrying the seeds on their person or on their vehicles. Seeds will get into the water and be spread downstream in both Gooseberry Creek and Cottonwood Creek. Control of noxious weeds as part of the Narrows Project would be the responsibility of SWCD.

Areas along the foothills of the west side of the Wasatch Plateau would be dissected with the diversion pipelines. Plant communities such as big sagebrush, (*Artemisia tridentata*

var. tridentata), gamble oak (*Quercus gambelii*), grasslands, and mountain brush communities along with their associated wildlife species would be disturbed by the conveyance pipelines. These disturbances, however, would be only temporary because the pipelines would be buried. Revegetation that reflects the existing plant community would be accomplished with a mixture of grasses, forbs, and shrubs. A total of 30 acres along a 17-mile-long alignment would be disturbed by the pipeline construction.

The reservoir basin was identified to receive the most significant impact by the proposed project. For this reason, the reservoir basin was studied in greater detail than the other areas associated with the project. The affected wetlands in this area occur in a dendritic pattern in the riparian zones along small drainages. As shown in table 3-19, plant communities that would be highly impacted by reservoir inundation include vasey sagebrush, silver sagebrush, and wetlands. All vegetation in the 604 acres listed in the table would be inundated by the reservoir.

S3.8 RECREATION AND VISUAL RESOURCES

S3.8.1 Recreation Resources

According to the Utah Division of Parks and Recreation's *1992 State Comprehensive Recreation Plan* (SCORP), the most popular outdoor individual recreational activity in Utah is fishing, followed by walking, golf, and camping. As with other major reservoirs along the Wasatch Front, Lower Gooseberry Reservoir, Beaver Dam Reservoir, and Fairview Lakes are heavily fished and overcrowded.

Boating also ranks as one of the more popular outdoor recreation activities in Utah, and not enough flat-water boating and boat launching lanes presently are available to meet public demand. Information from the Utah SCORP suggests that additional boating facilities are needed for the potential growth in demand for recreation users statewide.

Family-favored activities are sightseeing, developed camping, primitive camping, and fishing, among others. First choices for new facilities near communities are picnicking, fishing, special event areas, ice skating, and snowmobiling.

Beaver Dam is a heavily used day-use area for anglers near the proposed project, and there are several developed USDA Forest Service campground facilities in close proximity to the project area. The Lower Gooseberry Reservoir (16 units); Gooseberry (10 units); Flat Canyon (13 units); and Lake Campground (51 units) are all fee areas, with a 92-day season of use from June 15 through September 15. Water, sanitation facilities, tables, and fire grills are provided. Boulger Reservoir is a nondeveloped, dispersed camping area in the area. There are vault toilet facilities there. These campgrounds (with the exception of Boulger) are typically full on weekends and one-third full on weekdays throughout their season of use.

The proposed reservoir area is known as a very popular location for snowmobile enthusiasts. The USDA Forest Service and UDOT maintain unloading, parking, and sanitation facilities along SR-31, immediately west of the proposed reservoir area, from which snowmobiles embark for travel along groomed trails following Skyline Drive and SR-31, as well as in the proposed reservoir area itself.

Whitewater boating is limited mostly to a relatively short season when flows are peaking, coinciding with the high flows from the White River, when the gates at Scofield Reservoir are closed. In wet years, spills from Scofield may contribute to the peak.

When Scofield releases again are started up to supply irrigation demands downstream, the level of boating falls off significantly. The segment of the river between Scofield Reservoir and the picnic area above Price Canyon Dam (approximately 15 river miles) contains Class I–III rapids. The segment of the river between the picnic area above Price Canyon to Castle Gate (approximately 8.5 river miles) contains Class III–V rapids. This segment of the river is more challenging and requires skill and careful maneuvering to avoid the hazards of the narrow canyon. The segment of the river that receives the greatest use is between Woodside to the confluence with Green River. This segment of the river contains Class III–V rapids. The apparent reason for greater use in this area is the flow regime and the wilderness setting of the river segment.

Under the Proposed Action Alternative, recreation facilities, including a 60-unit campground, boat ramp, 10 picnic sites, and a corresponding number of restroom facilities, would be provided at the proposed Narrows Reservoir. The recreation facilities would draw heavy use from not only Sanpete, Carbon, and Emery Counties but also from the Provo/Orem and metropolitan Salt Lake City areas. The proposed Narrows Project would help meet the demand for additional boating facilities in the area. In addition, it is expected that the reservoir would develop into an excellent flat-water fishery. A conservation pool would be provided to ensure successful overwintering of fish.

The proposed Narrows Reservoir would increase the State and regional inventory for fishing, boating, and water play. At the top of the active capacity water level for the Proposed Action, the proposed project's facilities are expected to attract a total of 43,911 additional visitor days per year of total developed recreation use. These use rates are based on use rates of Joe's Valley Reservoir.

Construction of the proposed Narrows Project and its associated recreation facilities would cause the loss of 237 acres of "Roaded Natural" dispersed recreation on Reclamation withdrawn lands and 466 acres on private lands. It is estimated that these 703 acres would provide approximately 910 visitor days at 1980 levels of use and would provide about 2,670 visitor days of use in 2030. This reduction in dispersed use would be offset by the new facilities that would act as an attraction to local communities and individuals from the Wasatch Front who already contribute above 60% of the use on the Manti-La Sal National Forest. It is anticipated that the 43,911 visitor days of newly developed recreation use would be paralleled by an equal amount of dispersed recreation in the reservoir vicinity within the first 5 years of operation. This growth in recreation use would be a direct effect of the project and would require more intensive management in the area surrounding it (approximately, the area 8–10 miles in each direction).

At times when this newly developed recreation site and others in the area are at capacity (most of the summer season and particularly holiday weekends), users would move into nearby nondeveloped or dispersed areas. Some reservoir users actually would prefer dispersed sites regardless of developed site availability, and others would use dispersed sites to avoid associated fees.

The amount of dispersed use within 8–10 miles of the proposed reservoir is already at a level considered to be crowded during holidays and big game hunting seasons. The additional attraction of the new flat-water fishery in this area is expected to increase dispersed use to a point that the USDA Forest Service would need to place restrictions on areas available for this type of use. Such restrictions may include special measures for sensitive areas such as

wetlands. In addition to increased resource protection and rehabilitation costs, conflicts among such activities as ice fishing and snowmobile use, hiking, and all terrain vehicle users could be expected.

Along with increased dispersed use in the area, nearby developed recreation facilities would be impacted. Gooseberry Campground and the Lower Gooseberry Reservoir units are immediately adjacent to the proposed reservoir, as is the Scenic Byway and snowmobile parking area. Skyline Drive, Flat Canyon Campground, and the limited facilities at Beaver Dam and Boulger Reservoirs are also within reasonably close proximity.

Implementing the Proposed Action would cause Scofield Reservoir to operate at a lower level, thus reducing the surface area available for fishing and other forms of recreation by about 12% (274 acres). It is expected that this would result in the loss of about 12,708 visitor days per year, including fishing, based on the Reclamation data referenced in table 3-20. Based on use rates obtained in a 2005 and 2007 creel survey by UDWR, there would be a loss of 3,239 angler days of fisherman use.

Recreation use of Scofield without enlargement would have experienced fewer visitor days. There would have been fewer angler days of fisherman use had Scofield not been enlarged. The aquatic mitigation measures of restoring year-round flows in two small tributaries to Gooseberry Creek and maintaining Fairview Lakes at a higher elevation during the prime summer recreational season also would provide angler benefits to the area.

Under the Proposed Action, more frequent fish kills and accelerated eutrophication also could degrade the park. However, water quality mitigation has been provided. Whereas the total inventory of water-based recreation may be increased, some of it would be offset by a downgraded State park at Scofield. The higher elevation of the proposed Narrows Reservoir would have a shorter season of use at more than 8,600 feet elevation than would Scofield Reservoir at about 7,600 feet elevation. Greater snow cover would probably occur at 8,600 feet elevation causing less access because of deep snow and later snow melt.

Depending on the type of hydrologic year, water levels in Narrows Reservoir would fluctuate between 25–75% of the full pool area during the recreation period, 25% on average and up to 75% in an extended drought cycle. Recreation action may be affected, particularly for those using the boat dock at maximum draw down.

S3.8.2 Visual Resources

The project features would be located within the Manti-La Sal National Forest on the Wasatch Plateau. The dam and diversion works would be located in the Gooseberry Valley, a tributary to the Price River, at about 9,000 feet elevation.

The characteristic landscape is consistent with typical high elevation mountain areas. The topography on top of this plateau is rolling and contains shallow basins covered with sage/grass communities bordered by spruce/fir, interspersed with aspen.

The Narrows damsite is within 2 miles of the intersection of two State highways, SR-31 and SR-264. Both highways have been designated as National and State Scenic Byways. SR-31 connects Fairview in the Sanpete Valley with Huntington in Emery County. SR-264 connects Scofield with SR-31 at Skyline Drive. These are major commuter routes for miners from the Sanpete Valley working in the coal mines on the east side of the Wasatch Plateau. In addition to commuting and recreation traffic, SR-31

serves as a route for hauling livestock from the Sanpete Valley to summer ranges.

It should be emphasized that scenery is an important natural resource and recreational element in this part of the forest. It is primarily through the visual sense that most visitors perceive the forest and its interrelated components. There is additional visual sensitivity here due to the adjacent Scenic Byway, which serves as a forest gateway/viewing corridor for many recreationists.

Under the Proposed Action, temporary and permanent landscape disturbances would be apparent from the placement of project features such as the re-routing of SR-264 and construction of the Narrows Dam structure. These more permanent features would be acceptable in this area of partial retention, especially in the long term. The dam would be within the setting of other dams in the area, and the rerouted portion of the Scenic Byway would serve as a viewing corridor and not a dominant element. Maintaining views within the parameters of partial retention would be contingent upon successful restoration/ revegetation of the old highway alignment and any scarred areas associated with the dam. Care would need to be taken in developing any associated recreation facilities to ensure their design is subordinate to the surrounding landscape.

The Narrows Reservoir would be the most noticeable feature. The reservoir would have a surface area of 604 acres when full. However, during the recreation season, the surface area would average 454 acres. A body of water is generally considered to be aesthetically pleasing. However, as the reservoir is drawn down, exposed mud flats around the more shallow parts of the reservoir may be visually detractive but should remain naturally appearing as they follow the natural line of the reservoir's shore. Although viewed from the Scenic Byway and the reservoir itself, these mud flats primarily would be located on private lands that have no Visual Quality Objective (VQO) designation. However, it is anticipated that these areas would become more naturally appearing over time; and the additional variety provided by the new water body would well offset any negative effect. In the short term, it is anticipated that the visual impact of exposed mud flat or shoreline would be negligible due to steeper topography and the duration and angle of view.

The aquatic mitigation measures of restoring year-round flows in two small tributaries to Gooseberry Creek and maintaining Fairview Lakes at a higher elevation during the prime summer recreational season also would provide aesthetic benefits to the area.

During project construction, increased human activity, heavy machinery, and surface excavation would temporarily detract from the scenery. Such detractions would be visible in localized areas where construction would occur. Minor disruption of traffic on SR-264 would be expected since the existing road would not be inundated until dam construction was completed and the relocated road is serviceable. Temporary disruption on SR-31 is expected.

S3.9 CULTURAL RESOURCES

Cultural resources are defined as physical or other expressions of human activity or occupation. Such resources include culturally significant landscapes, prehistoric and historic archaeological sites as well as isolated artifacts or features, traditional cultural properties (TCPs), Native American and other sacred places, artifacts, and documents of cultural and historic significance. Section 106 of the National Historic Preservation Act of 1966 (NHPA) stipulates that Reclamation take into account

the potential effects of a proposed Federal undertaking on historic properties. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the *National Register of Historic Places* (NRHP).

The affected environment for cultural resources corresponds to the area of potential effect (APE) as defined in the regulations to Section 106 of the NHPA (36 Code of Federal Regulations [CFR] Part 800). According to 36 CFR 800.16(d), the APE

> *"means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist."*

The APE for the proposed Narrows Project includes the areas impacted by construction activities associated with the construction of the dam as well as the land areas eventually inundated by the reservoir pool area. Also included would be any disturbed areas associated with the construction of a proposed pipeline to Cottonwood Creek as well as additional pipelines to deliver water to existing water distribution systems. Finally, impacts from the proposed rehabilitation of an existing tunnel to Cottonwood Creek, the development of recreation facilities, staging areas, access roads, borrow areas, and any other ancillary facilities linked to the proposed Narrows project would be included in the APE.

Reclamation will complete cultural resource compliance as stated in Appendix F, "Environmental Commitments," of the SDEIS, as a means to fulfill Section 106 of the NHPA. These commitments state that any areas associated with the construction of the proposed project will be subject to Class I and Class III cultural resource inventories to identify and evaluate all cultural resources. If historic properties are located within the APE, and if they will be adversely affected by construction activities associated with the proposed project, a memorandum of agreement (MOA) will be developed. The MOA would be among Reclamation, the Utah State Historic Preservation Office, the USDA Forest Service, the Advisory Council on Historic Preservation (ACHP), if it chooses to participate, and SWCD. The MOA would outline cultural survey protocols, report and treatment plan requirements, and procedures for mitigation on potential impacts to identified and unidentified (inadvertent discovery situations) historic properties. The MOA also would include, among other stipulations, a Native American consultation summarization and would identify the cultural resource APE for the proposed project.

Numerous cultural resource inventories previously have been conducted within the proposed project area. Under a contract with Dames and Moore in 1979, the University of Utah conducted a Class I and Class III cultural resource inventory on a portion of the proposed project APE.

The 1979 Class III inventory identified two prehistoric archaeological sites near the proposed dam and reservoir area. The sites were open lithic scatters with few formal tools. No further evidence of cultural materials was present on these sites. From the limited data available, the proposed project area appears to support the idea that high altitude areas were utilized as temporary, seasonal hunting grounds during the Archaic period, about 2,000–4,000 years before present. In addition, a total of 26 isolated artifacts were recorded during the cultural resource inventory.

Also, one historic cultural resource site, a stone structure foundation, was located during the 1979 inventory. The three cultural resource sites were not evaluated for their

NRHP eligibility in 1979. As a result, the sites will be revisited and evaluated for eligibility as stated in the environmental commitments for cultural resources.

The design and, therefore, the APE of the proposed project have changed since the 1979 cultural resource inventory. Class I and Class III cultural resource inventories have not been performed for the Upper Cottonwood Creek, Oak Creek, or East Bench Pipeline alignments, new road alignments, borrow areas, staging areas, new campgrounds, marinas, wetland mitigation areas, or haul roads. Class I and Class III inventories covering the entire APE of the proposed project will be conducted prior to initiation of final design and construction in accordance with 36 CFR Part 800.

Predicted effects to cultural resources as a result of the proposed project will be determined following the Class I and Class III inventories of the entire project APE.

S3.10 Economic and Social Resources

Social and economic conditions in Carbon and Sanpete Counties are underscored by a century-long dependence upon agriculture. Both valleys originally were developed for agricultural use. However, rich coal deposits were discovered in Carbon County during the 1860s. As a result, the mining industry has become the principal economic activity in the area. Agriculture still remains a significant economic activity in both Carbon and Sanpete Counties. Lack of sufficient irrigation water and concerns over neglected longstanding agreements on water rights constrain the agricultural sector in Sanpete County.

Population in the two-county project area is 43,185 according to the 2000 census. Carbon County had a 2000 population of 20,422. A 2007 census population estimate for this county was 19,364, which is about a 5% decrease since 2000. Sanpete County's population in 2000 was 22,763. For 2007, the population estimate was 24,644, which is an increase of approximately 8% from the 2000 census. The largest community in the two counties is Price with latest census population data from 1990 and 2000; for 1990, the population was 8,712, which decreased to 8,402 in 2000.

The College of Eastern Utah in Price and Snow College in Ephraim are significant cultural and economic resources for Carbon and Sanpete Counties, respectively. The two counties have had a higher than average rate of unemployment since 1960 (refer to table 3-24). For 2007, the unemployment rate for Carbon County was 4.6%, Sanpete County was 3.6%, and the State of Utah was 3.0%. The leading economic sectors in Carbon County in 2006 (in order of importance) are mining, services, government, trade, and manufacturing. Leading economic sectors in Sanpete County include government, services, trade, agriculture, and manufacturing. Because of a larger population base, the city of Price rates higher on community facilities than do the north Sanpete County communities. Moroni and Spring City both have a particular need for improvements in police and fire protection, health care, housing, restaurants, day care facilities, youth recreation facilities, and cultural opportunities. In recent years, the construction and continued growth of the State Correctional Facility at Gunnison has created a sharp increase in the demand for housing in the project area, resulting in housing shortages. Educational facilities in the project area appear average, based on statewide norms.

Agriculture in Sanpete County is of major economic significance and involves a sizable number of people. From 1992 to 2002, the census of agriculture data shows the number

of farms increased by 9%, whereas the number of acres in production changed by less than 1%. The average farm size decreased from 643 acres in 1992 to 471 acres in 2002. About 55% of the land in Sanpete County is used for agriculture. Of that amount, a total of 113,647 acres or 32% is cropland.

Agriculture plays a much smaller role in Carbon County's economy. Only 21% of Carbon County's total acres is used for agriculture. Of that amount, 18,247 acres or 9% is cropland in the 2002 agricultural census. Since 1992, the number of farms increased by 33.5%; but average farm size declined from 1,604 to 821 acres.

As discussed in the SDEIS, agricultural development is limited severely by inadequate water supplies. The limited precipitation, averaging just above 4 inches during the summer months, makes irrigation essential to successful crop production. Yet the demand for irrigation water cannot be met by the fluctuating direct flows in local streams or the limited storage supplies currently available. Present irrigation practices in the project area encourage excessive early season diversion and low farm efficiency. Because of inadequate storage, there is a tendency to apply excessive water during spring and early summer when water is plentiful to obtain maximum soil moisture and sustain crops as long as possible after streamflows have diminished. Water supply studies show that shortages occurred during 1960–2002 on lands that would be served by the Narrows Project. Shortages during those years ranged from 3 to 44% of the diversion requirement. Because shortages are unpredictable, irrigators are unable to implement crop rotation and other practices necessary for optimum production. Table 3-25 presents the annual diversion requirements of the project-eligible lands within the Narrows Project area, quantifying the total water needs of currently irrigated lands and the extent to which these needs have been satisfied on an average annual basis.

Principal crops grown in the project area in order of importance include pasture, alfalfa hay, small grains (barley, oats, and wheat), and meadow hay. Under existing conditions, two crops of alfalfa are harvested each year; and in some years (less than 25% of the time) when weather conditions are favorable, a small third crop is harvested. One crop of meadow hay normally is harvested and the aftermath used as late summer and fall pasture. Small grains are used as rotation crops for hay and pasture. Small grains also sometimes are used as a "nurse" or companion crop for alfalfa. The most common small grain crop is barley. Corn silage, which makes up less than 1% of the irrigated area, is raised primarily by dairymen and livestock feeding operations. Present and projected project crop distribution and yields in Sanpete County are summarized in table 3-26.

Of the 15,420 acres of irrigated farmland within the Sanpete County project area, an estimated 9,252 acres are irrigated by sprinkler. The remaining acreage is flood irrigated. Water shortages within the project area average about 30% annually. Each pressurized pipeline distribution system generally has a regulating pond at its head. Water is diverted out of the streams into these ponds to provide system regulation and to allow sediments to settle out.

Irrigators in the Fairview area rely on the Narrows Tunnel to convey water stored in Fairview Lakes to Cottonwood Creek. As described in chapter 2, the tunnel is in a critical state of disrepair.

S3.10.1 Regional Impact Analysis

The number of jobs created in Sanpete and Carbon Counties during construction of the Narrows Project would not be significant based on a regional impact analysis conducted for this study on the Proposed Action, Mid-Sized, and Small Reservoir Alternatives. At the regional level, the project would cause positive economic output to the study area. Potentially, the most significant short-term impact would occur from construction activities.

The modeling package used in this study to assess the regional economic effects of construction of each alternative is IMpact Analysis for PLANning (IMPLAN). IMPLAN is an economic input-output modeling system that estimates the effects of economic changes in an economic region.

IMPLAN data files are compiled for the study area from a variety of sources, including the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor, and the U.S. Census Bureau. This analysis used 2004 IMPLAN data for Utah's Sanpete County, where most of the construction activity would occur for the regional impact analysis.

The expenditures associated with construction were placed into categories that represent different sectors of production in the economy. The expenditures that are made inside the study region were considered in the regional impact analysis. Expenditures made outside the study area were considered "leakages" and would have no impact on the local economy. Some construction items (specialized equipment and skilled labor) are more likely to be purchased outside the region and brought to the construction site because of their high cost and lack of availability in the region.

Because of the scale of the construction project, it was assumed that local suppliers and contractors would be able to supply only a portion of the necessary construction, equipment, supplies, and expertise. The regional impact analysis assumed that approximately 50% of the labor wages would be spent locally and approximately 45% of the construction equipment and supplies would be purchased locally.

This analysis also assumed that the majority of the construction expenditures will be funded from sources outside the study area. Money from outside the region that is spent on goods and services within the region would contribute to regional economic impacts, while money that originates from within the study region is much less likely to generate regional economic impacts. Spending from sources within the region represents a redistribution of income and output, resulting in a negligible increase in economic activity.

For the purpose of this study, the construction costs allocated to labor and construction materials spent in the region were used to measure the overall regional impacts. These overall impacts would be spread over the construction period and would vary year-by-year proportionate to actual expenditures. It was estimated that the regional impacts on employment, regional output, and income would be less than 1% of the study area's base employment, output, and income (see table 3-27).

The regional impacts from the construction costs for all the alternatives would be similar in that the impacts would be less than 1% of the regional employment, output, and income.

These regional construction impacts would be lost after construction was completed. A small amount of regional impacts related to operation and maintenance (O&M) activities would be expected but would not significantly impact the overall regional economy in the study area. The additional

water amount provided by each of the alternatives would support the existing community lifestyles and social structure in the study area.

S3.11 LAND RESOURCES

The proposed Narrows Project is located near the exterior boundaries of the Manti-La Sal National Forest. The damsite and other project features would be located on 225 acres of Reclamation withdrawn land. SWCD has acquired 366 acres of private lands for project uses from owners by perpetual easement or in fee. SWCD would purchase 1,340 additional acres of private and State School Trust lands for project needs (table 2-4).

While there are some private in-holdings, the majority of the lands located within the forest boundaries are federally owned and are administered by the USDA Forest Service pursuant to specific authorities granted by Congress to the Secretary of Agriculture and pursuant to the public land laws.

Lands within forest reserves may, however, be appropriated and used for irrigation works constructed under authority of the Reclamation Act of 1902 (32 Statute 388). Therefore, by Secretarial Order dated April 1, 1941, Reclamation withdrew certain forest lands from public entry under the first form of withdrawal (as provided in Section 3 of the 1902 Act). These lands were withdrawn for the construction, operation, and maintenance of the Gooseberry Project. The Gooseberry Project, as originally planned, was never constructed. However, a portion of the original project was constructed as the Scofield Project. The remainder of the Gooseberry Project, subsequently, was renamed the Narrows Project and is presently proposed as a non-Federal project. Today, approximately 6,728 acres of the lands originally withdrawn by Reclamation for the Gooseberry Project remain under Reclamation withdrawal for the Narrows Project.

The 1941 Reclamation withdrawal of lands within the Manti-La Sal National Forest created the potential for two Federal agencies—Reclamation and the USDA Forest Service—to have overlapping jurisdiction on the same lands. However, the authority of the Secretary of the Interior under the 1902 Act to withdraw and administer lands for Reclamation purposes is limited to the specific uses provided for in that Act, that is, Reclamation projects. As a result, whereas Reclamation's withdrawal is dominant, its jurisdiction has been somewhat nominal because no Reclamation project actually was constructed on those lands; as a result, the USDA Forest Service exercised the only meaningful jurisdiction over them per the master interagency agreement between Reclamation and the USDA Forest Service. Once Reclamation initiated planning and environmental compliance activities for the Narrows Project, however, the overlap between the authorities of the Secretary of the Interior under the 1902 Act and those of the Secretary of Agriculture became real.

At present, both agencies have administrative authority over these lands—but each for activities related only to its own mission. Thus, Reclamation has jurisdiction over the withdrawn lands for uses associated with or incident to environmental compliance, planning, construction, or O&M of projects under the Reclamation laws, such as the Narrows Project; and the USDA Forest Service has jurisdiction over the withdrawn lands for uses associated with or incident to national forest activities, such as recreation, grazing, and timber sales. If the Narrows Project were constructed, it is anticipated that the Reclamation withdrawal would be revoked for any lands not needed for the project.

Land ownership and use characteristics of Sanpete and Carbon Counties are summarized in tables 3-28 and 3-29, respectively. Federal and State-owned land comprises approximately 60% of each county's total land base; whereas, privately owned land accounts for 38% of the land base in Sanpete County and 41% of the land base in Carbon County. Of the total agricultural land in Carbon County, only 2% has been developed for cropland, and the remainder is rangeland. Comparatively, 36% of the total agricultural land in Sanpete County has been developed for cropland. An inventory of prime and unique farmland (Public Law 95-87) did not reveal any prime or unique farmland in the project area.

Lands approximately 3 miles east of the project area are under a Federal coal lease and are currently being mined. Additional mineable coal reserves are believed to exist beneath lands east of the East Gooseberry Fault approximately 1 mile east of the project area. A nearby landowner with both land and mineral rights to the east of the proposed reservoir, between the proposed dam and the currently operating Skyline mine, expressed to Reclamation in April 2009 his intent to mine his coal, but exact plans and timing are unknown at this time. Lands immediately adjacent to the project area (within the Gooseberry Graben) are not believed to have mineable coal reserves due to an offset of several hundred feet within the Gooseberry Graben area.

Agricultural land use within the project area is based on the livestock economy of the area—principally, cattle and sheep operations and a number of Grade A dairies. Other land uses include the turkey industry, large garden spots, potatoes, raspberries, and Christmas or ornamental trees.

The majority of the land area that would be inundated by the reservoir is privately owned; the dam, however, would be on Federal land. Some of the private land near the proposed dam and reservoir within the national forest boundary has been subdivided for summer homes and recreation development. Such development must comply with the zoning and building codes of the Sanpete County Commission and the sanitation requirements of UDEQ. The area adjacent to the proposed Narrows Reservoir is county-owned and is zoned as Forest Watershed 1–10 (one dwelling per 10 acres). The primary areas now under development include the area approximately 2 miles east of Lower Gooseberry Reservoir and the area on the north side of privately owned Fairview Lakes.

The Fairview Lakes development contains approximately 150 to 200 memberships in the privately owned Fairview Lakes Association. The memberships include the right to use a specific lot in the area north and east of Fairview Lakes and south of the project area to park a trailer or construct a cabin. This area has been rezoned, and the one dwelling per 10 acres development ratio does not apply to this area. As a result, it has been developed with lots every 1+ acre each. About 50 cabins have been constructed within the past 5 years. The cabins are used during the winter as well as the summer since the general area is a popular cross-country skiing and snowmobiling area. Many of the other lots have one to three trailers parked on them for the summer season (June–September). The private landowners allow their members to use some of the area southwest of Fairview Lakes for recreation use.

Portions of three grazing allotments occur within the project area. They include Swen's Canyon allotment, the Gooseberry-Cottonwood allotment, and the Beaver Dams-Boulger allotment.

Additional allotments that may be impacted by the mitigation measures include the Fairview, Cabin Hollow, and Pondtown allotments.

Swen's Canyon allotment is located in two watershed drainages. That portion which is located in the same drainage as the proposed Narrows Dam and Reservoir consists of 583 acres, of which all is suitable for grazing land in fair range condition. Grazing capacity of that portion is about 115 animal unit months (AUMs).

The Beaver Dams-Boulger allotment is a combination of two allotments. Grazing use includes 1,200 head of sheep with a season of July 6 to October 5. It is grazed with a rest rotation grazing system where part of the allotment is rested each year.

The Cottonwood-Gooseberry allotment is grazed by 900 head of sheep with a season of July 6 to September 30 using a rest rotation grazing system. Suitable grazing land was determined during a range analysis conducted during 1976.

A summary of information concerning the three grazing allotments and four grazing permits is presented in table 3-30. Range conditions and grazing were discussed in the vegetation section of chapter 3.

Under the Proposed Action, major changes in land use are not anticipated. Construction of summer homes outside of platted subdivisions might be accelerated but would be limited by zoning restrictions of one dwelling per 10 acres. Development of the Fairview Lakes complex would continue as previously planned, although build-out may occur earlier. Narrows Reservoir, SR-264 and forest development roads relocation, the recreation area, and the conservation easements adjacent to the reservoir would reduce the available grazing area by 856 acres. This area is about 10% of the suitable grazing acreage in the area. The Proposed Action may result in the direct loss of 114 AUM grazing use (856 project acres per 1.5 acres per sheep month = 571 sheep months per 5 sheep months per AUM = 114 AUM); however, indirect loss of grazing (estimated to be about 1,014 acres) may occur on adjacent areas around the reservoir, between the highway and the reservoir and around camping and residence areas. The total grazing impact is estimated to be 249 AUM (1,870 acres per 1.5 acres per sheep month = 1,247 sheep months per 5 sheep per AUM = 249 AUM). This impact of grazing includes both private and Federal lands. Restrictions on the number of sheep and cattle allowed and/or realignment of grazing allotments may be required due to implementing the Proposed Action.

As the recreation use increased and summer home development proceeded, there could be additional areas in the upper Gooseberry drainage which would not be available for livestock grazing due to anticipated or existing livestock-people conflicts. For every 7 to 10 acres of additional land which cannot be grazed due to conflicts with traffic and/or people, there may be a loss of 1 AUM (5 sheep months) grazing use. Grazing permits and allotment boundaries may need to be adjusted. Land use in the Manti-La Sal *National Forest Land and Resource Management Plan* would change to reflect project implementation.

No reduction of acres of mineable coal reserves is anticipated as long as the dam is designed to withstand the effects of induced seismicity from mining approximately 1 mile away.

S3.12 PUBLIC SAFETY

The public safety issues raised, related to development of the Narrows Project, deals with increases in recreational traffic. The

area adjacent to the proposed Narrows Reservoir is served by two State highways, SR-31 and SR-264. These two-lane roads are narrow and winding. Both highways are maintained for year-round use by the Utah Department of Transportation.

Average daily traffic (ADT) numbers for these roads are listed in table 3-31. ADT values shown in the table are based on UDOT traffic counts taken in 2000.

ADT on SR-31 would increase by 252 or 16% under the Proposed Action. ADT on SR-264 would increase by 31%. However, even with these increases, both roads would still be well within their design capacity. In order to increase safety, additional turning lanes with adequate sight distance would be provided at recreation area entrances and exits.

S3.13 Air Quality Resources

Ambient air quality is monitored by UDEQ, Division of Air Quality, at locations throughout the State of Utah. There are no existing monitoring sites near the proposed Narrows Project located in Sanpete County. The closest monitoring station is located in north Provo. Data from this station cannot be used as an estimate of the existing air quality in the impact area of influence because Provo is an urban/suburban area. The actual ambient air quality in Sanpete County most likely is much better than that in north Provo because of the lower population density and lack of significant major emission sources.

For the purposes of air quality management, geographic areas of the country are classified as "attainment" or "nonattainment" with the National Ambient Air Quality Standards (NAAQS). All air quality standards are classified as being met in Sanpete County and, therefore, would have an "attainment" classification.

The Narrows Dam and Reservoir area is located in a fairly remote and rugged mountainous terrain. The air quality associated with this area is generally excellent. Primary sources of existing air pollutants in the project area include dust, smoke from campfires in area campgrounds, and exhaust emissions from intermittent traffic and recreational vehicles. Dozens of summer homes are located in the vicinity of the project. High levels of dispersed recreational use of this area are common.

Noise and air pollution are not expected to significantly increase under the Proposed Action (table 3-32).

S3.14 Slope and Channel Stability

Fairview Canyon, which contains Cottonwood Creek, is a steep, narrow canyon located east of Fairview, Utah. Highway SR-31 is located in the canyon. The canyon is approximately 7 miles long. The stream elevation at the mouth of the canyon is about 6,300 feet and about 8,800 feet near the summit. Typical slopes of the canyon wall are 2:1 to 2.5:1 (ratio of horizontal to vertical distance). Numerous landslides are located throughout the canyon on both sides. In several places, continual road maintenance is required to repair damage caused by landslides.

A total of 104 landslides were identified from aerial photographs and during a 1991 field review along the slopes of a 6-mile reach of Cottonwood Creek. The review team was comprised of individuals from various government agencies and private consulting firms. The review was to determine the impact of projected flow increases from

Narrows Tunnel on adjacent slopes of Cottonwood Creek. The state of activity of the slides was noted with 85 slides classified as "active" and 19 classified as "dormant." The certainty of landslide identification included 89 slides as "definite," 13 as "probable," and 2 as "questionable." The distances of the landslides from the tunnel portal ranged from 0.3 mile to 6.1 miles. Dominant types of slope movement of the 104 landslides are shown in table 3-33.

Based on observations during the review, it was determined that landslide activity is not related to stream channel stability or the flow in Cottonwood Creek but is caused by saturation from water sources on the hillsides.

Under the Proposed Action, increased flows in Cottonwood Creek will occur due to releases from Narrows Reservoir through the Narrows Tunnel and Upper Cottonwood Creek Pipeline. These increased flows will occur below Left Hand Fork where the Upper Cottonwood Creek Pipeline will discharge into the creek. Figure 3-10 is a hydrograph based on daily flow data which compares present, or No Action Alternative, flows in Cottonwood Creek with flows that will occur under the Proposed Action. The figure is based on 1968 data, which is an average year. As shown in the figure, the peak discharge of about 112 cfs occurs during the snowmelt runoff period. Presently, summer base flows are about 18 cfs. Under the Proposed Action, the summer base flows would increase to about 50 cfs. The maximum flows possible through the tunnel would increase by 45 cfs, from a preproject capacity of 15 cfs to a Proposed Action capacity of 60 cfs.

The 50-year rainfall peaks expected in the canyon range from 330 cfs below Left Fork to 570 cfs near the mouth of the canyon. The possible maximum increase in tunnel flows is less than 15% of the rainfall peaks. The snowmelt peak is not a consideration because the tunnel will not operate during the snowmelt runoff. Based on the physical characteristics of Cottonwood Creek and the impacts of the proposed project on the flow characteristics, the project is unlikely to have a significant impact on the stability of the creek. To insure that the tunnel releases will not cause an impact, the measures described below will be implemented.

As described in chapter 2, remote control of the Narrows Tunnel operating gate would be provided to automatically regulate the releases through the tunnel. These controls would be coupled to an automated stream gauging station on Cottonwood Creek near the mouth of the canyon. The stream flow in Cottonwood Creek would be constantly monitored by these controls. As the streamflow increases during high runoff events such as thunderstorms, the tunnel operation would be discontinued when the flow exceeds 100 cfs. The project releases would not resume until after the flows drop below 100 cfs. Under this operating regime, the project flows through the tunnel would not increase streamflows above what is considered safe for channel stability. Increased flows under project conditions would be well below the 50-year channel-forming discharge.

Erosion along the banks of Cottonwood Creek would be carefully monitored, especially during the first year of operation, to verify that the project has no effect on Cottonwood Creek channel stability. Appropriate action would be taken if additional erosion above background levels is observed during project operation. Remedial actions could include placing additional armoring materials in the channel or along the bank or revising project operation to avoid more widespread stability problems.

S3.15 GEOLOGIC RESOURCES

The reservoir basin lies within a high elevation, shallow valley in the Wasatch Plateau subprovince of the Colorado Plateau. This subprovince represents the transition between the Colorado Plateau to the east and the Basin and Range Province to the west. Several ridges isolate the valley basin, which lies about 8,680 feet above sea level.

The proposed Narrows Dam and Reservoir area is underlain by the Cretaceous age North Horn formation. This formation consists primarily of interbedded sandy, clayey siltstone, silty claystone, silty sandstone, and limestone with occasional thin seams of coal. Bedrock crops out on the steeper slopes of the left abutment and in the drainage located immediately upstream of the left abutment. There is less exposure of bedrock on the right abutment. Unconsolidated sediments overlying bedrock consist primarily of a mixture of residual soil (weathered rock) and colluvium that generally consists of silty sand with some fine to coarse gravel. A geologic study performed by SWCD indicates that there is low potential for reservoir-induced landslide activity in the reservoir basin.

The North Horn formation is overlain by the Flagstaff Limestone formation which consists primarily of microcrystalline limestone with thinly bedded shale and silty claystone. Abundant fossils are common within the limestone, and the boundary between the formations is transitional. The Flagstaff Limestone formation generally is present in the higher elevations and beyond the actual limits of the proposed dam and reservoir.

The Flagstaff Limestone formation is present at the downstream portal area of the existing Narrows Tunnel.

Bedrock generally is covered by a mantle of residual soils and/or colluvium. These unconsolidated sediments are about 5–10 feet thick with some areas in excess of 27 feet. The unconsolidated sediments are composed of a mixture of clay, silt, and sand with minor amounts of organic deposits. Within the active stream channel of Gooseberry Creek and its tributaries, there are limited deposits of recent alluvial sand and gravel.

The structure of the Wasatch Plateau is dominated by a series of north-trending faults across the broad, west-dipping monocline of the plateau. The Sevier fault zone lies closest to the damsite at a distance of about 20 miles. The local structure is dominated by north-trending faulting around the site area. The dam and reservoir sites are located entirely on a down-dropped block between two fault traces, which is known as the Gooseberry Graben. Variation in orientation of beds indicates that the dam area is located on a westward-plunging synclinal fold with the axis running about 1,000 feet south of the proposed dam axis.

Three faults have been mapped in the vicinity of the Narrows Project. These faults, shown in figure 3-11, are all north-trending normal faults, and the West Gooseberry Fault, the Fairview Lakes Fault, and the East Gooseberry Fault are from west to east.

Observed earthquakes in the region of the Narrows damsite date back to 1853, giving a historical data base of about 157 years. A network of seismograph stations throughout the region currently provides the accurate location of any seismic event. Geologic evaluation of the Wasatch Plateau area indicates that existing faults are not active. Maximum seismic events for the area are, therefore, projected to be controlled by random background earthquakes—that is, events not attributable to specific faults or geologic structures.

The largest earthquake recorded in the Wasatch Plateau Province is a magnitude 4.9 event. The maximum random earthquake

event postulated for the Wasatch Plateau is a 5.5 event, occurring beneath the site at a depth of 3 miles. Such an event would produce a maximum acceleration of approximately 0.35 g (acceleration of gravity). Earthquake activity related to mining activities would not be expected to produce events which exceed magnitude 4.5 and, therefore, would not produce the maximum earthquake. Earthquake epicenters are shown on figure 3-12.

From a geoseismic standpoint, the recommended Narrows damsite is suitable for construction. No significant geologic hazards were found in the embankment or reservoir area, and no seismic activity would be expected to occur from or be induced by this reservoir. Faults which occur in the site vicinity are believed to be inactive. However, design of project facilities would be based on a "maximum credible earthquake" (MCE). Preliminary studies indicate that the appropriate MCE would be of magnitude 5.5. Further review of the appropriate MCE would be performed prior to final design of the dam.

During construction, detailed observations of the subsurface conditions would be monitored by qualified personnel.

There would be no residual geology or seismicity impacts under the Proposed Action. There would be no geology and no seismicity mitigation measures under the Proposed Action.

S3.16 SOIL RESOURCES

Soils in the project service area and along the Oak Creek and East Bench Pipelines alignments have developed under semiarid conditions. They are highly calcareous, are high in inherent plant nutrients, have weak to moderate developed soil profiles, and have a wide range of soil textures. They are derived principally from both old and recent alluvial materials eroded from geologic materials of the Wasatch Plateau. The lands are found on benches and terraces formed by the coalesced alluvial fans of the streams tributary to the San Pitch River. A broad area of valley fill material of deeper soils is found west of Mount Pleasant and in small cove areas at the base of the large alluvial fans. Valley fill also is found in the flat valley or river bottom areas west and southwest of Moroni.

Soils within the vicinity of the proposed Narrows Reservoir are formed mostly in colluvial, alluvial, and residuum materials weathered from sedimentary rocks, limestone, sandstone, and shale. Soils on the high ridges along the west side of the area are formed in materials derived primarily from limestone, while soils in the central and eastern sections of the project area are formed in materials dominated by sandstone, (silty) shale, and some limestone.

Soils are dark colored, rich in bases, freely drained, and cold. Mean annual soil temperature is less than 47 degrees Fahrenheit (°F), and the mean summer soil temperature is less than 59 °F. Average annual precipitation ranges from 20–25 inches, and the growing season is approximately 90–100 days. All but two of the soil series described are in the Cryoboroll Great Group, Boroll Suborder, and Mollisol Order of soil classification. The two exceptions, Fairview and Gooseberry series, are classified as being in the Cryaquoll Great Group, Aquoll Suborder, and Mollisol Order.

The erosion hazard for the soils within the vicinity of the proposed reservoir ranges from severe to low with over 80% of the area being classified as having a moderate or low erosion potential. Precipitation runoff rates range from rapid to slow, with most of the area having a moderate to slow runoff rate. Average sediment yields in the vicinity of the proposed reservoir are estimated to be 73 tons

per square mile per year. With a drainage area of about 5.5 square miles, there is an estimated sediment load of 400 tons per year at the proposed damsite. This drainage area excludes the area that drains into Fairview Lakes.

Under the Proposed Action, about 604 acres of land would be inundated by Narrows Reservoir. An additional 32.4 acres would be disturbed by construction of SR-264 relocation and the recreation area. Development of a rockfill material source area outside of the reservoir basin would disturb another 2.0 acres. Earthfill material source areas would be developed within the reservoir basin, and contractor staging areas and tunnel spoil areas also would be located below the low water level of the reservoir basin.

The alignment of the proposed highway relocation crosses relatively gentle terrain, and cut and fill slopes would be minimal. All cut and fill slopes would be revegetated to minimize erosion. Roadways in the recreation area would be paved to minimize dust and soil erosion. Following construction, the rockfill material source area would be recontoured, topsoil would be replaced, and the area would be revegetated. Virtually all runoff from disturbed areas would flow into Narrows Reservoir which would act as a trap for all upstream sediment. The current sediment load in Gooseberry Creek downstream from the proposed Narrows Reservoir would be reduced by about 400 tons per year with construction of the Proposed Action. This sediment would accumulate in the reservoir.

The Upper Cottonwood Creek Pipeline would be constructed in a previously disturbed area along the shoulder of SR-31. Construction of the Oak Creek and East Bench Pipelines would disturb about 30 acres. As part of the construction process, the ground would be recontoured and revegetated with native plants to minimize erosion and to restore the natural appearance.

Mitigation for disturbances to soils under the Proposed Action would be accomplished by revegetating all cut and fill slopes to minimize erosion. Roadways in the recreation area would be paved to minimize dust and soil erosion. Following construction, the rockfill material source area would be recontoured, topsoil would be replaced, and the area would be revegetated.

Residual impacts to soils under the Proposed Action would include inundating 604 acres by Narrows Reservoir and the 32.4 acres that would be covered by relocating SR-264.

S3.17 TRACE ELEMENTS

A trace element survey was conducted in accordance with current Reclamation practices to identify where concentrations of potentially toxic elements, such as selenium, arsenic, and mercury, likely would be to occur in irrigation return flows under project conditions. Accumulations of these substances can be harmful to humans and wildlife. A total of 11 soil samples, collected in 1990, were analyzed by the U.S. Geological Survey (USGS). The results are shown in table 3-34 for arsenic, mercury, and selenium from three representative sites in the project area.

Study results indicate that all three elements analyzed are present in low to moderate concentrations; therefore, further testing for these elements was not considered necessary.

Data was also gathered from the National Geochemical Database which contained extensive information on soils in the vicinity of the survey area. Most of the data was from the National Uranium Resource Evaluation Surveys conducted from 1976–80. The primary objective of these surveys was to

prospect for uranium; however, many other trace elements also were analyzed in the survey. Located in the vicinity of the survey area were 59 soil sampling sites from this. Almost all sites were in Quaternary alluvium.

The data indicate that most trace elements are present in concentrations within the common range for western soils. Cobalt was the only element consistently present in concentrations outside the common range. However, cobalt is not considered hazardous in the alkaline soils of the region. Limited water analysis data indicate cobalt was not detected in the San Pitch River.

Table 3-35 summarizes the number of soil samples with noteworthy concentrations of trace elements. Although these elements were found at elevated concentrations at scattered sites, it appears that none of the elements are present in concentrations of concern in the existing project return flows.

The data indicate that trace elements are present in low concentrations in ground water in or near the proposed Narrows Project. A review of the STORET data for the San Pitch River indicated low concentrations of the same trace elements present in the surface water in the Narrows Unit.

The data presented in table 3-37, from the EPA STORET database, indicates that water quality of the San Pitch River in the project area is generally acceptable. The San Pitch River shows some improvement in water quality through the project area, possibly due to high quality inflows from the Manti-La Sal drainage.

Lands in the project area have been irrigated for more than 50 years, and the results of the data gathered showed no significant quantities of trace or toxic elements in the ground water and in the San Pitch River; therefore, no increase of potentially toxic trace elements is anticipated under project conditions. There would be no residual impacts associated with potentially toxic trace elements under the Proposed Action.

S3.18 Indian Trust Assets

The United States has a trust responsibility to protect and maintain rights reserved by or granted to American Indian tribes or Indian individuals by treaties, statutes, and Executive orders. These rights are sometimes further interpreted through court decisions and regulations. This trust responsibility requires that agencies, such as Reclamation, take actions reasonably necessary to protect these trust assets. Implementation of the Proposed Action would have no foreseeable negative impacts on Indian Trust Assets.

S3.19 Environmental Justice

On February 11, 1994, the President issued Executive Order 12898 on Environmental Justice in Minority Populations and Low Income Populations. As a result of that Executive order, each Federal agency is required to analyze the environmental effects, including human health, economic, and social effects, of Federal actions, including effects on minority communities and low-income communities.

In the project area, there are no minorities or low-income populations.

S3.20 Related Laws, Rules, Regulations, and Executive Orders

The Council of Environmental Quality regulations (40 CFR 1500.2 and 1502.25) encourage related environmental laws, rules,

regulations, and Executive orders to be integrated concurrently to the fullest extent possible in an EIS.

The following environmental laws, rules, regulations, and Executive orders have been considered during the preparation of the SDEIS. It has been determined that the Narrows Project would have no adverse effect upon them.

- Executive Order 11988 (Flood Plain Management).
- Wild and Scenic Rivers Act, Public Law 90-542. In 2007, the USDA Forest Service and Bureau of Land Management evaluated thousands of river miles for potential inclusion in the National Wild and Scenic Rivers System. In determining suitability, a key question was, does the river segment have Outstanding Remarkable Values (ORV). The USDA Forest Service conducted an environmental impact statement to evaluate the suitability of 86 eligible river segments (840 miles) including 21 miles of Fish Creek and Gooseberry Creek. The Record of Decision, signed November 2008, determined that Fish Creek and Gooseberry Creek were not suitable to be designated by Congress as components of the National Wild and Scenic Rivers System. All the nonsuitable river segments are no longer afforded agency interim protection under the Wild and Scenic Rivers Act and continue to be managed under the direction of the respective agencies.
- Executive Order 13007 (Indian Sacred Sites).
- Executive Order 11990 (Protection of Wetlands).

S3.21 CUMULATIVE IMPACTS

The following discussion addresses the cumulative impacts to area resources in the Upper Colorado River Basin. Any analysis of cumulative impacts must deal with the issue of scope, both in terms of spatial and temporal scales. In the following discussions, these scales will vary depending upon the resource under evaluation.

Since 1960, some 30 water resources projects have been built or are under construction by Reclamation in the Upper Colorado River Basin (table 3-38). Reclamation estimates that those projects have provided full irrigation service to 158,460 acres with supplemental service to another 204,870 acres. These developments account for an estimated 62,776,000 megawatt hours of generated power and some 431,100 acre-feet of M&I water supplied annually. Recreational use associated with these projects, including sightseeing, picnicking, camping, boating, fishing, hunting, and other activities, is estimated at 45,068,970 annual recreation days. In terms of average annual permanent employment opportunities, these projects are responsible for some 18,716 jobs.

Aside from providing a net increase of 41,900 annual recreation days, and providing 855 acre-feet of M&I water annually, the Narrows Project would not affect the above resources. No new acres of cropland would be irrigated; no new power would be generated; and no new permanent jobs would be created. Because there would be no net change in existing levels of these resources in the Upper Colorado River Basin, it is assumed that there would be no cumulative impact from the proposed project; and it has been determined that further analysis of cumulative impacts of the above described resources is not necessary.

Several resource issues have been affected by past Reclamation developments and would be affected by the proposed project; thus, they have the potential to contribute to cumulative (additive) impacts within the region and beyond. These issues involve stream depletions that can impact fisheries and endangered native fishes and changes in salt loading within the Colorado River. These issues are treated in the SDEIS under the headings of fisheries, threatened and endangered species, and water resources, use, and quality.

S4.0 CONSULTATION AND COORDINATION

This section details the consultation and coordination between Reclamation and other State, Federal, and local agencies; Native American tribes; and the public in preparation of the SDEIS and the draft EIS published in 1998, which the SDEIS updates and supplements. Throughout the EIS process dating back to 1990, input has been actively solicited from a broad range of public constituencies as part of the ongoing public involvement process. Comments and involvement in the planning for and preparing of the Narrows Project generally were sought through two broad efforts: communication and consultation with a variety of Federal, State, and local agencies; Native American tribes; and interest groups; and the formal SDEIS scoping process and comment process, both of which invited input from the general public.

S4.1 SUMMARY OF INTER-AGENCY COORDINATION 1996–2003

In 1996, Reclamation invited a number of State and Federal agencies to become cooperating agencies in preparation of the DEIS. The two agencies that agreed to become cooperating agencies for the EIS process, including the SDEIS, are the USDA Forest Service and U.S. Army Corps of Engineers. In addition to these two agencies, the following agencies had representation on the interdisciplinary team led by Reclamation that prepared the draft EIS published in 1998:

- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- Utah Division of Wildlife Resources
- Utah Division of Water Quality
- U.S. Department of the Interior, Office of the Solicitor
- Sanpete Water Conservancy District

Reclamation hosted periodic cooperating agency meetings and interdisciplinary team meetings throughout preparation of the DEIS and the SDEIS, to ensure that all of the agencies were informed of, and involved in, the issues and analyses related to the SDEIS.

S4.2 CONSULTATION

Consultation was conducted as needed with agencies or experts that provided information for preparation of the DEIS published in 1998 and the SDEIS.

S4.3 PUBLIC INVOLVEMENT AND SCOPING

The scoping process for the SDEIS was conducted by Reclamation beginning in November 2003 to provide the general public, organizations, State and local governments, and affected Federal agencies an opportunity to identify issues and concerns they believe should be studied early in the preparation of

the SDEIS. "Scoping" is the public involvement process required by the Council on Environmental Quality regulations to help Federal agencies determine issues and alternatives analyzed in the SDEIS. Results of the scoping meetings and comments received during the scoping process were used to establish the scope of the SDEIS and focus the environmental analysis on the important issues and concerns.

S4.4 DOCUMENT AVAILABILITY

Those who were on the mailing list for the 1998 draft EIS, or who asked to be added to the mailing list in response to the November 2003 Notice of Intent to Prepare a SDEIS, will be provided notification of document availability along with other environmental groups; Federal, State, and local government agencies; and other interested parties. Approximately 425 notifications of the SDEIS have been mailed to interested agencies, organizations, and individuals. The SDEIS is available online at www.usbr.gov/uc/envdocs/index.html#eis.